

2008 Research Report

Radboud University Nijmegen

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Preface

In 2008, we celebrated our 85th anniversary, with as our motto: 'Radboud University Nijmegen, 85 ground-breaking years.' The achievements of researchers at the University in the past year have certainly been ground-breaking and, thanks to their efforts, we have made substantial progress towards our goal of being one of the top universities in Europe.

The quality of research at our University is evident in the evaluations made by international committees in recent years: the average score has been 'very good' to 'excellent'. Other signs of the quality of research are the increasing number of scientific publications, especially in top journals such as *Nature* and *Science*, and the amount of funding for commissioned research coming from secondary and tertiary sources (*i.e.* research grants and research contracts from government or non-government sources, respectively).

The national and international prizes awarded to our staff are a feather in the cap for the academics concerned, but also for the University. Prof. Theo Rasing received the Spinoza prize and the prize for Science and Society. Prof. Floris Rutjes was chosen as the most enterprising academic. Three professors received prestigious European Scholarships (ERC Advanced Investigator Grants) for their pioneering research: the linguist Prof. Pieter Muysken, the astronomer Prof. Heino Falcke and the microbiologist Prof. Mike Jetten. Radboud University Nijmegen is the only Dutch university to have received awards in all three fields: in social sciences and humanities, physics and engineering, and in life sciences. That says a great deal about the quality of research here across all academic disciplines.

However, such success does not imply that there is no need for continual improvement. The establishment of the Donders Institute for Brain, Cognition and Behaviour in 2008 reflects a major effort by the University to make 'brain' studies – cognition & neuroscience – a strong focal point. All the studies in this field have been brought together in a powerful platform with a staff of four hundred. There is research relating to all of the levels that are important to understanding cognition: from the molecular and gene level, via neurons and networks involving parts of the brain, to behaviour.

In addition, Clinical and Translational Research was located in three new research institutes in 2008: the Nijmegen Institute for Infection, Inflammation and Immunity; the Institute for Genetic and Metabolic Diseases; and the Research Institute for Oncology. This restructuring has further strengthened the University's medical research.

All of our research is structured within specialized institutes. In recent years, these have proved to be a stimulating and inspiring environment for cutting-edge research. In this publication we report, with some pride, on the research achievements during the past year. For each of the institutes we report on the current state of research, the societal impact of the research, and plans for the future.

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

Prof. S.C.J.J. Kortmann
Rector Magnificus

Table of contents

Academic reputation	6
Research Institute for Religious Studies and Theology	14
Centre for Ethics	20
Research Institute for Philosophy	22
Institute for Historical, Literary and Cultural Studies	26
• Centre for Parliamentary History	29
Research Centres of the Faculty of Law	32
Institute for Management Research	40
Nijmegen Institute for Social & Cultural Research	46
• Institute for Gender Studies	49
Centre for Language Studies	52
Behavioural Science Institute	58
Donders Institute for Brain, Cognition and Behaviour	64
• Centre for Cognition	66
• Centre for Cognitive Neuroimaging	72
• Centre for Neuroscience	78
Institute for Genetic and Metabolic Diseases	86
Research Institute for Oncology	92
Nijmegen Institute for Infection, Inflammation and Immunity	96
Nijmegen Centre for Evidence-Based Practice	100
Nijmegen Centre for Molecular Life Sciences	108
• Molecule-2-Man	111
Institute for Water and Wetland Research	116
Institute for Molecules and Materials	122
Institute for Mathematics, Astrophysics and Particle Physics	130
Institute for Computing and Information Sciences	136
Institute for Science, Innovation & Society	140
Glossary	144

Academic reputation

Radboud University Nijmegen is a broad, multidisciplinary, internationally-oriented research university. It has the ambition to become one of Europe's top academic institutions. In 2008, the University again made good progress towards achieving this ambition. The numbers of academic publications, publications in top-ranking journals, and research grants obtained in strong competition have all increased substantially. The stimulating environment and attractiveness to gifted young researchers across the University has once again been demonstrated by the 44 prestigious grants awarded to this new generation.

The University's visibility and societal impact have been further improved by frequent contributions to debates, news items in the media and memberships in advisory councils. Partnerships with private and public institutions have been consolidated, and international scientific networks have been strengthened and extended.

This report highlights the most significant achievements of the institutes in which all of the research at the University is organized.

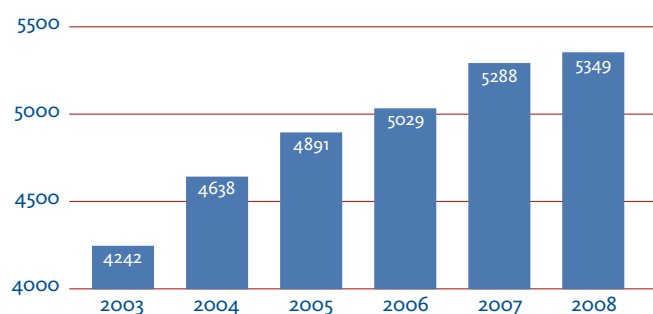


Figure 1: Total number of scientific publications per year

Strong international position

The international context in which the University operates is best illustrated by the map on the inside cover of this report. By taking the initiative to establish an International Research Universities Network (IRUN) in 2007, the University joined eight partner universities in order to further improve the international quality of research and education.

The IRUN partners will encourage and facilitate the exchange of researchers, lectures and students. This may lead to joint curriculum development and joint degree programmes for Masters students and doctoral candidates. Furthermore, the network will serve as a platform for joint conferences, symposiums and seminars.

Several meetings with IRUN partner universities were organized in 2008, including a Nanotechnology Symposium at the University of Münster and a Conference on Women in Science at Radboud University Nijmegen.

The following universities currently participate in the IRUN network: Jagiellonian University in Krakow (Poland), Peter Pazmany Catholic University, Budapest (Hungary), Radboud University Nijmegen (Netherlands), the University of Barcelona (Spain), the University of Duisburg-Essen (Germany), University of Glasgow (Great Britain), the University of Münster (Germany), Université de Poitiers (France) and the University of Siena (Italy).

Radboud University Nijmegen has an active policy of strengthening its international position not only with publications in high-ranking international journals, also through recruitment of international staff, acquisition of international research grants and attracting visiting scholars from around the globe.

A few examples of research in an international setting:

In 2008 the Integrated FP6 Research Programme Eumitocombat, which is coordinated by Prof. Jan Smeitink, was completed successfully. This European Research consortium was given an outstanding assessment by external reviewers.

In cooperation with Harvard University, Profs. Venbrux, van Binsbergen and Witzel (Harvard) organized the Second Annual Conference of the International Association for Comparative Mythology, including a session on the mythology of death and dying.

Prof. Joost Drenth established a pan-European Working Party on Alcoholic Chronic Pancreatitis (ACP), assembling researchers from 21 different sites in 12 European countries. This collaborative effort has enabled him to collect 2,585 well-phenotyped ACP cases and 2,980 ethnically matched controls in order to carry out a Wellcome Trust-funded case-control genome-wide association study.

In collaboration with the 'Centre d'études du vivant' (Paris 7 - Diderot), the Centre for Psychoanalysis and Philosophical Anthropology (Radboud University - Catholic University of Leuven), which is led by Prof. Philippe van Haute, organized the foundational meeting of the 'International Society for Psychoanalysis and Philosophy'. This bilingual organization (French-English) facilitates collaboration between psychoanalysts and philosophers worldwide. The next meeting will be hosted by Boston College in November 2009.

Profs. Scheepers (Principal Investigator) and Schilderman (coordinator) initiated an international research programme 'Religious Sources of Solidarity' (EURESOURCE) in collaboration with the Johann Wolfgang Goethe University (Frankfurt) and Warwick University (UK). This programme addresses the question as to what extent religion in Europe is re-emerging as a social force. It views solidarity as one of the main concerns that are re-emerging on the political agenda at the national and European level.

Members of the *Centre for Migration Law* 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.

The construction of the sign language Corpus NGT at the *Centre for Language Studies* has led to a unique innovative database that is available on-line, both to linguistic researchers and to the general public (www.corpusngt.nl). This pioneering methodology and related software development is setting the standard in the sign language research community worldwide.

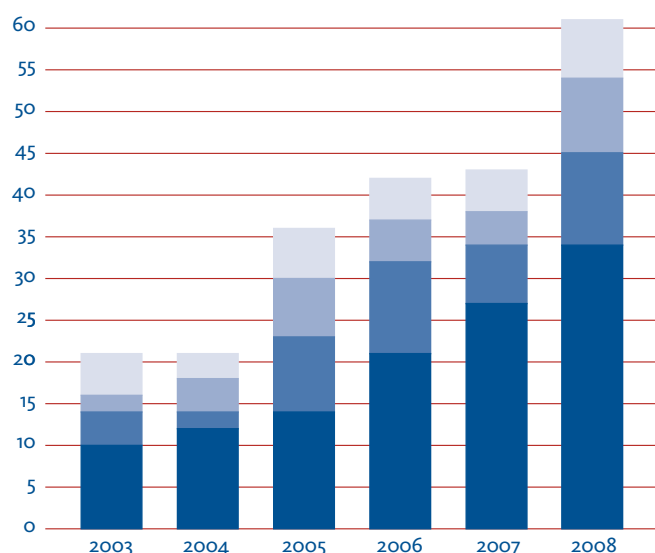


Figure 2: Number of publications per year in

- Nature
- Science
- Proceedings of the National Academy of Sciences
- New England Journal of Medicine

External evaluations

The research institutes at Radboud University Nijmegen are periodically evaluated by an international commission of peers. If a programme does not receive at least a 'very good' evaluation, a plan is drawn up to raise it to that level. If at the following evaluation no better result is achieved, the programme is terminated. Research programmes that are rated 'excellent' are encouraged that they can continue to deliver high-quality results.

Key figures

Research staff

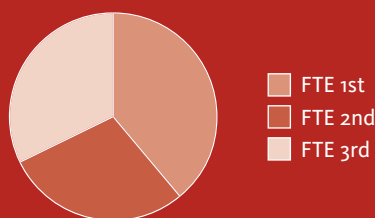
Tenured

Full Professors	137.2 FTE
Associate Professors	69.8 FTE
Assistant Professors	157.6 FTE
Researchers	105.0 FTE

Non-tenured

Researchers	260.0 FTE
Postdocs	194.7 FTE
Doctoral candidates	799.4 FTE

Research input



Research output

Dissertations	260
Scientific publications	5349
Professional publications	892
Annotations	187
Patents	7

The Review Committees assess the institutes according to the Standard Evaluation Protocol for scientific research in the Netherlands. For each research programme four criteria are being used: 1) quality, 2) productivity, 3) relevance and 4) vitality & feasibility. The assessments attached to these criteria are:
 Excellent: leading, at the forefront worldwide
 Very good: internationally competitive, leading nationally
 Good: nationally competitive, visible internationally
 Satisfactory: visible nationally
 Unsatisfactory: not worth pursuing

In 2008 three research institutes at the University – the *Institute for Molecules and Materials*, the *Institute for Management Research* and the *Business and Law Research Centre* – were evaluated by independent international review committees.

Academic reputation



ERC Advanced Grant laureates

Prof. Pieter Muysken
 Prof. Mike Jetten
 Prof. Heino Falcke
 Prof. Conny Aerts

The research at the *Institute for Molecules and Materials (IMM)* was assessed overall as 'very good' to 'excellent'. The Committee regarded in particular, the leadership, the unique infrastructural facilities and the dedication to acquisition to be competitive internationally. Of the 18 research programmes, two were rated 'excellent' and nine 'nearly excellent' for all four criteria. The Committee also greatly appreciated the quality of the education and training of doctoral candidates.

The research at the *Institute for Management Research (IMR)* has not yet reached the level of quality that the University requires. The IMR has made progress since the last mid-term evaluation: both the quality and quantity of publications had increased, as have the number of dissertations and the number of national and international research grants. However, the Committee criticized the lack of coherence within and between research programmes. In the meantime the IMR has reduced the number of programmes from six to four, and is actively developing a plan to secure its future.

The *Business and Law Research Centre (OO&R)* was assessed overall as 'nearly excellent' for all criteria. Three of the four research programmes were evaluated as 'very good' or 'excellent'. The Committee

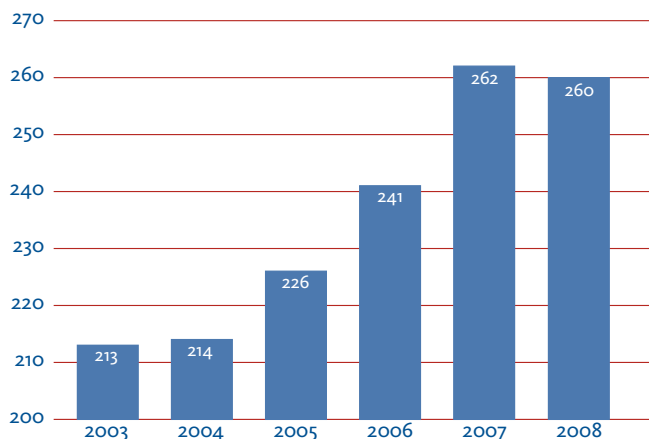


Figure 3: Number of dissertations per year

rated both the scientific and the societal relevance of the research as 'excellent'. In particular, the intensive cooperation between OO&R and law firms was greatly appreciated. Such cooperation makes it possible to contribute to legal research based on daily practice in business law. In addition, the Committee admired the involvement of OO&R in preparing new laws for the government. The Committee recommended ways to improve OO&R's international visibility, for example by publishing more in international legal journals and by extending its international network.

The *Donders Institute's Centre for Cognition* was once again accredited by the Royal Netherlands Academy of Arts and Sciences.

Acknowledged excellence

A large number of researchers at the University received prizes or prestigious personal grants for their excellent performance in academic research. A selection is presented here.

International

The Advanced Investigator Grant of the European Research Council is a new, highly prestigious grant for individual scientists. On average €2,500,000 is awarded for five years of research. Four researchers at Radboud University Nijmegen received an ERC Advanced Grant for their research in astronomy, microbiology and linguistics. This enormous success underlines the quality of research across the University.

Prof. Heino Falcke received the ERC Advanced Grant for his research on the origin of the most energetic cosmic particles.

Prof. Mike Jetten acquired the ERC Advanced Grant for continuing and extending his successful research on anammox bacteria, which can convert ammonia to nitrogen without using oxygen and without producing carbon dioxide.

Prof. Pieter Muysken received the ERC Advanced Grant for new directions in the field of language contact studies.

Prof. Conny Aerts was awarded the ERC Advanced Grant for her research on oscillations of stars at the Catholic University of Leuven, where she also has a chair.

Prof. Chris van Weel received the Maurice Wood award, the most prestigious international award for research in the field of primary care.

Prof. Peter Friedl received the prestigious German Cancer Award on the occasion of the 28th German Cancer Congress in Berlin.

Prof. Ap Dijksterhuis won the Career Trajectory Award from the Society for Experimental Social Psychology (SESP).

Prof. Peter Hagoort was awarded the Senior Heymans Prize.

Prof. Ronald de Groot received the Bill Marshall Award from the European Society for Paediatric Infectious Diseases (ESPID).

Dr Richard Lopata received the Young Investigator Award at Euroson 2008 for his research on diagnosis of chronic heart failure, using cardiac strain imaging.

Prof. Joost Schalkwijk received the Wyeth award 'Advances in psoriasis research'.

Prof. Mai Gehrke, together with Profs. J.E. Pin and S. Grigorieff (Paris), won the Best Paper Award in Track B at the ICALP 2008 conference.

Roger Smeets MSc received the Haynes prize for being the most promising young scholar – together with Maarten Bosker – and the Best Reviewer Award at the Academy of International Business meeting in Milan, Italy.

Prof. Myrra Vernooij-Dassen became an honorary visiting professor at the University of Bradford.

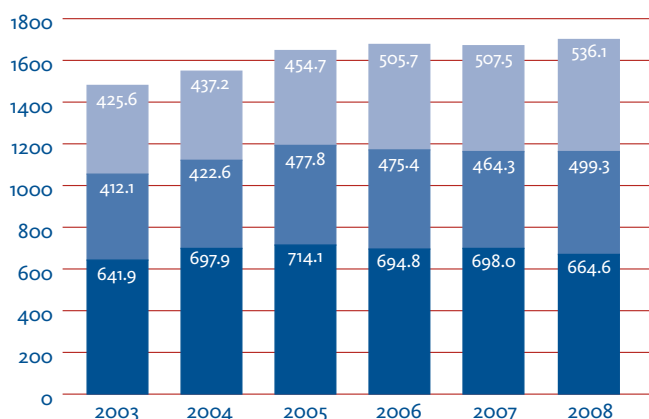


Figure 4: Number of researchers (in FTEs) per year from
■ core funding ■ research grants ■ contracts

National

Prof. Theo Rasing won the Netherlands' most prestigious award for scientific achievements (the NWO Spinoza Award).

Prof. Dorine Swinkels received the first prize in the category 'Business Management' for her presentation at the Dutch Society for Clinical Chemistry.

The National Innovation Platform chose 'MijnZorgNet' (Prof. Kremer and Dr. Bloem) as one of the most innovative care initiatives in the Netherlands. The award was granted by the Dutch Minister of Health during the 'Top conference on Innovative Care Initiatives, Innovations within Reach'.

Prof. Jack Wetzels received an award as 'MEDNET Toparts 2008 (best MEDNET doctor in 2008)'.

The Parkinson Centre Nijmegen (ParC) was recognized as a Centre of Excellence by the National Parkinson Foundation.

Prof. Carl Figdor (Department of Tumour Immunology) and Prof. John Jansen (Department of Periodontology and Biomaterials) were elected as members of the Royal Netherlands Academy of Arts and Sciences.

Prof. Paul Groot was elected to the Young Academy of the Royal Netherlands Academy of Arts and Sciences.

Dr Niels Riksen was awarded the annual dissertation prize by the Dutch Society for Clinical Pharmacology & Biopharmacy, the 2008 Eindhoven Dissertation Prize from the Dutch Society for Cardiology and Inter-university Cardiology Institute, and the 2008 Vascular Medical Science Prize from the Dutch Society for Vascular Medical Science. Dr Riksen also received an honorary mention in relation to the Dr Roos Award by the Dutch Internist Association.

Grants for excellent young scientists

Young scientists and Research Masters students at the University have produced outstanding results. Forty-four excellent young researchers have won prestigious national or international grants against strong competition.

Eleven talented young researchers received an NWO Veni grant in 2007, which will enable them to do research for three years. The winners are: Dr M.C. van den Berg, Dr B.M.C. Breij, Dr E. van Gijn, Dr R. Hoogenboom, Dr H.W.M. van Laarhoven Dr S.B. Nabuurs, Dr S.A. Rueschemeyer, Dr W.D. van Suijlekom, Dr P. Vergeer, Dr V. Vonk and Dr L. Mommer.

Ten post-doctoral researchers received NWO Vidi grants, which will enable them to develop their line of research for five years. These grants were awarded to: Dr A. Schenck*, Dr R. Cools*, Dr G.

Academic reputation

Janzen*, Dr K.G. Blank, Dr J.A.A.W. Elemans, Dr A.I. Hollander, Prof. R.P.C. Kessels, Dr J.B. Koenderink, Dr. G.A. Nelemans, Dr R.P. van Rij and Dr R.B.J. Tinnevelt. (* including an extra NWO ASPASIA grant to promote the academic careers of female researchers)

An NWO Vici grant, which permits senior scientists to build their own research group, was won by Dr I.Toni for his project on how brains allow us to communicate without using language.

Ten young researchers received an NWO Rubicon Scholarship to enable them to go to another country to conduct research immediately after gaining their doctorates. These scholarships were awarded to: J. Huitink MSc, A.S. Rijpkema MSc, Dr R.M. Willems, Dr V. Kuperman, Dr J.T. Bousema, M.J. van Setten MSc, R.J.F. Melis MSc, Dr C. Lavigueur, Dr M.J.G.M. De Pourcq and M.H. de Vries, MA, MSc.

Four talented medical students (M. Dorresteyn MSc, H. de Koning MSc, H. van den Nieuwenhof MSc and W.G. Leen MSc) won an ZonMW AGIKO grant that will allow them to be trained both as a medical specialist and a clinical researcher.

Three Research Masters students (J.K.M. Berns, L. Peperkamp and M.J.A.G. Henckens) received an NWO Top Talent grant for four-year PhD research programmes which they designed themselves.

Four Research Masters students (T. Dawood, T. Xi, K. Nganou Makamdop and A.F. Khadem) have gained an NWO Mozaiek Grant for four-year PhD research programmes which they designed themselves. The NWO Mozaiek Grant is dedicated to talented students from ethnic minorities and is designed to support their academic careers.

An NWO Top subsidy was received by Dr J.G.J. Hoenderop to boost his research group, which investigates magnesium transporters in the kidney.

Societal impact of our research

A large number of researchers at the University have positions in the public and private domain as advisors, council members or board members. Many of them are members of influential scientific committees and they often contribute to national and international clinical guidelines and systematic reviews. A few examples:

- In 2008, Prof. Maatman was appointed to the management board of the AFM (Netherlands Authority for the Financial Markets).
- Prof. Rank was appointed as a Technical Assistance Advisor by the International Monetary Fund (IMF).
- Prof. Olde Rikkert is a member of the International Research Forum of Alzheimer Nederland, which was founded in 2008. Furthermore, he is a Board member of the European Alzheimer Research Consortium.



Through active dissemination of science to society and by delivering new generations of well-trained researchers, the University contributes to innovation. The relevance of our expertise is evident in a number of domains.

Cognitive neuroscience and linguistics

According to the World Health Organization, diseases of the nervous system will become the most important medical priority this century. The costs of treating nervous system disorders are already 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 crucial to technologically advanced societies. According to the OECD, a brain-based learning science is urgently needed. The excellent infrastructure and expertise at the *Donders Institute for Brain, Cognition and Behaviour* is an effective factor in this domain.

Arts and history

Another way in which the University shares its knowledge and expertise is by contributing to exhibitions, museums and other cultural activities, where the general public profits from new insights and state-of-the-art developments in research.

Prof. Moormann and Dr Mols participated in staging the excellent exhibition 'Luxury and decadence. Life on the Roman Gold Coast' in the Valkhof Museum in Nijmegen and wrote parts of the accompanying catalogue.

Two white marble reliefs from the early seventeenth century, which were removed from St. Jan's Cathedral in 's-Hertogenbosch 150 years ago, appeared in an exhibition in Dendermonde (Flanders) at the end of 2007. Jos Koldeweij, Professor of Art History of the Middle Ages, ensured that the two kneeling angels were restored and returned to St. Jan's in April 2008.

Nearly all Dutch and Flemish researchers in modern Dutch literature gathered in Nijmegen for the bi-annual conference



Spinoza Award laureates

2008	Prof. Theo Rasing
2006	Prof. Carl Figdor
2005	Prof. Peter Hagoort
2002	Prof. Henk Barendregt
2001	Prof. Bert Meijer
1999	Prof. Anne Cutler
1998	Prof. Pieter Muysken

'Behind the stories' ('Achter de verhalen'). The first two days were dedicated to an overview of the state of affairs in the study of modern Dutch literature, while the third day focused on the future of Dutch studies.

Life sciences and health

Infectious disease is the number one reason for morbidity and mortality in the world and many projects, such as those focusing on poverty-related infection, vaccines and antibiotics are designed to tackle this problem. Disorders of inflammation and immunity play a major role in other diseases which are studied within the framework of the *Nijmegen Institute for Infection, Inflammation and Immunity*.

Cancer – a major health problem in developed countries – has an enormous physical and mental impact on patients and their families. *The Institute for Oncology* improves prevention, diagnosis and therapy as well as psycho-social assistance, which are all important to the well-being of society as a whole.

Life science processes and material applications inspire many researchers, resulting in extensive collaborations with a range of regional, national and international industrial partners. Among the formal cooperative arrangements are those with companies such as DSM, Philips, Organon, Solvay, Unilever, AkzoNobel, Synthon, Lundbeck and Schering-Plough.

Examples of research on health-related issues include:

- The research line of Dr van Bokhoven and Dr Schenck, which goes all the way from the clinic to model organisms via the genetics lab and back. As a proof-of-concept for this research pipeline, a severe mental retardation syndrome – 9q subtelomeric deletion syndrome – is studied, which is caused by heterozygous mutation of the EHMT1 gene.
- Prof. Buydens' team focused on models predicting the mutagenicity of a particular drug, thus providing valuable information for a drug discovery process.
- In the search for attractive drug candidates, the group led by Prof. Rutjes is developing a total synthesis sequence of platencin, a new antibiotic, starting from commercially available chemicals.

- The publication by Prof. Roubos and Dr Kozicz in April 2008 on gender differences in adaptation, and the role of urocortin-1 in stress, depression and suicide received considerable attention from radio, television, press and professional journals.

Behaviour and society

Dr van der Vorst and Prof. Engels collaborate with the Trimbos Institute on developing a national campaign designed to influence the role of parents in preventing juvenile alcohol use. A mass media campaign was launched early in 2008.

The *Centre for Ethics* contributes to the moral education of a wide range of professional bodies, such as the police, the army, health-care professionals and sports coaches, and members of the Centre are directly involved in moral education programmes in schools. Some of the Centre's publications have large circulations and have attracted attention in national newspapers and periodicals.

The *Centre for Migration Law* carried out research on behalf of the UNHCR, European Commission, the Dutch Ministry of Justice, the Advisory Committee for Aliens' Affairs, the Dutch Refugee Council, FORUM (Institute for Multicultural Development) and the Dutch Foundation for Legal Aid for Asylum Seekers.

Prof. Benschop gave presentations on gender in organizations, gender and leadership, and gender at work for companies such as BAM, ING Bank, KPMG and PWC, as well as non-profit organizations including the police and policy makers.

Scholars working in the Trajectories of Religion programme contributed to the dissemination of research findings to academics, professionals and to the wider public. They organized an expert meeting with key players in the world of undertaking, while their book on ritual creativity attracted the attention of the public and the media.

Prof. Verhoeven is head of the National Language Education Centre, which was set up to improve the teaching and learning of Dutch language and literacy at primary schools in the Netherlands.

Academic reputation

Science and mathematics

The impact of the *Institute for Computing and Information Sciences* is evident in various industrial projects designed to improve the security of computers and the quality of software, for instance in the medical domain. The research on the Mifare Classic RFID tags was listed by the professional journal *InformationWeek* as one of the Top 10 Security Stories of 2008.

A high degree of public visibility and relevance to society and policy is inherent in the innovative, interactive research programmes at the *Institute for Science, Innovation and Society*. This Institute, which hosts the public website www.watisgenomics.nl (~ 10,000 hits each month), organizes a number of interactive workshops, public debates and on-line discussions (DNA dialogues) in collaboration with established podia and various popular magazines.

The *Institute for Water and Wetland Research* extended its research in Wetland Ecology. This Institute was also actively engaged in cooperation with Dutch consultant engineering companies to improve the management of wetlands in general, in terms of water quality, sediment quality, hydrological regimes, and ecological and socio-economic development.

The discovery and distribution of anammox bacteria in the oceans had great impact on the current models of the global nitrogen and carbon cycles used by oceanographers. Two new wastewater treatment plants based on the anammox concept were built to remove ammonia from industrial waste streams more cost effectively.

Control of recombination processes would allow breeders to more easily develop elites. The ultimate goal of the plant genetics research is to induce position-specific recombination so that specific bad traits can be removed. New transposon insertion analysis technology has already attracted attention from industrial companies.

The prestigious National Prize for Science and Society was won in 2008 by Prof. Theo Rasing for his 'ground-breaking research with great potential for technological applications'.

The prize from the National Innovation Platform for the 'Most Entrepreneurial Scientist of the Netherlands' was won by Prof. Floris Rutjes for his initiative 'Future Chemistry BV', which is designed to develop and exploit microreactor systems for the production of new drugs.

Research highlights in 2008

The achievements in research have not only led to an increase in the absolute numbers of publications but even more to an increased number of publications in high-ranking scientific journals. A selection of ground-breaking results throughout our University is presented below. In the following chapters of this report each Research Institute presents its own highlights in 2008.

Researchers at the *Behavioural Science Institute* revealed that automatic avoidance behaviour is a central mechanism in social anxiety, while automatic tendencies to approach alcohol stimuli are critical in heavy drinkers, especially in those with a genetic vulnerability. Luckily, these unhealthy approach tendencies can be re-trained and reduced.

Prof. Vlieg's research yields new insight into how to manipulate the electronic properties of semiconducting indium phosphide nanowires, thus achieving controlled growth of twinning superlattices.

Prof. Wieggers conducted research on Islamic jurisprudence and ethics with Prof. Beck of Tilburg University. They demonstrated the dynamics of Muslim law and ethics in Europe and how Muslim scholars offer solutions when inherited religious points of view are challenged by the values and norms prevalent in modern, secular, societies on the basis of selected issues, such as political participation, human rights, matters relating to daily life and bio-ethical issues.

The research conducted within the OO&R provides new insights into the approach to current problems in the legal practice of business and finance (such as preventing market abuse, strengthening financial supervision, combating the financial crisis, achieving a more flexible company law, and modernising insolvency law).

Prof. Maan's research in the High Field Magnet Laboratory reveals the first metrological characterization of quantum Hall resistance in graphene.

In the programme Linguistic Information Processing, Dr Gemmeke and Dr Cranen introduced a promising new approach for noise-robust exemplar-based speech recognition.

Dr ten Bosch, Prof. Boves and Dr Klein clarified the relationship between the neural and psychological models of language acquisition, using a cognitively plausible computational model that can learn up to 50 words without any priori meta-linguistic knowledge – a breakthrough in research on automatic language learning.

At the *Institute for Mathematics, Astrophysics and Particle Physics* a fundamental duality was discovered between profinite structures in algebra and geometry and extended Stone duality for Boolean algebras with additional operations as they are studied in logic and theoretical computer science. At the same institute a possible X-ray progenitor of the Type Ia Supernova 2007 was found.

Researchers at the *Donders' Centre for Cognition* were the first to outline the suggested complementary roles of the action system (the mirror neuron system) and the mentalizing system (the theory of mind system) in understanding other agents' goal-directed actions.

Prof. Gielen revealed the mechanism for selective attention. Selective attention is the phenomenon of selecting only the relevant information and ignoring information that is not relevant. He showed that a simple feedforward model with fixed synaptic conductance values can reproduce these two phenomena.

Marine anammox bacteria were enriched from anoxic Fjord sediment. The genome and proteome of the microbes were elucidated. The activity, gene expression and ladderane lipids of the marine anammox bacteria were investigated, showing that these bacteria may contribute significantly to the dinitrogen gas production of our atmosphere.

Prof. Buitelaar, Dr Franke and colleagues found no linkage between genes responsible for AHDH on the most established ADHD-linked genomic regions of 5p and 17p, but suggestive linkage signals on chromosomes 9 and 16.

A series of pharmacological neuroimaging studies have revealed contrasting effects of dopaminergic drugs in healthy volunteers as a function of task demands, baseline levels of dopamine in associated fronto-striatal circuitry and impulsive personality. These effects of dopamine were particularly pronounced during tasks that involved measuring reward-directed behaviours. In parallel, the effects of serotonergic manipulations, which were more pronounced in punishment-directed behaviours, were investigated.

A method for quantitatively determining the proportions of plant species present in mixed root samples was developed, based on their DNA signature. This method opens up new avenues for research into mechanisms of biodiversity, as – for the very first time – it is now possible to determine where the roots of different species of a plant community are in the soil.

The report 'Increased Market Stability as a result of Consensus and Transparency with respect to Price Ranges for Illiquid Derivatives', which was published in 2008, may lead to the development of an important tool that can be used to solve one of the main problems in the present financial crisis. It shows why the stability, liquidity and transparency of the financial system would greatly benefit from so-called Scientific Market Makers.

The scientific achievements presented here – together with the skills and enthusiasm of the staff – make all of us at Radboud University Nijmegen feel confident about the future.

Radboud University Nijmegen has the following 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 specialized institutes:

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

Centre for Language Studies
Behavioural Science Institute
Donders Institute for Brain, Cognition and Behaviour

- Centre for Cognition
- Centre for Cognitive Neuroimaging
- Centre for Neuroscience

Institute for Genetic and Metabolic Diseases
Research Institute for Oncology
Nijmegen Institute for Infection, Inflammation and Immunity
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 & Society

Preparing for a career in research with 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

Research Institute for Religious Studies and Theology

The Research Institute for Religious Studies and Theology (RST) seeks to conduct, encourage, integrate and internationalize excellent research in Religious Studies and Theology. Its point of departure is the continuing relevance of religion for present-day societies, and especially the religious transformation processes that are taking place in them. By transformation is understood a gradual process of change in form, function or meaning taking place within religious traditions.



Research focus

The religious dynamics in many societies today require profound study. Are we witnessing a process of religions becoming 'fluid' or a revitalization of traditional religions and the return of religions to the public domain? Are the changes that are currently happening unique or will historical and comparative research reveal comparable processes in the past? What is the role of modernization, globalization and pluralism? Which scientific instruments and theories are needed to identify, interpret and explain these dynamics?

The research programme 'Religions and Transformation in Contexts' (RATIC) (2007-2012) makes a scientifically and socially relevant contribution to research into religious dynamics by focusing on the concept of transformation. While this concept is commonly associated with the dynamics under investigation, it is seldom accurately defined or operationalised. In the RATIC programme transformation is studied as a 'change process in religious and spiritual identities, hence both at the level of the individual believer and at the (collective) level of communities and institutions'.

The programme 'Religions and Transformation in Contexts' is carried out by five research groups:

Trajectories of Religiosity (until 2008: Traditions and transformations in intercultural and inter-religious contexts) (Prof. G.A.Wiegers and Prof. H.J.Venbrux)

This programme, which combines comparative religious studies with anthropology of religion, focuses on the transformations of Islam, Asian religions, and new religious movements (including indigenous and local religions) in relation to the Western world. There is a focus on 1) ritual and religiosity (death rites, pilgrimage, and religious tourism), 2) religion and the arts, 3) religion, conflict, and media, 4) methods and theories of comparative religious studies, and 5) the history of religions.

Reframing Spirituality and Mysticism in Past and Present (Prof. F. Maas)

This programme starts from the observation that there is growing interest in spirituality and mysticism in contemporary Western societies. Recent social and cultural developments have deeply transformed both socio-cultural manifestations of spirituality and mysticism and awareness of the inner structures of spirituality



Young people are attending religious meetings in ever-larger numbers.

Staff

Prof. W.P. van den Bercken (e)
 Prof. G. Essen (o)
 Prof. R.L. Grimes (p)
 Prof. M.A.C. de Haardt (p)
 Prof. C.A.M. Hermans (o)
 Prof. A.J.M. van den Hoogen (p)
 Prof. A.T.M. de Jong (e)
 Prof. F.A. Maas (o)
 Prof. H. Motzki (p)
 Prof. P.J.A. Nissen (o)
 Prof. J. van Oort (p)
 Prof. H.G.B. Teule (p)
 Prof. J.B.A. Schilderman (p)
 Prof. P.J.C.L. van der Velde (p)
 Prof. J.A. van der Ven (p)
 Prof. H.J.M. Venbrux (p)
 Prof. G.A. Wiegers (o)
 Prof. F.J.S. Wijsen (o)
 Prof. J.-P. Wils (o)

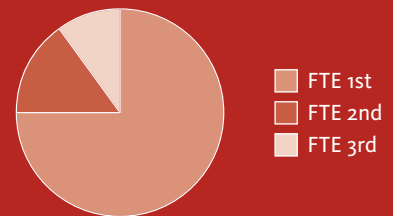
(o), (e) and (p) see Glossary

Tenured

Full Professors	5.1 FTE
Associate Professors	0.4 FTE
Assistant Professors	4.1 FTE
Researchers	1.5 FTE

Non-tenured

Researchers	2.2 FTE
Postdocs	2.0 FTE
Doctoral candidates	7.2 FTE



and mysticism and their relationship to texts, material objects, images, social and economic culture, histories, practices, and theoretical presuppositions.

Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism (Dr E. Eynikel)

This programme focuses on biblical and extra-biblical texts which mirror religious transformations in social, political, or religious contexts. The research concentrates on interpreting a number of key texts on religious transformations, different levels of interpretation, and re-working of early Christian and Jewish texts, as well as their historical, religious and hermeneutical backgrounds.

Transformation of Religion within the Frameworks of Modernity (Prof. G. Essen)

The aim of this programme is to investigate the effects of social and cultural transformation on the normative quality of religious interpretive systems. It includes the following subjects: (1) the crisis of theism in modernity, (2) science and theology, (3) conflict and cohesion, and (4) chronology and topography.

Religious Identity Transformation in Context (Prof. C. Hermans)

This research programme develops theories about the transformation of religious identity within a pluralizing and individualizing context that involves various types of interactions between religions. Transformation of religious identity is studied as a continuity – or discontinuity – of religious identity in time, through adaptation within its current contexts and within an explanatory framework of its antecedents and consequents. The context in which religious identity is transformed is characterized by intended and unintentional interactions between individuals and groups with different religions in terms of the social cohesion of society.

Research facilities

The institute houses special collections in the University Library, such as the Egyptological collection of books named after the Nijmegen professor J. M.A. Janssen, which is considered to be one of the richest in the Netherlands, and the collections of the Titus Brandsma Institute, a fine collection of publications on Mysticism and Spirituality. Furthermore, the collections of the Catholic Documentation Centre (Katholiek Documentatiecentrum) are important. In addition to publications, the KDC also preserves audio-visual materials.

Research Institute for Religious Studies and Theology

Hans Schilderman, Full Professor of Empirical Religious Sciences, with a special focus on religion and care, coordinates the EU-funded project 'Re-emergence of Religion as a Social Force in Europe'.



Collaboration

The institute collaborates with the Theological Faculty of the Catholic University Louvain, the Catholic University of America (Washington, USA); the University of South Africa (Pretoria, South Africa); the Westfälische Wilhelms-Universität Münster (Germany), the Netherlands School for Advanced Studies in Theology and Religion (NOSTER, the Netherlands), the Faculty of Theology of Dharmaram Vidya Kshetra in Bangalore (India) and the University of Heidelberg (Germany).

Research results

Trajectories of Religiosity

Prof. Wiegers conducted research on Islamic jurisprudence and ethics with Prof. H.L. Beck of Tilburg University. Together they published a study on fatwas, targeting Muslims in Europe, in the framework of religious jurisprudence for minorities. In it, they demonstrate the dynamics of Muslim law and ethics in Europe and how Muslim scholars offer solutions when inherited religious points of view are challenged by the values and norms prevalent in modern, secular societies on the basis of issues such as political participation, human rights, matters relating to daily life and bio-ethical issues.

Preliminary research by Dr Hermkens (NWO-VENI) shows that ritual practices played a significant role (for example, in mobilizing people, morally and religiously legitimizing violence, and preventing

violence) in the destructive conflict that erupted between Christians and Muslims and among Muslims in North Maluku in Indonesia between 2000-2001.

The NWO-funded 'Refiguring Death Rites' research group (Prof. Venbrux), conducted empirical research into new ritualizations of death and related notions of religiosity in the Netherlands, which indicated that there are limits to secularization. Whereas nearly all other ritualized moments can be avoided, death is consistently found to be the most difficult to leave symbolically undefined and meaningless. The project 'Allerzielen Alom' (i.e. All Souls Everywhere) combined quantitative and qualitative methods and revealed notions of religiosity among the religiously unaffiliated.

Drs. Van der Velde, Wiegers and Jespers presented papers at the conference of the European Association for the Study of Religion (EASR) in Brno on comparative research on Indian and new religions. Van der Velde presented a paper on Ritual Conflict in Myanmar, Jespers on holistic spirituality as an area of religious activity in the Netherlands. Prof. Wiegers participated in a panel that reviewed a recent study by Douglas Alles, organized by Steven Sutcliffe (Edinburgh).

The 'Refiguring Death Rites' group presented eight papers at the international conference 'Ritual Dynamics and the Science of Ritual' at the University of Heidelberg, six of them in a panel co-organized by Prof. Venbrux (and Prof. U. Hüsken, Oslo). In cooperation with Harvard University, Profs. Venbrux, Van Binsbergen (ASC, LU/EUR)

and Witzel (Harvard) organized the Second Annual Conference of the International Association for Comparative Mythology in Ravenstein in the Netherlands, including a session on the mythology of death and dying.

Biblical Studies, Ancient Judaism, Christianity, and Gnosticism

Dr Eynikel organized the conference 'Samson: Hero or Fool?' in which the many faces of Samson from the Hebrew Bible that have reached us via the Ancient Church and the Middle Ages, up to modern times (including those in literature, music, film and the fine arts) were discussed. The conference papers will be published in the 'Themes in Biblical Narrative series' (Leiden: Brill). Hans van Oort continued his research on Gnosticism.

Transformation of Religions within the Frameworks of Modernity

Profs. Troch and Essen analyzed the ambivalent role of religions in situations involving structural violence worldwide. Troch concludes that globalization processes destroy the very foundation of the right to cultural diversity, because the trends towards a uniform 'global culture' are experienced as cultural and religious marginalization. Essen analyzes the return of religious conflict to world politics arguing that pluralistic societies do not have political and legal mechanisms apart from the basic principles of European modernity (separation of religion and state and freedom of religion) to resolve religious differences. Drs. Van den Brandt, De Kesel en Van Erp contributed in their research to the creation of a cultural archive of the Shoah by researching and preserving testimonies of life in the concentration camps and conceptualizing them with regard to the problems of evil and suffering in modernity.

Reframing Spirituality and Mysticism in Past and Present

Research was carried out on the nature of the historical and contemporary affinity between spirituality and arts, focusing on the spirituality of the 'Devotio Moderna' and on exemplary products of modern art. Furthermore, research was done on the spirituality of the well-known Nijmegen professor of spirituality, Titus Brandsma. This resulted in the discovery of the regenerative power of Brandsma's spirituality, which has continued until the present day.

With regard to another line of research, that of Eastern Christianity, it appears that explicit religious and cultural interactions are taking place between Syrian Christianity and Islam. Ethnicity is a substantial factor in the construction of the identity of Christian communities in the Middle East.

In scientific conceptualizations of spirituality the influence of constructivist theories, which strongly emphasise cultural mediation in spirituality, increased, whereas the perennialist position, which underlines the supra-cultural side of spirituality, lost ground. This again raises the question as to what exactly is the common element in the diversity of forms of spirituality.

Religious Identity Transformation and Social Cohesion

An international NORFACE-funded research programme, 'Religious Sources of Solidarity' (EURESOURCE) started in collaboration with the Johann Wolfgang Goethe University (Frankfurt) and Warwick University (UK). The programme, which is led by, among others, Profs. Scheepers (PI) and Schilderman (coordinator), addresses the question as to what extent religion in Europe is re-emerging as a social force, both from a comparative and a cross-national point of view and from real-life perspectives as revealed by focus group research. Religion is conceptualized as religious capital that is socially 'invested' or remains 'dormant' in certain times and places and that varies with regard to its private or public display. To investigate this, the programme identifies European religious characteristics in the various countries in recent decades and determines whether these contribute to social interests. It views solidarity as one of the main concerns that are re-emerging on political agendas at the national and European level.

Dr Van Eersel and others developed a new method for studying classroom communication in the field of interreligious learning. They adjusted the taxonomy of Verbal Response Modes (VRM) developed by W.B. Stiles for dyadic interactions in the field of psycho-social help. The research shows that teachers create limited space for pupils to express their identity from their own personal perspective. Teachers tend to maintain control of classroom communication through guided learning.

Dr Sterkens demonstrated the use of religiocentrism as a new theoretical construct in cross-religious comparative research among religious groups (Christian, Muslim, and Hindu students) in India (Tamil Nadu). Full-score comparability is possible for positive in-group attitudes but is hampered in the case of negative out-group attitudes because of out-group prejudice towards specific religious groups.

Societal impact

A number of scholars working in the Trajectories of Religion programme (including Prof. Wiegers and Van der Velde) contributed to Dutch newspapers, public lectures and appeared otherwise in the media. A large number of presentations on the Refiguring Death Rites project were held at various locations, contributing to the dissemination of research findings to academics, professionals and to the wider public. An expert meeting with key players in the undertaking business was organized. And, as part of the Festival 'Geloven in Gelderland' ('Believing in Gelderland') a photo exhibition was held at the university library and two public libraries in the Nijmegen region. The launch of a book on ritual creativity also attracted the attention of the public and the media, as did a book launch and a symposium on the project 'Allerzielen Alom'.

Research Institute for Religious Studies and Theology

Key publications

Beck, H. & Wiegers, G.A. (2008). Moslims in een westerse samenleving. Islam en ethiek. Zoetermeer: *Meinema*. 268 pp.

Blommestijn, H. & C. Caspers (Eds.) (2008) *Seeing the Seeker*. Explorations in the Discipline of Spirituality. [Studies in Spirituality, Supplement 19]. Louvain: *Peeters*, 687 pp.

Eersel, S. van, C. Hermans & P. Slegers (2008). Expressing Otherness in Interreligious Classroom Communication. In *Journal of Empirical Theology*, 21(1), 1-31.

Erp, S. van & L. Verstricht (Eds.) 2008, *Longing in a Culture of Cynicism*, Wien, Berlin: *LIT Verlag*.

Essen, G. (2008), 'De akelig brede kloof...'. De betekenis van de hernieuwde vraag naar de 'historische Jezus' voor de hedendaagse dogmatiek'. In *Tijdschrift voor Theologie*, 48, 367-388.

Hense, E.H. & Farias, M. (2008). Concepts and misconceptions in the scientific study of spirituality. In B. Spalek and A. Imtoul (Eds.), *Religion, spirituality and the social sciences*. Bristol: *Policy Press*, pp. 163-176.

Hermkens, A.K. (2008). Josephine's journey: Gender-based violence and Marian devotion in urban Papua New Guinea. In *Oceania*, 78(2), 151-167.

Sterkens, C. & Anthony, F.V. (2008). *A Comparative Study of Religiocentrism among Christian, Muslim and Hindu Students in Tamil Nadu, India*. In *Journal of Empirical Theology*, 21(1), 32-67.

Teule, H. (2008). *Les Assyro-Chaldéens. Chrétiens d'Irak, d'Iran et de Turquie* [Fils d' Abraham 30]. Turnhout: *Brepols*. 240 pp.

Venbrux, E. (2008). Indigenous Religion in an Intercultural Space. In L. Zimmer –Tamakoshi and J. Dickerson-Putman (Eds.), *Pulling the Right Threads: The Ethnographic Legacy and Life of Jane C. Goodale*, Urbana and Chicago: *University of Illinois Press*, p. 168-186.

Venbrux, H.J.M., Heessels, M. & Bolt, S.H. (Eds.) (2008). *Rituele Creativiteit. Actuele veranderingen in de uitvaart- en rouwcultuur in Nederland*. Zoetermeer: *Meinema*. 188 pp.

Waaïjman, K. & F. Maas (2008). De spiritualiteit van Titus Brandsma. Hoe de tijd ons godsbegrip bepaalt. Kampen: *Ten Have* 2008. 126 pp [includes text of a lecture by Titus Brandsma].

Dissertations:	4
Scientific publications:	103
Professional publications:	58

Prof. Van den Hoogen was engaged in various aspects of Socially Responsible Enterprise and organized, together with OIKOS, the workshop 'Maatschappelijk verantwoord ondernemen' (Socially Responsible Enterprise). Drs. Hübenal, Essen and Troch organized – in cooperation with the Soeterbeeck Programme and Pax Christi – the conference 'Vrede, bevrijding, verzoening. 60 jaar Pax Christi Nederland' (Peace, Liberation, Reconciliation. Sixty years of Pax Christi in the Netherlands)

Outreach by the research group led by Prof. Maas included a symposium on the spirituality of Titus Brandsma in Nijmegen, which was attended by 1200 participants. Profs. Van der Velde, Venbrux, Maas and Wiegers contributed to the Symposium of the Thijmgenootschap on Modern Art and Spirituality (Tilburg) (250 participants). Prof. Maas delivered the *dies natalis* lecture

of the Catholic Theology Faculty (Faculteit Katholieke Theologie, University of Tilburg) at Utrecht on 28 November 2008.

Dr Castillo Guerra finished his collaborative research on the social impact of Christian Churches in Rotterdam, based on the Social Return on Investment (SROI) method, which calculates the net societal effect of non-profit organizations. It appears that all churches – migrant churches more than autochthonous ones – are engaged in many activities in the field of social work and psycho-social help, both for members and non-members, the net effect of which is calculated to be worth around €400,000. The results were published in a study 'Tel je zegeningen' ('Count your blessings') which was presented to the City Council of Rotterdam on 17 July 2008 and to Mr P.H. Donner, Minister of Social Affairs, on 2 December 2008.

Director: Prof. Gerard Wiegers

Prof. Wiegers specializes in the history of Islam and Muslim minorities in Europe and the Islamic World. He publishes on the relationship between Islam and other religions and on methods and theories in the science of religions. He is a member of several editorial boards, including the Numen Book series (*Brill*), chairs the Dutch Association for the Study of Religions (NGG), and is a board member of the Dutch School for Advanced Studies in Theology and Religion Studies (NOSTER).



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Future research

Within the *Trajectories of Religiosity group*, research will take place on the ritualization of dying in a new project. In cooperation with the University Medical Centre at Groningen, Dept. Department of Anatomy (Dr Gerrits), research will also be conducted on body donation, related to an individual project led by S. Bolt MA of the RDR research group.

The NWO-funded 'Ritual, Conflict, and Media' project, in cooperation with the 'SFB Ritualdynamik' of the University of Heidelberg, will result in a book published by Oxford University Press, part of The Oxford Ritual Studies Series, co-edited by Profs. Grimes and Venbrux, and Prof. Hüsken of the University of Oslo. The authors of the book will hold a meeting in Ravenstein in February 2009. Prof. Wiegers will organize – together with Prof. Mercedes García-Arenal (CSIC, Madrid) – a conference on the expulsion of the Moriscos from Spain, hosted by the CSIC in Madrid.

Members of the 'Transformation of Religion in the Framework of Modernity' group will focus on economic, cultural and scientific theories of modernity, with an emphasis on 'science and theology' on the one hand and on 'conflict and cohesion' on the other. The group is involved in organizing a number of sessions at national and international conferences, such as for example a lecture by Prof. Oomen on the occasion of 'Charles Darwin year 2009'. In cooperation with the 'Herinneringscentrum Kamp Westerbork' (Memorial Centre for the Westerbork camp), Dr van den Brandt is involved in preparing an interview project on autobiographical writings (diaries, letters and memoirs) by prisoners in the Theresienstadt concentration camp.

Research on Eastern Christianity (Reframing Spirituality) will continue to focus on the role of Orthodoxy in relation to the construction of European identity. The relationship between orthodoxy and human rights will be the subject of a symposium to be held from 9-11 February 2009. An international expert meeting on the reframing of Spirituality will be organized by the research group in Nijmegen from 3-5 March 2009.

The research group *Biblical Studies* will organize a conference in Leuven on 'King, Sage and Architect. Solomon the Wise King and His Temple in Jewish and Early Christian Tradition'. This conference is part of the 'covenant'-related activities with the Catholic University of Leuven and a sequel on the conference on 'Other worlds' held in Nijmegen in April 2007. The Leuven conference will be led by Profs. Verheyden and García Martínez (Leuven) and Eynikel and Teule (Nijmegen).

Under the supervision of Prof. Hermans (*Religious Identity Transformation in Context*) a junior research project funded by a public organization about competences related to the education of teachers in primary education in religious rituals will start.

Centre for Ethics

The aim of the Centre for Ethics is to conduct research on important contemporary moral problems, challenges and ideas. The centre engages in both fundamental and applied research, bringing together the approaches of various intellectual and research traditions in order to arrive at a better understanding of the moral, political and socio-cultural problems of our time. Research focuses partly on developing theory within international scholarly discussions and practical philosophy and partly on encouraging philosophical reflection within our linguistic and cultural environment, as well as providing a service to numerous groups and institutions within society.



Members of the Centre for Ethics regularly contribute to public debates on topical issues.

The research takes place in three main categories, each of which generates scholarly publications and participation in the international scholarly dialogue on practical philosophy, while making useful contributions to the cultural and societal environment. All researchers contribute to at least two of the following lines of research.

1. *The intersection of religion, morality and politics*, especially in relation to the plurality of moral and religious convictions in today's society, and to the question as to how politics can do justice to this plurality. In this category research is conducted on 'freedom of speech and blasphemy', on 'Islam and democracy', on 'democracy and populism' and on 'the history and topicality of Christian social thought'.
2. *Implementation of Virtue Ethics under Contemporary Conditions*. In this category research takes place within the following projects: 'integrity as virtue for professions in public administration', 'moral education and citizenship education in schools', 'forgiveness, reconciliation and mediation', and 'virtue ethics and modernity'.
3. *Hermeneutics as a methodology for practical philosophy*. Under this title the role of the history of practical philosophy in interpreting contemporary problems is researched. This takes place in projects concentrating on key figures in the history of Philosophy, such as Aristotle, Thomas Aquinas, Spinoza, Kant and Nietzsche.

Cooperative arrangements

Some researchers are members of research schools such as the Netherlands Research School of Ethics or cooperate with national institutes such as 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).

Research results

The Centre for Ethics published four books, one of which – by Dr B. van Stokkom – attracted considerable media attention. One PhD thesis was completed and defended. Dr E. van der Zweerde won a grant from the Netherlands Organisation for Scientific Research (NWO) for an explanatory research project on 'Islamic Repertoires of Democracy', and the centre played a pivotal role in producing a year-long series of articles on 'Virtues' in the Dutch newspaper *Trouw*.

Societal impact

Members of the Institute regularly participate in forum discussions and contribute to public debates, with articles in newspapers, and items on the radio and in other media reaching a wider audience than the scientific community alone.

Staff

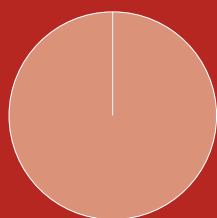
Prof. P.J.M. van Tongeren (o)
Prof. J.-P. Wils (o)

Tenured

Full Professors	0.2 FTE
Assistant Professors	1.0 FTE
Researchers	1.3 FTE

Non-tenured

Researchers	0.2 FTE
Doctoral candidates	2.0 FTE



■ FTE 1st
■ FTE 2nd
■ FTE 3rd

Key publications

Becker, M. (2008). Ethics of E-Voting: An Essay on Requirements and Values in Internet Elections. In: S. Mishra (Ed.) *E-democracy: Concepts And Practices*, ICFAI Business School Research Center, Kolkata-700091, West Bengal, India (in collaboration with W. Pieters).

Bocken, I. (2008). Citizen of Two Worlds. The Religious Origins of Liberal Democracy. *Poligrafi, Journal for Interdisciplinary Study of Religion*, 6, 12-28.

Doorn, N. (2008). Forgiveness and Reconciliation in Transitional Justice Practices'. *Ethical Perspectives*, 15(3), 381-98.

Stokkom, B. van (2008). Symbolen van orde en wanorde. Broken windows policing en de bestrijding van overlast en buurtverval. Den Haag: *Reed Business*.

Terpstra, M. (2008). A decisionist approach to democratic political order', *Rechtsfilosofie & rechtstheorie [Journal for legal Philosophy and Jurisprudence]* (Sanne Taekema, Hans Lindahl Eds., *Special Issue: On Normal and Exceptional Politics. In Discussion with Bonnie Honig*), 37(2), 151-162.

Tongeren, P. van (2008). Impossible forgiveness. *Ethical Perspectives* 15(3), 369-380. Also as e-book publication: *Forgiveness*, Oxford, *Inter-Disciplinary Press* 2008.

Zweerde, E. van der (2008). Gesellschaft, Gemeinschaft, Politik: zur Aktualität der Sozialphilosophie Semën Franks. In H. Kuße (Hrsg.), *Kultur als Dialog und Meinung*. München: *Verlag Otto Sagner* (p.113-139).

Dissertations:	1
Scientific publications:	44
Professional publications:	17

Part of the mission of the Centre for Ethics is to establish a significant presence in the public domain. The Centre achieves this goal by contributing to the moral education of a wide range of professional bodies, such as the police, the army, health-care professionals and sports coaches and members of the Centre are directly involved in moral education programmes in schools. They gave dozens of lectures to professional groups as well as to general audiences. Some of the Centre's publications, which are intended to contribute to increasing the public's knowledge of ethics and to improve the moral quality of society, are selling in large numbers and have attracted attention in national newspapers and periodicals. Members of the Centre regularly contribute to public discussions on radio and television and write articles in the opinion columns of newspapers. They also sit on the board of several national and international journals and book series.

Future research

The Centre for Ethics has planned three new volumes in its book series. In addition, the Centre will organize an expert seminar on 'Forgiveness in public discourse' (April 2009), as well as conferences on 'Christian Social Thought' and 'Populism and democracy'. In 2009, too, the Centre will play a leading role in a national event on Virtues, that will be organized by the Dutch newspaper *Trouw*.



Director: Prof. Paul van Tongeren

Paul van Tongeren was Extra-Ordinary Professor in 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', vice-editor-in-chief of the international journal 'Tijdschrift voor Filosofie', and a member of the editorial board of several other national and international journals and book series.

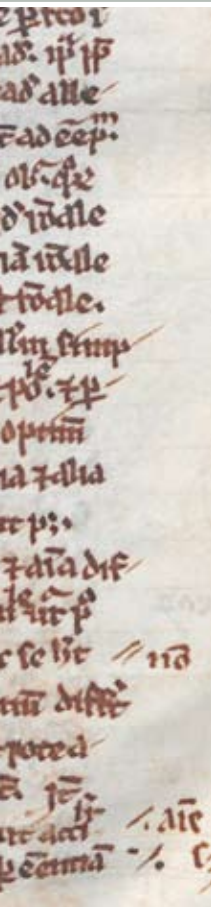
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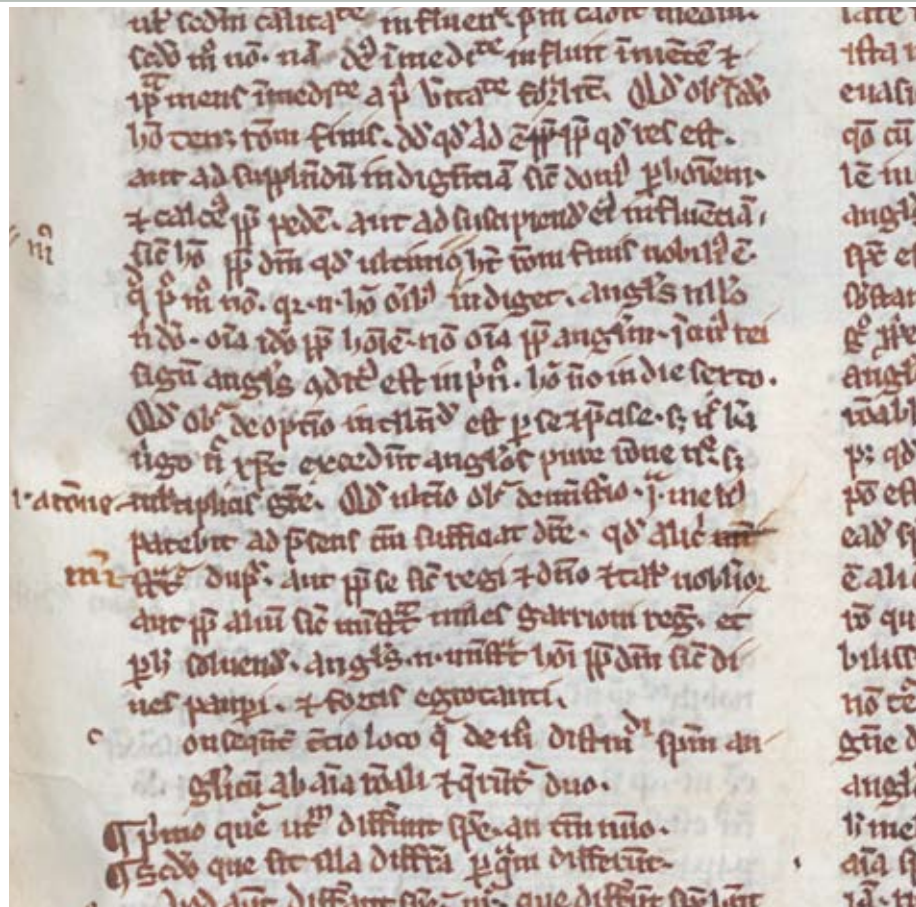
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Research Institute for Philosophy



Rationality is often said to be a distinctive characteristic of human beings. But what does it mean to be a rational being and how can we define rationality? This problem is not only one of the key problems of western philosophy; it is also of crucial importance to today's multicultural society.



Within the Research Institute for Philosophy the systematic study of rationality takes place in the context of the following three programmes, which interconnect and overlap in various ways:

- Cognition, Interpretation and Context (Prof. R. van der Sandt)
- The Project of a Hermeneutic Philosophy (Prof. P. van Haute)
- From Natural Philosophy to Science (Prof. P. Bakker)

These three programmes explore different aspects of the wide range 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?

These headline questions are addressed in each of the three programmes. The first relates to the conceptions of belief, cognition, and language. It analyses the various ways in which we interpret and understand human behaviour, linguistic and otherwise, in its physical and social context. In the second, the relationship between rationality, meaning and interpretation is examined. It focuses in

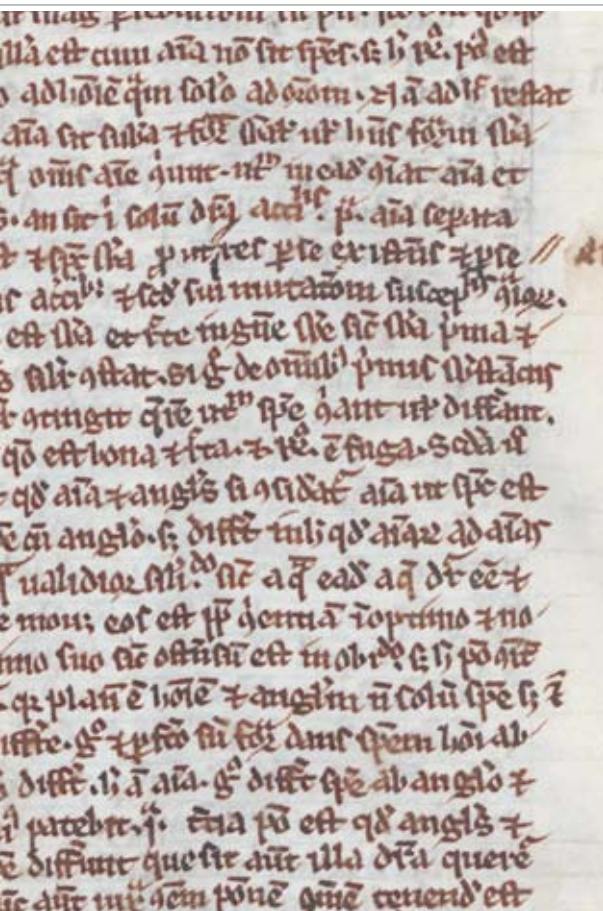
particular on the hermeneutical and related criticisms of the modern idea of rationality. The third programme focuses on the emergence of science as the key paradigm of rational thinking in Western Europe and traces the history of long-term developments and transformations in scientific thinking from its philosophical beginnings.

The three programmes employ a variety of methodological approaches: analytical, hermeneutical, critical, and historical-philological. This makes the institute one of the few places where a dialogue between these very different approaches and traditions is possible. Hence, initiatives that encourage this dialogue are actively promoted.

The Institute's research programmes attach particular value to the works of past thinkers, either as 'discussion partners' for contemporary systematic philosophy or as historical subjects in their own right.

Research facilities

The faculty library houses one of the finest collections of books and journals on philosophy in the Netherlands, particularly in



Staff

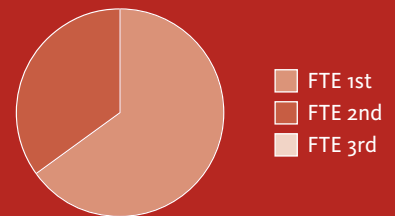
Prof. P.J.J.M. Bakker (p)
 Prof. P.I.M.M. van Haute (o)
 Prof. C.H. Lüthy (p)
 Prof. R.A. van de Sandt (o)
 Prof. M.V.P. Slors (o)
 Prof. J.M.M.H. Thijssen (o)
 Prof. P.J.M. van Tongeren (o)
 Prof. B.H. Vedder (o)
 Prof. J.A.F.J. Visscher (e)

Tenured

Full Professors	3.2 FTE
Associate Professors	0.7 FTE
Assistant Professors	2.3 FTE
Researchers	0.7 FTE

Non-tenured

Researchers	0.2 FTE
Postdocs	1.6 FTE
Doctoral candidates	6.0 FTE



< Femke Kok MA uses medieval manuscripts as sources for her dissertation on metaphysical comments by the fourteenth century philosophers Johannes Buridanus and Marsilius van Inghen.

the history of philosophy, and one of the world's largest microfilm collections of manuscripts on medieval logic and natural philosophy.

Collaboration

Some researchers are members of research schools such as the Netherlands Research School for Medieval Studies.

There are formal cooperative arrangements with the Universities of Leuven (Belgium) and Stellenbosch (South Africa), and the University of Münster, which also participates in the IRUN network. There are similar arrangements with the University of Parma (Italy), the University of Pretoria (South Africa), the University of Kwazulu Natal (South Africa), De Paul University (Chicago, USA), the University of Sao Paolo (Brazil) and the Pontifical University of Sao Paolo, as well as the 'Nederlands-Afrikaanstalig Genootschap voor Wijsbegeerte'.

In addition, members of the research programmes have close contacts with institutions such as the Departments of Philosophy at the Universities of Middlesex (UK), Antwerp (Belgium), Stuttgart and Tübingen, and the Humboldt University in Berlin (Germany),

Stanford (USA), Emory University (Atlanta, USA), The Centre of Excellence 'History of Mind Research Unit' at the University of Helsinki (Finland) and the University of Hertfordshire.

Research results

The section dedicated to the philosophy of language and logic (part of the research programme 'Cognition, Interpretation and Context' led by Prof. R. van der Sandt) focused its research on implicatures in relation to psychology, the analysis of tense and aspect, and the treatment of modalities. Dr Bart Geurts received a replacement subsidy from the NWO that enabled him to write a book on quality implicatures in relation to psychology. Dr J. Huitink, who successfully completed her PhD in 2008, received a Rubicon bursary to continue her research on 'Redeneren met als-dan zinnen in context' ('Reasoning with if-then sentences in context') for two years at the Laboratory of Experimental Psychology of the Catholic University of Leuven. Prof. R. van der Sandt conducted research on time and anaphoricity.

In the Philosophy of Cognition, another important aspect of the research programme, 'Cognition, Interpretation, Context', Prof. M. Slors conducted research on an innovative approach to the role

Research Institute for Philosophy

Key publications

Aydin, C. (2008). The Struggle between Ideals: Nietzsche, Schmitt, and Lefort on Politics of the Future. In Siemens, H.W. & Roodt, V. (Eds.), *Nietzsche, Power & Politics: Prospects and Perspectives for the 21st Century*. Berlin/New York: De Gruyter. (p. 761-776).

Bakker, P.J.J.M. (2008). Ziel & Lichaam. *Over de filosofische voorgeschiedenis van de psychologie*, Amsterdam: Boom.

Haute, P.I.M.M. van (2008). Lacan reads Klein. Some remarks on the body in psychoanalytic thought, in (SPEP supplement). *Philosophy Today*, 52, 54-62.

Heiden, G.J. van der (2008). The Scintillation of the Event: On Badiou's Phenomenology, *Symposium* 12(2), 93-109.

Lüthy, C. (2008). Magnen, Jean-Chrysostome. In: Luc Foisneau et al. (Eds.), *Dictionary of Seventeenth-Century French Philosophers*, 2 vols. Bristol: Thoemmes Press. (Vol. I, p. 109-111).

Palmerino, C.R. (2008). Une force invisible à l'œuvre: le rôle de la vis attrahens dans la physique de Gassendi. In S. Taussig (Ed.) *Gassendi et la modernité*. Turnhout: Brepols. (p. 141-176).

Sandt, R. van der (2008). When satisfaction is not enough. *Theoretical Linguistics* 34-3, 275-285.

Slors, M & C. Macdonald (2008). Rethinking Folk-Psychology: Alternatives to Theories of Mind. *Philosophical Explorations*, 11(3), 153-162.

Tongeren, P. van (2008). Vom „Arzt der Kultur“ zum „Arzt und Kranken in einer Person“ Eine Hypothese zur Entwicklung Nietzsches als Philosoph der Kultur(en). In Andreas Urs Sommer (Ed.), *Nietzsche – Philosoph der Kultur(en)?* Berlin/New York: W. de Gruyter. (p. 11-31).

Vedder, B. (2008). Contingency and Salvation, A Hermeneutics of Christianity from the Perspective of Heidegger and Thomas Aquinas'. In D.M Grube and P. Jonkers (Ed). *Religion Challenged by Contingency, Theological and philosophical Perspectives to the Problem of Contingency*. Leiden: Brill. (p. 119-135).

Dissertations:	4
Scientific publications:	41
Professional publications:	12

of neuronal resonance in social cognition: in between social perception and implicit simulation; on the crucial role of the genesis of the concept of a 'person' at around the age of five for developing 'folk-psychological competence'; and on developing a two-layer model of the mind.

In the programme 'The Genesis of a Hermeneutic Philosophy', two PhD dissertations were successfully defended in 2008. The members of the programme continued their research on hermeneutics and its critics. More specifically, the Nietzsche Research Group continued the preparation of the second volume of the 'Nietzsche Wörterbuch'. In February, the programme hosted an international expert seminar on hermeneutics. In collaboration with the 'Centre d'études du vivant' (Paris 7 - Diderot), the programme's Centre for Psychoanalysis and Philosophical Anthropology (Radboud University - Catholic University of Leuven), directed by Prof. Ph. van Haute, organized the foundational meeting of the 'International Society for Psychoanalysis and Philosophy'. This bilingual organization (French-English) facilitates collaboration among psycho-

analysts and philosophers worldwide. The next meeting will be hosted by Boston College in November 2009.

In the programme 'From Natural Philosophy to Science', one dissertation was completed and defended. The members continued their research on the transformation of natural philosophy into physical science between 1200 and 1700. Within the context of this ESF programme, Dr C.J. Leijenhorst and Prof. P. Bakker organized an international summer school entitled 'From the Aristotelian Scientia de Anima to Early Modern Psychology'. In collaboration with Prof. M. Stone (Catholic University of Leuven), Prof. Bakker further organized an international conference entitled 'Science, Theology, and Humanism in Seventeenth-Century Leuven. The Life and Career of Libertus Fromondus (d. 1653)' hosted by the Catholic University of Leuven from 23-25 October 2008.

Societal impact

Members of the Institute regularly participate in forum discussions and contribute to public debate by publishing articles in newspapers,

Director:
Prof. Philippe van Haute

Philippe 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 its psychopathological variants. Van Haute is president of the Belgian School for Psychoanalysis.



Research Institute for Philosophy

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giving talks on the radio and in other media, thus reaching a wider audience than the scientific community alone. One such example is the lectures given by members of the Institute in secondary schools and at HOVO (Higher Education for the Elderly). Furthermore, the competence of many of the members of the Institute is widely acknowledged. This is evident from the fact that they are often asked to participate in PhD juries (also abroad) and from the many guest lectures that they give, both inside and outside of the Netherlands. In addition, some of the Institute's members contribute to national and international encyclopaedias, as well as general works of reference.

Future research

Dr B. Geurts will publish his book on implicatures and Prof. R. van der Sandt will finish his book on Logic and Interpretation. Prof. M. Slors will continue his research on the two-layer model of the mind and submit an ESF application on mental causation in collaboration with Prof. Dan Hutto (University of Hertfordshire, UK).

In 2009 the Vidi programme, 'Form of the Body or Ghost in the Machine? The Study of Soul, Mind, and Body (1250-1700)', which is directed by Prof. P.J.J.M. Bakker, will be concluded. This will result in one PhD defence (S.W. de Boer) and in the publication of a monograph. Together with Prof. R.L. Friedman of the Catholic University of Leuven, Prof. Bakker will organize an international conference entitled 'Philosophical Psychology in Late-Medieval

Commentaries on Peter Lombard's Sentences' from 28-30 October 2009. Prof. Bakker, Prof. J.M.M.H. Thijssen and Dr M. Streijger will co-publish an edition of Johannes Buridanus' commentary on 'De generatione et corruptione'.

The Centre of Philosophical Anthropology and Psychoanalysis will co-organize the second meeting of the International Society for Psychoanalysis and Philosophy that will take place at Boston College in November 2009. It will also organize an expert meeting on Anthropology and Pathology in November 2009.

The second volume of the 'Nietzsche-Wörterbuch' (dictionary) will be published next year and continued efforts will be made to find subsidies to ensure the successful completion of this important project. In the course of 2009, the Institute will prepare an international conference on Nietzsche that will take place in Nijmegen in 2010. The conference will celebrate the launch of the second volume and the scholarly importance and contribution of the Nietzsche-Wörterbuch to Nietzsche studies worldwide.

Institute for Historical, Literary and Cultural Studies

The Institute for Historical, Literary and Cultural Studies (HLCS) is part of the Faculty of Arts. Its main objective is to create a stimulating research environment for high-quality, innovative research in the fields of literature and literary theory, cultural studies, history, art history and archaeology. HLCS research is organized in programmes on the basis of common research questions, themes, methodologies or a common focus on a specific period. Each programme is designed to maximize integration through joint projects. Sharpening the profile by combining expertise and making a clear choice for high-level research and talent, HLCS ensures that the research conducted in Nijmegen remains prominent nationally and internationally.



There are five research programmes at HLCS:

- The Ancient World
- Christian Cultural Heritage
- The Dynamics of Islamic Culture
- History after the Middle Ages
- Literature, Culture, Media

In 2007 five key research themes were defined within these programmes, bringing together researchers working on key issues to strengthen the profile of HLCS and to provide a framework for specific research proposals. These themes have been successfully prolonged in 2008 and will be evaluated in the 2009 mid-term review. The outcome of this review will determine which of the themes will be included in the new programming period, from 2010 to 2013. It has already been decided to replace the programme *Literature, Culture, Media* with the more focused research themes *Performances of Memory*, *Studying Criticism* and *Reception Across Borders* from 2009.

The University Board has funded the appointment of two visiting professors to give Nijmegen research in the humanities an extra boost. In 2009 the American classicist, philosopher and literary historian Prof. Glenn W. Most (Scuola Normale Superiore di Pisa and University of Chicago) will advise HLCS researchers on developing a new research line on 'New Philology'. Prof. Willem Frijhoff, Emeritus Professor of History at the Free University of Amsterdam, will help focus all of the Nijmegen research on 'Culture, Religion and Memory'.

From August 2008 to January 2009, a top-quality exhibition was on display in the Valkhof Museum in Nijmegen: 'Luxury and decadence. Life on the Roman Gold Coast'. This offered a glimpse into the lives of a small group of mega-rich Romans who lived in immense villas on the Gulf of Naples 2000 years ago. Their possessions were on show for the first time outside Italy: frescoes, statues in bronze and marble, and jewellery. Attention was also paid to the often biting criticism made by classical authors of the luxurious lifestyle of the Roman elite. These authors reveal an increasing focus on status rather than traditional Roman values. Classical



Anneke Smelik, Full Professor of Cultural Science, in particular visual culture, received an NWO grant for her project 'Dutch fashion in a globalized world'.

Staff

Prof. R.A.M. Aerts (o)
 Prof. C.C. van Baalen (p)
 Prof. J.T.J. Bak (o)
 Prof. H. Bekkering (p)
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 Prof. S.L. de Blaauw (p)
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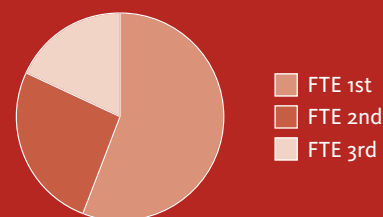
Prof. P.J.A.N. Rietbergen (o)
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 Prof. A.M. Smelik (p)
 Prof. M. Steenmeijer (o)
 Prof. C.H.M. Versteegh (o)

Tenured

Full Professors	10.5 FTE
Associate Professors	0.6 FTE
Assistant Professors	11.1 FTE
Researchers	6.7 FTE

Non-tenured

Researchers	3.6 FTE
Postdocs	7.4 FTE
Doctoral candidates	28.5 FTE



archaeologists Prof. Eric Moormann and Dr Stephan Mols participated in staging the exhibition. Members of *The Ancient World* programme delivered lectures, conducted tours in the museum and wrote parts of the accompanying catalogue.

In close connection with this exhibition, nine members of HLCS combined their expertise on various aspects of the luxurious or decadent lifestyle of the Romans in the book 'Romeinse decadentie. Pracht en praal in de Romeinse keizertijd' (Roman decadence: pomp and magnificence in Roman imperial times), edited by Dr Stephan Mols, Prof. Olivier Hekster and Prof. Eric Moormann. This book about the beauty and splendour of the Roman Empire was issued to mark the 85th anniversary of Radboud University Nijmegen.

On the occasion of this anniversary, the city of Nijmegen established a special chair in the Faculty of Arts to teach the history of Nijmegen, with a specific focus on mediating between scholars and the general public. Extraordinary Professor Dolly Verhoeven therefore not only teaches and does research at the

university; she also organizes activities for the general public, which are connected with historical places and events in the city. The chair has been established for a period of five years.

Research facilities

- The Humaniora Library (155,000 volumes, 15,500 serial volumes, 750 serial subscriptions and 600 manuscripts)
- Catholic Documentation Centre: archives and publications of Catholic institutions and people in the Netherlands, 1800-2000 (www.ru.nl/kdc)
- Centre for the Documentation of Art History: collections of pictures, photographs, and slides (www.ru.nl/ckd)
- Archaeological project bureau Auxilia (Provincial Roman History; excavations in the former territories of Germania Inferior, and especially Ulpia Noviomagus Batavorum (www.ru.nl/auxilia))
- Kunera: a database of medieval pilgrim badges and souvenirs (www.let.kun.nl/ckd/kunera/)

Institute for Historical, Literary and Cultural Studies

Collaboration

Prof. Olivier Hekster and Dr Gerda de Kleijn (*The Ancient World*) are members of the executive team of the International Network 'Impact of Empire', which focuses on the Roman Empire and the consequences of its actions for the regions it dominated. The network is directed by an international board of reputed scholars drawn from the Classics, Archaeology, Ancient History, and History of Law from the universities of Amsterdam (Free University), Brussels (Free University), Groningen, Heidelberg, Leiden, Metz, Münster, New York, Nijmegen, North Carolina, Nottingham, Oxford, Paris (Sorbonne), Rome (La Sapienza) and Toronto. Prof. Hekster chairs this board.

Prof. André Lardinois (*The Ancient World*) is one of the founders of a network for the study of archaic Greek lyric, iambic and elegiac poetry or song, with representatives in most European countries and at the main American universities. The aim of this network is to pool the resources of individual scholars, who now often work in isolation, by holding regular meetings, keeping in contact through a network website and a newsletter, and defining common topics within archaic Greek poetry that groups of scholars in different countries will work on together.

Prof. Marit Monteiro (*Christian Cultural Heritage*) is a member of the board of RELINS-Europe (European Forum on the History of Religious institutes in the 19th and 20th centuries), a collaborative venture between KADOC Leuven, Universität Fribourg, Hochschule Vallendar, and Radboud University Nijmegen.

Members of *The Dynamics of Islamic Culture* cooperate with:

- the Research group 'Bases for a New Biography of Mohammed' at the Department Altertumswissenschaften und Orientalistik, Orientalisches Seminar, University of Basel. The aim of this project is to reconstruct the earliest sources of the biography of Mohammed.
- the Mu'tazilite Manuscripts Project, established in 2003. The project has so far involved an international group of fifteen scholars collecting, recording and preparing critical editions of all unpublished material of Mutazili provenance. Among the members of the Mu'tazilite Manuscripts Project Group are scholars not only from the West (Europe and the US), but also from Israel and the Islamic world (Iran, Lebanon, Oman, Saudi Arabia and Yemen).

Prof. Theo Engelen (*History after the Middle Ages*) is director of a joint venture between historians and anthropologists of the N.W. Posthumus Instituut, Stanford University and Academia Sinica (Taiwan) called 'Population and Society in Taiwan and the Netherlands'.

Members of the programme *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 Royal Netherlands Academy of Arts and Sciences.

Prof. Anneke Smelik (*Literature, Culture, Media*) collaborates with ArtEZ Institute of the Arts, Saxion Universities, Prensela Institute for Fashion and Design, the Amsterdam Fashion Institute and the University of Amsterdam in the Netherlands Organisation for Scientific Research 'Cultural Dynamics' programme 'Dutch fashion in a globalised world'.

Research results

In 2008 eight dissertations were defended, two of which were awarded cum laude: Jill Bradley, *'You shall surely not die': the concepts of sin and death as expressed in the manuscript art of north-western Europe c. 800-1200* and Martijn Icks, *Images of Elagabalus*.

Profs. Marc van der Poel and André Lardinois were members of the organizing committee of the VIIIth international conference on Orality and Literacy in the Ancient World: 'Orality, Literacy and Religion', which was held in July at the university's Soeterbeeck study centre. Experts from 25 universities and 11 countries discussed Greek and Roman literature and religion, sacred laws, and early Christianity.

In June, Prof. Marit Monteiro published *Gods Predikers. Dominicanen in Nederland (1795-2000)*. Responding to what they saw as 'the spirit of the times', the Dominicans reinvented their collective identity time and again. Monteiro discusses this process and analyses the organization and structure of this male community from a gender perspective. The book is based on exhaustive research in archives in the Netherlands and Rome and interviews with over 40 Dominicans and former Dominicans. *Gods Predikers* shows how groups like the Dominicans left their mark on the Dutch Catholic church until late in the twentieth century.

In December, the research project 'Repertoires of Democracy. The Transfer of Democratic Practices and Institutions in 20th-Century Europe' (funded by the Netherlands Organisation for Scientific Research programme 'Democracy Contested') organized its first conference. Research was presented on four themes: institutionalized forms of direct democracy, populism as an alternative mode of democracy, the practices and discourses of defensive democracy in the 1930s, and the European trend toward the democratisation of parliamentary democracy since the 1960s. Four other panels discussed the history, study and future of democracy among academics and practitioners. The interdisciplinary list of speakers included historians, political scientist and political philosophers.

Centre for Parliamentary History
Director: Prof. C.C. van Baalen
www.ru.nl/cpg

HLCS houses the Centre for Parliamentary History (known by its Dutch abbreviation, CPG), which researches Dutch parliamentary history since the Second World War. Results from this research are published in the series 'Parlementaire Geschiedenis van Nederland na 1945' (Dutch parliamentary history since 1945) and the annals of parliamentary history from 1999 onwards.



Societal impact

Two white marble reliefs from the early seventeenth century, which were removed from St. Jan's Cathedral in 's-Hertogenbosch 150 years ago, appeared in an exhibition in Dendermonde (Flanders) at the end of 2007. Jos Koldewij, Professor of Art History of the Middle Ages, ensured that the two kneeling angels were restored and returned to St. Jan's in April 2008.

Prof. Koldewij, who has been involved in the restoration of the late medieval cathedral for many years and knew that the grubby cracked reliefs must have originated from the Renaissance high altar of St. John's, found a sponsor who was willing to finance not only the purchase, but also the restoration and conservation of the reliefs: the 'Kring vrienden van 's-Hertogenbosch'.

The research project 'Islam and the Performing Arts: from Cultural Heritage to Cultural Citizenship' has been awarded funding within the Netherlands Organisation for Scientific Research programme 'Cultural Dynamics'. The project started with an exploratory workshop on *Islamization of the cultural sphere? Critical perspectives on Islam and performing arts in Western Europe and the Middle East*, which was held at Amsterdam on 23-24 October and funded by the European Science Foundation (ESF). Since the Danish cartoon affair, Islam is often represented as incompatible with art. Expressive culture has become the frontline of a battle between different imaginations and ideals among and between Muslims and 'the West'. The workshop aimed to show the multiplicity of discourses and practices with regard to the performing arts among Muslim communities in Western Europe and the Middle East.

In May Johan van Merriënboer, Peter van Griensven and Peter Bootsma, researchers at the Centre for Parliamentary History, published *Tour de force*, the biography of A.A.M. van Agt, Dutch minister and Prime Minister in the 1970s and early 1980s. The biography reveals the role that Van Agt played in this dynamic period of Dutch history. As Minister of Justice (1971-1973) and Prime Minister (1977-1982), Van Agt faced delicate issues such as 'De Drie van Breda', the escaped war criminal Pieter Menten, liberalization of abortion laws, the train hijackings and kidnappings of 1975 and 1979 and the intended deployment of cruise missiles in the Netherlands. He is currently known as a passionate advocate of the Palestinian cause.

From March 26 to 28 nearly all Dutch and Flemish researchers in modern Dutch literature gathered in Nijmegen for the bi-annual conference 'Behind the stories' ('Achter de verhalen'). The first two days were dedicated to an overview of the state of affairs in the study of modern Dutch literature, while the third day focused on the future of Dutch studies. At the end of day one Prof. Jos Joosten, professor of Dutch literature, presented his latest collection of essays 'Misbaar. Hoe literatuur literatuur wordt' (Outcry. How literature becomes literature).

Future research

Prof. Olivier Hekster has obtained a Netherlands Organisation for Scientific Research grant for his research project 'Emperors and ancestors: the creation of an imperial image'. Roman emperors and their representation are central topics of research into the Roman world. This project offers a radical new approach to the study of

Institute for Historical, Literary and Cultural Studies

Key publications

Baalen, C.C. van, Breedveld, W., Bos, A.S., Leenders, M.H.C.H., Ramakers, J.J.M. & Secker, W.P. (Eds.). (2008). *Het feest van de democratie. Rituelen, symbolen en tradities* (Jaarboek Parlementaire Geschiedenis, 10). Amsterdam: Boom. (192 pp.).

Blaauw, S.L. de (2008). Kultgebäude. *Reallexikon für Antike und Christentum*, 22, 227-393.

Bradley, J. (2008). 'You shall surely not die': the concepts of sin and death as expressed in the manuscript art of northwestern Europe c. 800-1200. Diss. Radboud University Nijmegen., Leiden: Brill. (xviii, 396+332 pp.).

Gazzah, M. (2008). *Rhythms and Rhymes of Life. Music and Identification processes of Dutch-Moroccan youth*. Diss. Radboud University Nijmegen, Amsterdam: Amsterdam University Press. (279 pp.)

Hekster, O.J. (2008). *Rome and Its Empire, AD 193-284*. Edinburgh: Edinburgh University Press. (XVI, 183 pp.).

Jensen, L.E. (2008). *De verheerlijking van het verleden. Helden, literatuur en natievorming in de negentiende eeuw*. Nijmegen: Vantilt. (270 pp.).

Joosten, J.H.T. (2008). *Misbaar. Hoe literatuur literatuur wordt*. Nijmegen: Vantilt. (224 pp.).

Maarseveen, J.G.S.J. van, Klep, P.M.M. & Stamhuis, I.H. (Eds.). (2008). *Official Statistics, Social Progress, and Modern Enterprise* (The statistical mind in modern society. The Netherlands 1850-1940, Volume I). Amsterdam: Aksant. (428 pp.).

Meijer, R. (2008). Yusuf al-Uyairi and the Transnationalisation of Saudi Jihadism. In: Madawi Al-Rasheed (Ed.), *Kingdom without Borders: Saudi Political, Religious and Media Frontiers*. London/New York: Hurst & Co/ Columbia University Press. (p. 221-243).

Mols, S.T.A.M. & Moormann, E.M. (2008). *La Villa della Farnesina. Le pitture. Milan: Electa*. (84 pp.).

Monteiro, M.E. (2008). *Gods Predikers. Dominicanen in Nederland (1795-2000)*. Hilversum: Verloren. (991 pp.).

Plate, L. (2008). Remembering the Future; Or, Whatever Happened to Re-Vision. *Signs: Journal of Women in Culture and Society*, 33(2), 389-411.

Rietbergen, P.J.A.N. (2008). *Cultuurwegen, cultuurwerelden: Europa en/in Eurazië*. Nijmegen: Valkhof Pers. (156 pp.).

Stamhuis, I.H., Klep, P.M.M. & Maarseveen, J.G.S.J. van (Eds.). (2008). *Statistics and Scientific Work* (The statistical mind in modern society. The Netherlands 1850-1940, Volume II). Amsterdam: Aksant. (500 pp.).

Trieschnigg, C.P. (2008). Iphigenia's Dream in Euripides' Iphigenia Taurica. *Classical Quarterly*, 58(2), 461-478.

Dissertations:	8
Scientific publications:	259
Professional publications:	217

imperial representation by focusing on the development of modes in which emperors presented themselves and were presented in specific media over a long period of time. The approach used here is to trace how one notion, that of lineage, developed and was made visible through central and provincial coinage, official proclamations, historical writing, and imperial artwork, from the reign of the first emperor Augustus (31 BC - 14 AD) up to that of Constantine (AD 306 - 337). Lineage, which was central to Roman thinking, was used by many emperors to strengthen their legitimacy. Proper ancestry provided status. The place of lineage in imperial self-representation, which changed over time, can be traced verbally and iconographically, using a variety of sources.

The research project *Islam and the Performing Arts: from Cultural Heritage to Cultural Citizenship* has been awarded for funding by Netherlands Organisation for Scientific Research in the framework of its research programme 'Cultural Dynamics'. This project, which

is coordinated by Dr Karin van Nieuwkerk, started in July with a postdoc and two PhD researchers. It focuses on new discourses and practices in Western Europe and the Middle East in which Islam and the performing arts are creatively merged. In both minority and majority contexts, these artistic experiments are considered disconcerting for reasons related to cultural politics, identity politics as well as different ideas about the place of the religious in the cultural sphere. The project aims to explain the way in which these debates become not only questions about the creation of cultural heritage but also about integration and citizenship.

In the same Netherlands Organisation for Scientific Research programme ('Cultural Dynamics'), the project 'Dutch fashion in a globalised world' has been awarded to Prof. Anneke Smelik. In today's 'creative experience' economy innovation relates to values, symbols, and culture. That is particularly true for dress and fashion, which are central to all forms of human identity construction, from

Director: Prof. Eric Moormann

Eric 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 worked 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 is editor-in-chief of the *Bulletin Antieke Beschaving*, a peer-reviewed annual publication on archaeological studies in the Mediterranean region. Moormann received the Winckelmann Medal for his research on this 18th-century pioneer scholar of Classical Archaeology.



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the individual to the social level. In contemporary culture, dressing has become a vital part of identity. Fashion is also at the heart of the dynamics of cultural heritage and innovation: culturally (e.g. clogs with stiletto heels by Viktor & Rolf); socially (e.g. the higher classes wearing jeans); and technologically (e.g. globalized organization of the supply chain). The innovative contribution of this project lies in opening up the under-researched field of Dutch fashion from interdisciplinary perspectives. The project will assess the relationship between economic and cultural *performance*, which is increasingly important in the creative economy. The research hypothesis is that the creative industry of fashion in the Netherlands is capitalising on a unique cultural mix of individualism, innovation and postmodern design. With the results of the research, Prof. Smelik and her team aim to understand and reinforce the cultural innovation of Dutch fashion in an international context.

A Netherlands Organisation for Scientific Research Veni grant was awarded to Dr Bé Breij for her proposal on 'Autocrats and underdogs: declamation and the dynamics of power in ancient Rome'. For over 400 years *controversiae* – mock-forensic speeches on set themes – served as a prestigious pastime in the literary salons of the Roman Empire, but also as its primary educational tool. They have only recently been recognized as valuable objects of study, not just for their philological and rhetorical properties, but also because of what they reveal about the attitudes and preoccupations of the Roman male elite.

Dr Martijn Icks has received a 'Niels Stensen Stipendium' and a Marie Curie grant. Both scholarships are intended to gain international research experience. On the first grant Icks will spend nine months at the University of Heidelberg, doing research on character assassination of Roman emperors. The project title is 'Making and Unmaking the Emperor. The use of ritualised standard practices to elevate and denigrate emperors in ancient Rome (46 BC-AD 395)'. For two years from September 2009 he will use the Marie Curie grant as a postdoctoral fellow in Heidelberg.

The Ancient World has attracted Dr Maarten De Pourcq of the Catholic University of Leuven to come and work at the Institute for Historical, Literary and Cultural Studies for one year on a *Rubicon* grant, carrying out research on 'The science of the text and the classical tradition: sources and strategies of Julia Kristeva's reception of antiquity'. Throughout the history of Western thinking Greco-Roman antiquity has been used as an authoritative archive to inform the development of theoretical paradigms, especially in the humanities. De Pourcq will develop a theoretical framework to analyse the function of antiquity in twentieth-century literary theory.

Research Centres of the Faculty of Law



The legal and moral status after wars is being studied at the Centre for State and Law.

- The Business and Law Research Centre
- Research Centre for State and Law
- The Centre for Notarial Law

The Business and Law Research Centre (Prof. C.J.H. Jansen)

The Business and Law Research Centre – known in the Netherlands by its Dutch abbreviation ‘OO&R’ (Onderzoekcentrum Onderneming & Recht) – is a cooperative venture between the Law Faculty of Radboud University Nijmegen and thirteen prominent, mostly international, law firms and Dutch multinationals. The following leading law firms, companies and financial institutions are partners: ABP Pension Funds, Akzo Nobel, Allen & Overy, De Brauw Blackstone Westbroek, Clifford Chance, Eumedion, Houthoff Buruma, ING, Loyens & Loeff, Nauta Dutilh, Pels Rijcken & Droogleever Fortuijn, Rabobank Netherlands and Stibbe. Various partners are closely involved in

its research. What’s more, these partners may provide recommendations on the governance policy and focus of the OO&R through their participation in its Advisory Board.

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

The four key research programmes of the OO&R are Company Law and Capital Markets, Banking, Finance and Insolvency Law, Business and Patrimonial Law (including European Private Law,

Staff

Prof. I.P. Asscher-Vonk (o)
 Prof. S.E. Bartels (o)
 Prof. F.E.J. Beekhoven van den Boezem (o)
 Prof. J.M.A. Berkvens (e)
 Prof. P.P.T. Bovend'Eert (o)
 Prof. Y. Buruma (o)
 Prof. E.C. Coppens (e)
 Prof. D.R. Doorenbos (o)
 Prof. N.E.D. Faber (o)
 Prof. R. Fernhout (e)
 Prof. C.A. Groenendijk (o)
 Prof. J.W. van de Gronden (o)
 Prof. L.E. de Groot-van Leeuwen (p)
 Prof. C.M. Grundmann-van de Krol (o)
 Prof. E. Guild (o)
 Prof. H.M.A.L. Hamaekers (e)
 Prof. A.S. Hartkamp (o)
 Prof. J.J. van Hees (o)
 Prof. F.J.P. van den Ingh (o)
 Prof. C.J.H. Jansen (o)
 Prof. J.G.C. Kamphuisen (o)
 Prof. W.R. Kastelein (e)
 Prof. P.H.P.H.M.C. van Kempen (o)
 Prof. E.J.J.M. Kimman (o)
 Prof. C.J.M. Klaassen (o)
 Prof. A.M. Korebrits (e)

Prof. C.A.J.M. Kortmann (o)
 Prof. P.M.C. de Lange (e)
 Prof. R.H. Maatman (o)
 Prof. A.J. Machielse (o)
 Prof. T.J.M. Mertens (o)
 Prof. G.T.K. Meussen (o)
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 Prof. R.E.C. Niessen (o)
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 Prof. M. van Olffen (o)
 Prof. A.A. Quaedvlieg (o)
 Prof. W.A.K. Rank (o)
 Prof. B.P.M. van Ravels (o)
 Prof. J.S.L.A.W.B. Roes (p)
 Prof. R.J.N. Schlössels (o)
 Prof. F.W.J.M. Schols (o)
 Prof. C.H. Sieburgh (o)
 Prof. G.M.F. Snijders (e)
 Prof. G. van Solinge (o)
 Prof. J.H.V. Stuyck (o)
 Prof. P.J.P. Tak (o)
 Prof. A.B. Terlouw (o)
 Prof. N. van Tiggele-van der Velde (o)
 Prof. P.C. Vegter (e)

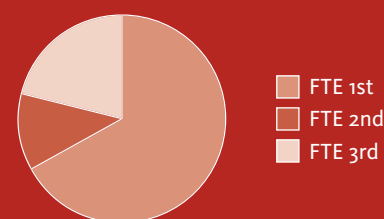
Prof. L.G. Verburg (e)
 Prof. H.L.E. Verhagen (o)
 Prof. B.P. Vermeulen (p)
 Prof. K.C. Wellens (o)

Tenured

Full Professors	11.4 FTE
Associate Professors	5.6 FTE
Assistant Professors	3.1 FTE
Researchers	2.2 FTE
Lecturers	1.9 FTE

Non-tenured

Researchers	3.8 FTE
Lecturers	7.2 FTE
Doctoral candidates	27.4 FTE



Dutch General Private Law and Private International Law) and Employment Law.

As from 1 January 2009, a fifth research programme has been established in the field of 'Business and Financial Law'.

The OO&R, which was established in 1991, is accredited as a research school and a 'centre of excellence' by the Royal Academy of Arts and Sciences (KNAW).

An international peer review committee assessed research at OO&R in 2008 on average as nearly excellent (score 4.5 - 5 on a five-point scale) on all of the four criteria it uses.

Research facilities

The OO&R 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 that is unique in the Netherlands.

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 and chaired by Prof. S. Kortmann), the OO&R cooperates with leading academics from a wide range of universities across the EU and beyond. There is close cooperation with senior researchers at the following universities: Berlin – Humboldt (Germany), Bern (Switzerland), Budapest (Hungary), Edinburgh (Scotland), Leuven (Belgium), Linz (Austria), London – King's College (England), Luxembourg (Luxembourg), Madrid (Spain), Milan – Bicocca (Italy), Montpellier (France), Ohio (United States of America), Oxford (England), Paderborn (Germany), Paris II (France), Prague (Czech Republic), Rome – Luiss Guido Carli (Italy) and Thessaloniki (Greece).

The OO&R also collaborates with INSOL Europe within the context of its Academic Forum. Furthermore, various researchers of the OO&R participate in projects of the United Nations Commission on International Trade Law (UNCITRAL), the Inter-

Research Centres of the Faculty of Law

Lonneke Peperkamp MA won an NWO Top Talent grant – a four-year PhD research project – for her proposal on ‘the legal and moral status of jus post bellum’ (justice after a war).



national Institute for the Unification of Private Law (UNIDROIT), the European Research Group on Existing EC Private Law (Acquis) and the Common Core of European Private Law (Trento).

Research results

The research conducted within the OO&R provides new insights into the approach to current problems in the legal practice of business and finance (such as preventing market abuse, strengthening financial supervision, combating the financial crisis, achieving a more flexible company law, and modernising insolvency law).

Various books written by members of the OO&R were published in the following series:

- Serie Onderneming en Recht (currently 47 volumes)
- Series Law of Business and Finance (currently 9 volumes)
- Serie vanwege het Van der Heijden Instituut (currently 98 volumes)

The OO&R also publishes the leading case law review relating to Business and Law (Jurisprudentie Onderneming en Recht). Research in the field of company law, insolvency law, agency law, the law of obligations, private international law and European private law is carried out on a continuous basis by authors of (forthcoming) volumes in the prominent Asser Series. Furthermore, extensive comparative research has been conducted by two International Working Groups established by the OO&R: the International Working Group on Protected Funds in the EU and the International Working Group on Security Rights in Europe.

The following conferences were organized by the OO&R in 2008:

- Conference on The influence of European Law on Dutch Private Law (‘De invloed van het Europese recht op het Nederlandse privaatrecht’), on 11 April 2008, SER (The Hague)
- INSOLAD/OO&R Conference on ‘The conservator, an octopus’ (‘De bewindvoerder, een octopus’) on 29 May 2008, Rabobank Netherlands (Utrecht)
- Conference on Insurance Law (‘Verzekeringsrecht, Prof. J.G. Kamphuisen’) on 19 September 2008, Radboud University Nijmegen
- Conference on Bottlenecks in writs and foreclosure (‘Knelpunten bij Beslag en Executie’), on 11 December 2008, Rabobank Netherlands (Utrecht).

Societal impact

Prof. S.C.J.J. Kortmann is Chairman of the Advisory Committee to the Minister of Justice on the reform of Dutch Insolvency Law. This Committee has submitted a proposal for a new Insolvency Act to the Minister of Justice and the Members of the Dutch Parliament. Prof. Kortmann also participates in the Council of INSOL Europe and is Rector Magnificus of Radboud University Nijmegen. Prof. G. van Solinge participates in the AFM’s Capital Markets Committee and the Company Law Committee (an Advisory Committee to the Ministry of Justice). Prof. A.S. Hartkamp is Council Member of UNIDROIT and a member of the Royal Academy. Prof. J.J. van Hees is Chairman of the Board of INSOLAD. Prof. R.H. Maatman has been appointed to the management board of the AFM (Netherlands Authority for the Financial Markets). Prof.

W.A.K. Rank has been appointed as Technical Assistance Advisor by the International Monetary Fund (IMF). Prof. C.H. Sieburgh is a Member of the Young Academy of the Royal Academy of Arts and Sciences (KNAW), the Common Core of European Private Law Working Group on Torts and the Acquis Project on the Principles of the Existing European Community Contract Law.

Future research

Research within the OO&R will continue to cover the following topics: corporate governance and compliance, financial markets, prospectus liability in Europe, attachment and enforcement, corporate litigation and special judicial remedies, structured finance, the credit crisis in domestic and comparative perspective, business and pension, ring fencing of pension funds, protected funds in the EU, security rights in Europe, as well as security rights in a historical and comparative perspective, and Insolvency Law in Europe and beyond.

Several researchers will participate in the Expert Group on Private Actors and Self-Regulation of HiiL (the Hague Institute for the Internationalization of Law). Several researchers will participate in the deliberations of UNCITRAL Working Group V on Insolvency Law and Groups of Companies and UNCITRAL Working Group VI on Secured Transactions. Members of the OO&R are expected to play an active role in the forthcoming INSOL International Conference in Vancouver in June 2009 and the INSOL Europe Annual Conference in Stockholm in October 2009. Various conferences are planned by the OO&R in 2009 in the field of Business and Law. Given sufficient research funds, consideration will be given to establishing the International Working Groups on Insolvency Law in and beyond Europe.

Research Centre for State and Law (Prof. R.J.N. Schlössels)

The Centre for State and Law – known in the Netherlands by its Dutch abbreviation ‘SteR’ (Onderzoekcentrum voor Staat en Recht) – focuses 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 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 Centre for Migration Law (CMR) – the oldest of the three research units that come under the Centre for State and Law – brings together researchers from various disciplines. Its purpose is to provide a stimulating context for high-quality research, both

legal and empirical, on migration and the protection of minorities. The CMR is unique in Europe for its interdisciplinary approach and the composition of its staff, which include lawyers, sociologists, anthropologists and political scientists. It is also known for the comparative international approach it takes to much of its research.

The CMR 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 conduct 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 CMR 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 year book 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 Immigratierecht) and the Free University of Amsterdam. The CMR seeks to balance the funding of its research by maintaining a balance between funds from the University, Netherlands Organisation for Scientific Research, and other external sources.

The Research Unit ‘Administration of Justice’ was established within the SteR to enhance a multidisciplinary approach, providing excellent opportunities for its members to benefit from each other’s know how. The unit focuses on law in action – the working of the courts, public prosecutors and the legal profession. Special attention has been paid to the phenomenon of convergence of civil, criminal and administrative procedural law. Exploration of common principles and concepts of legal proceedings is an important research topic. Administration of Justice involves research in four main areas:

- 1 Legislation and case law concerning procedural law, including the position of citizens in adjudication
- 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
- 4 The legitimacy of the Administration of Justice, from the perspective of the ethics of legal professionals (magistrates, lawyers and others).

The Research Unit ‘Principles of Public Law’, which was established in 2008, will be extended in the next few years. Research is concerned with the main principles of public law from a national, European and international perspective. The unit focuses on the relationship between principles of the democratic constitutional state (i.e. the

Research Centres of the Faculty of Law

Key publications

The Business and Law Research Centre

Doorenbos, D.R., Kortmann, S.C.J.J. & Nieuwe Weme, M.P. (Eds.) (2008). *Handboek marktmisbruik*. Serie Onderneming en Recht, 34 (2nd edition). Deventer: *Kluwer*, 600 pp.

Hartkamp, A.S. (2008). *Europees recht en Nederlands vermogensrecht*. Mr. C. Assers handleiding tot de beoefening van het Nederlands Burgerlijk Recht, 3-1. Deventer: *Kluwer*, 232 pp.

Jansen, C.J.H. (2008). Die Beweggründe des Eduard Maurits Meijers (1880-1954) für den Entwurf des neuen Niederländischen Bürgerlichen Gesetzbuches (1992). *ZEUP*, 59-78.

Kortmann, S.C.J.J. (2008). First Come, First Served. In: Zwolve, W.J. & Koops, E. (Eds.) (2008). *The Past and Future of Money*. The Hague: *Boom Juridische uitgevers*, p. 155-168.

Kortmann, S.C.J.J., Hees, J.J. van, Faber, N.E.D., Vermunt, N.S.G.J., Domingus-Schwencke, Ch.A.M. (Eds.) (2008). *De bewindvoerder, een octopus*. Serie Onderneming en Recht, 44. Deventer: *Kluwer*, 500 pp.

Nieuwe Weme, M.P., Solinge, G. van, Have, R.P. ten, Hijmans van den Bergh, L.J. (Eds.) (2008). *Handboek openbaar bod*. Serie Onderneming en Recht, 46. Deventer: *Kluwer*, 1242 pp.

Velden, J.W.P.M. van der (2008). *Beleggingsfondsen naar burgerlijk recht*. Serie Onderneming en Recht, 47. Deventer: *Kluwer*, 419 pp. (Dissertation, Nijmegen)

Verburg, L.G. (2008). *De koers van de bestuurder*. Serie Onderneming en Recht, 45. Deventer: *Kluwer*, 51 pp. (Inaugural Lecture, Nijmegen)

Verdaas, A.J. (2008). *Stil pandrecht op vorderingen op naam*. Serie Onderneming en Recht, 43. Deventer: *Kluwer*, 387 pp. (Dissertation, Nijmegen)

Research Centre for State and Law

Bovend'Eert, P.P.T. (2008). *Rechterlijke organisatie, rechters en rechtspraak*. Alphen aan den Rijn: *Kluwer*, 353 pp.

Broeksteeg, H., Van den Driessche, I. & Verhey, L. (2008). Political Accountability in the EU Member States: Different Concepts and Practical Implications. In: Verhey, L., Broeksteeg, H. & Van den Driessche, I., (Eds.) *Political Accountability in Europe: Which Way Forward? A Traditional Concept of Parliamentary Democracy in an EU Context*. Groningen: *Europa Law Publishing Groningen*, p. 273-298.

Geenens, R. and Tinnevel, R. (Eds.) (2008). *Does Truth Matter? Democracy and Public Space*. Dordrecht: *Springer*, 194 pp.

Gronden, J.W. van den (2008). The EU and WTO Law on Free Trade in Services and the Public Interest: Towards a Framework Directive on Services of General Economic Interest? In: Gronden, J.W. van den (Ed.), *The EU and WTO Law on Services, Limits to the Realisation of General Interest Policies within the Services Markets?* Alphen aan den Rijn: *Kluwer Law International*, p. 249-279.

Guild, E. & Geyer, F. (Eds.) (2008). *Security versus Justice? Police and Judicial Cooperation in the European Union*. Aldershot: *Ashgate*, 336 pp.

Mertens, Th. (2008). *Immanuel Kant: Fundering voor de metafysica van de zeden; Inleiding, vertaling en annotaties*. Amsterdam: *Boom*, 150 pp.

Kemp, P.H.P.H.M.C. (2008). *Repressie door mensenrechten: over positieve verplichtingen tot aanwending van strafrecht ter bescherming van fundamentele rechten*. Nijmegen: *Wolf Legal Publishers*, 98 pp. (Inaugural Lecture Nijmegen).

Venema, D., Groot-van Leeuwen, L. de, Mertens, T. (Eds.) (2008). *Onder de huidige omstandigheden: De Hoge Raad en het toetsingsarrest*. Den Haag: *Boom Juridische uitgevers*, 256 pp.

Zwaan, K.M. (Ed.) (2008). *The Procedures Directive: Central Themes, Problem Issues, and Implementation in Selected Member States*. Nijmegen: *Wolf Legal Publishers*, 264 pp.

The Centre for Notarial Law

Burgerhart, W. (2008). *Waarde en erfrecht. Beschouwingen over de waarde van een onderneming in het erfrecht en enige verwante wetten*. Deventer: *Kluwer*, 566 pp. (Dissertation Nijmegen)

Snijders, G.M.F. (2008). *Bijzondere overeenkomsten. Mr. C. Assers handleiding tot de beoefening van het Nederlands Burgerlijk Recht, 7-III*. Deventer: *Kluwer*, 294 pp.

Dissertations:	5
Scientific publications:	261
Professional publications:	186
Annotations :	187

rule of law, human rights, the democratic order, and accountability) with national and international social developments. In this way, the tenability of these basic principles can be assessed. Within this unit, the expertise and know-how of constitutional, administrative, criminal, European and jurisprudential lawyers can be matched. The research done in this unit will lead 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 administrations.

Awards and acknowledgements

- Profs. P.J.P. Tak and Y. Buruma received a royal honour.
- Dr D. Venema received the Praemium Erasmianum prize.

Collaboration

SteR participates in the International Research Universities Network (IRUN), collaborating with the universities of Münster, Kiel, Leuven, Poitiers, Montpellier, and Exeter. The centre also has international associations with the Max Planck Institut für ausländisches und internationales Strafrecht (Freiburg, Germany), the Challenge project (Challenge Landscape of European Liberty and Security, the International Penal and Penitentiary Foundation, the EU-AGIS program and the Working Group on Comparative Studies of Legal Profession. Within the Netherlands SteR collaborates with the Council for the Judiciary, the Ministry of Justice, several courts, municipalities and lawyers.

The Centre for Migration Law is responsible for co-ordinating the European Network on Free Movement of Workers within the European Union, which is funded by the European Commission. The CMR 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.

Research results

The Research Unit 'Administration of Justice' of the Centre for State and Law evaluated an experimental project on court sessions, combining cases in criminal and civil law for young offenders. Prof. T. Nijmeijer delivered his inaugural lecture on environmental law in December 2008. Prof. J.W. van den Gronden held his inaugural lectures on Free Trade in Services in October 2008. He was one of the organizers of the international conference on 'The changing framework of public services in Europe', in April

Research Centres of the Faculty of Law

2008 in Potsdam, Germany. He chaired a commission of the Scientific Institute of the Christian Democratic Party (CDA), resulting in the report 'The citizen and Europe'. Dr R. Tinnevelt received a Netherlands Organisation for Scientific Research Vidi grant for research on 'Cosmopolitanism in a world of interconnected threats and challenges. From a world of states to a world state?'

In 2008, the European Network on Free Movement of Workers – coordinated by the CMR – produced 27 national reports on developments that affect the freedom of movement of workers in the Member States, and published a European comparative report written by staff members at the Centre. An international conference was organized in Rotterdam, entitled: 'Celebrating 40 Years of Free Movement of Workers: Old Problems and New Issues'.

Members of the CMR 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.

In cooperation with the 'Taalstudio' (a company that develops projects and products arising from linguistic research), the CMR organized seminars on the use of language analysis in the Dutch asylum procedure. An international conference in tribute to Prof. C.A. Groenendijk was organized in Nijmegen under the title 'Migration, Citizenship and Law'. Prof. E.H. Guild was awarded an honorary doctorate from the University of Lund, Sweden in May 2008.

Societal impact

The Centre for State and Law arranged a day for the general public with replayed court cases and reflections on the jury system, the advocacy and the judiciary. Prof. L.E. de Groot-van Leeuwen is a member of the Advisory Editorial Board of Legal Ethics. She chairs the Working Group on the Comparative Studies of the Legal Profession (RCSL) and is a member of the Board of the Association of Complaint Law and Chief Editor of the Journal for Complaint Law. Prof. C.J.M. Klaassen chairs the Dutch Association for Procedural Law.

Prof. Y. Buruma chairs the Admittance Committee Regarding the Evaluation of Completed Criminal Cases. Prof. C. Kortmann holds an Academy Professorship endowed by the Royal Netherlands Academy of Arts and Sciences and he is a member of the Academy. Prof. P.P.T. Bovend'Eert is a member of the Board of Editors of the Journal for Constitutional Law, a new Dutch review body that will be further developed in 2009. Prof. J.W. van den Gronden is a member of the Commission for Consumer Affairs of the Social-

Economic Council (Sociaal-Economische Raad). He is a member of the Board of Editors of the Journal for Health Law. Prof. P.J.P. Tak is Secretary-General of the International Penal and Penitentiary Foundation (IPPF).

The CMR carried out research on behalf of the UNHCR, European Commission, the Dutch Ministry of Justice, the Advisory Committee for Aliens' Affairs, the Dutch Refugee Council, FORUM (Institute for Multicultural Development) 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 have affected both the political and the public debate on various issues, such as reversed discrimination, deprivation of Dutch citizenship and the need for a database of case law relating to new EC migration law. As part of the CHALLENGE programme, the CMR collaborated with the Centre for European Policy Studies in organising three seminars in Brussels in 2008.

Future research

Research on the 'Administration of Justice' will continue and the Research Unit 'Principles of Public Law' will be further developed. The Research Unit 'Administration of Justice' will organize a conference on 'Convergence of procedural law' in 2009. Prof. P.P.T. Bovend'Eert is member of the Board of Editors of 'The Constitutional Law of the EU Member States', a volume which makes a comparative study on constitutional law. The first results of the study can be expected in 2009.

The CMR has been commissioned by the European Commission to coordinate the Network on Free Movement of Workers in the EU in the coming years. The CMR will continue to participate in several other projects funded by the EU, such as a PhD project on deprivation of citizenship under EU Framework VII (ENACT) and on withdrawal of nationality, together with four partners (Open University, CEPS, CEU Budapest and the University of Istanbul). A Netherlands Organisation for Scientific Research-funded PhD project on service provision and migration started in 2008.

The Centre for Notarial Law (Prof. M.J.A. van Mourik; since November 2008, Prof. F.W.J.M. Schols)

Researchers at the Centre for Notarial Law (CNR) study the principles, the system and the development of those 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 relating to inheritance, business succession, estate planning and inheritance tax. They also examine closely related fields such as personal and family law, agricultural law and the law on pensions. Particular attention is

Director: Prof. Henny Sackers

Henny Sackers was Associate Professor of Criminal Law at Radboud University Nijmegen from 1997 to 2007. In 2008 he was appointed Full Professor of Administrative Penal Law. In the past he was Vice-dean for Education at the Faculty of Law. As from January, 1, 2008 he has also been Vice-dean for Research. He is a substitute judge in the criminal chamber of the High Court in Arnhem.



Research Centres of the Faculty of Law

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paid to the bearing of these fields on the general law of property. The approach to all such work is practical, with several researchers also being active in notarial practice.

The Centre 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 Institute for Law has a large, well-equipped library with state-of-the-art ICT facilities.

Collaboration

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 Royal Notarial Association (KNB), the Association of Estate Planners in Notarial Practice (EPN), Netwerk Notarial Association and with Tilburg University as part of its course in Notarial and Fiscal law.

Research results

The Centre for Notarial Law publishes since 2006 a series called 'Publicaties vanwege het Centrum voor Notarieel Recht' (currently 8 volumes). The Centre for Notarial Law organized in 2008 in

cooperation with the Foundation 'Stichting Nijmeegse Notariële Congressen' a national conference on 'Notarial disciplinary law'.

Societal impact

The interaction between science and notarial law practice advocated by the Centre involves a strong bond between members and legal practice. Researchers are actively involved in lectures, training and legal advice, while acting as preliminary advisors. Researchers are lecturers (in charge) for the Stichting Beroepsopleiding Notariaat (SBN), for the estate planners of EPN, the association of estate planners in notarial law. They are also involved in several organizations, including the Commission Succession Law II of the Royal Notarial Association, The Board of the Institute for Agricultural Law in Wageningen, the Stichting tot Bevordering der Notariële Wetenschap and the Scientific Council and Board of the Thijmgenootschap. Moreover, one researcher is legal advisor of the Dutch Province of the Roman Catholic Church (statute-law).


Future research

Current projects within the Centre for Notarial Law will continue, including the historical development of the legal position of the surviving spouse in Dutch civil law, the exegesis of last wills, the international aspects of estate planning, the new law concerning non-liability partnerships ('personenvennootschappen') and developments in the legislation on marital or matrimonial property. 'Delegation of last wills to third parties' and 'the new inheritance tax law' will be new research projects. In 2009 the results of an empirical research project on the facilities for business succession in practice will be published.

Institute for Management Research



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 to urban networks and from macro-economic systems to individual organizations and firms.



How to intensify sustainable energy policies and management is one of the key questions studied at the Institute.

IMR's multidisciplinary composition makes it possible to apply various theoretical perspectives, such as the managerial, the economic, the geographic and the political. IMR aims to combine these theoretical perspectives to provide a richer understanding of international, societal and organizational phenomena related to management.

In 2008 the six previous research programmes were bundled into four programmes. These are carried out by approximately 94 FTE researchers and address the following themes:

Governance and Places (GaP)

Researchers at GaP explore and evaluate the social and environmental qualities of places, from local to global, with a particular focus on questions of spatial structure and governance. Research topics include urban and regional development, transport and water management, environmental policy and governance, real estate development, identities and borders, and European spatial planning. The programme integrates perspectives and methods from four disciplines (human geography, spatial planning, environ-

mental studies and public administration), taking a systematic approach to the issue of governance.

Nijmegen Centre of Economics (NiCE)

NiCE specializes in research on economic issues from a pluralistic and multidisciplinary perspective. Apart from economic theories, researchers use psychological and sociological theories. NiCE focuses on three themes: (a) experimental and behavioural economics, (b) the influence of culture and institutions on economic markets and (c) accounting and finance in relation to organizational change. NiCE uses survey, longitudinal and experimental data sets on governance to test the various theoretical perspectives.

Shifts in Government and Governance in a Comparative and International Perspective (SHIFTS)

The SHIFTS programme deals with changes in public governance and management. The main hypothesis is twofold: (a) many of the traditional mechanisms, capabilities and styles of government have never 'shifted' to the extent that theory suggests, (b) a counter-trend back to 'old' forms of government is taking place. The following

Staff

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 Prof. Y.W.M. Benschop (p)
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 Prof. F.W.M. Boekema (o)
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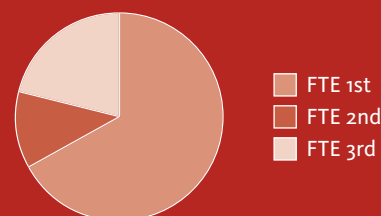
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Tenured

Full Professors	9.3 FTE
Associate Professors	10.6 FTE
Assistant Professors	17.6 FTE
Researchers	4.2 FTE
Lecturers	0.7 FTE

Non-tenured

Researchers	9.4 FTE
Lecturers	0.2 FTE
Postdocs	6.0 FTE
Doctoral candidates	33.0 FTE



topics are central: relationships between government and civil society, institutional arrangements regarding citizens' participation in the public domain, and shifts in multilevel governance. Research from public administration and political science is combined with normative and empirical approaches.

Relational Enterprise (RE)

RE is the result of a merger of previous programmes that dealt with organizational cybernetics, participation, and relationship management. Researchers at RE investigate how social processes within organizations determine the performance of organizations and management. The programme takes into account the fact that all kinds of elements and functions continually interact within and around organizations. An integrated approach will eventually improve the performance of organizations. The study of RE focuses on four interrelated research themes: relationship management and social networks, institutional dynamics and organizational behaviour, organizational decision making and innovation.

Research facilities

IMR operates the NSM Decision Lab, where experimental research based on game theory and social choice theory is carried out in order to gain insight into cooperative decision making in various empirical domains. The software used was developed by the team and is therefore unique. Experimental domains include those in health insurance and real estate policy making.

IMR also uses the Visa Skills Lab, an Electronic Meeting/Group Decision Room, which is equipped for studying group processes such as agenda setting and specifying and evaluating policy alternatives. These facilities are, for example, used for PhD research.

The research programmes use specialized national and international databases, adapting and combining them according to the Institute's research requirements. For example, the Database Developing World (DDW), built as part of Dr J. Smits' Vidi project involving research on educational participation, contains socio-economic, demographic and health information for more than ten million individuals living in over 100 developing countries.

Institute for Management Research

Dr Jörg Henseler, Assistant Professor of Marketing, received the 'Promotionspreis Energie', donated by Saar Ferngas AG, in Saarbrücken, Germany, for his PhD thesis on customer-switching behaviour in the German electricity market.



Researchers at RE 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 consulted. The economists use the Datastream International database, Consensus Economic Survey database, Educational Participation Database, Regional Indicator Database and Inequality of Mortality Database.

The Institute has access to a large dataset of employee commitment data belonging to a large multinational company. 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, a compendium of surveys on human resource management practices in more than 40 countries. Researchers within GaP use databases on property prices from the real estate company DTZ Zadelhoff and a national database on transport behaviour.

Collaboration

IMR continued to collaborate with various Dutch research schools and networks: the Research School for Resource Studies for Development (CERES), the Netherlands Graduate School of Urban and Regional research (NETHUR), the Netherlands' Network of Economics (NAKE), the Netherlands Institute of Government (NIG), the Netherlands' Organization for Research in Business Economics and Management (NOBEM) and the Research School on Transport Infrastructure and Logistics (TRAIL).

IMR participates in many other national and international research networks. Below are some examples of research collaboration with new partners that started in 2008:

- GaP: with the Netherlands Institute for City Innovation Studies (NICIS) – including several municipalities – on city development
- GaP: with TU Delft en TU Eindhoven in the context of the NWO programme on the Sustainable Accessibility of the Randstad
- NiCE: with Warwick University (England) and the Goethe-University of Frankfurt am Main in the project 'EURESOURCE – Religious Sources of Solidarity', financed by NORFACE
- NiCE: with universities and societal partners in Turkey, India and Brazil in the field of the educational participation of women and minorities in developing countries
- RE: with the Netherlands Defence Academy in PhD research on infrastructural conditions for moral military behaviour in international missions
- RE: with the Municipality of Nijmegen, the organization 'Innercity Service', TNO, Erasmus University and the Dutch Open University on city distribution
- SHIFTS: with the universities of Budapest and Ljubljana joint research – and a Masters programme – was initiated
- SHIFTS: joint research with Dipartimento di Scienze Politiche, Università di Bologna and L'Institut d'études Politiques of the University of Grenoble.

Research results

IMR researchers continued to contribute to developing theoretical, methodological and empirical insights into the management of public and private organizations. These insights have been presented and discussed at international conferences, and published in disser-

tations, books, scientific and professional journals. The number of successfully defended dissertations has doubled compared to the years before 2006.

Awards

IMR is proud to have received the following awards in 2008:

- Dr J. Smits received, for the fourth consecutive year, a ranking from CentER in Tilburg, the Netherlands, as one of the top 40 Dutch economists in 2008.
- Dr Maseland won the Hendrik Casimir-Karl Ziegler research stipendium of the Royal Netherlands Academy of Arts and Sciences (KNAW).
- Prof. de Vries received the Pierre De Celles Best Paper Award for his contribution to the IASIA (International Association of Schools in Administration) Conference in 2005 in Como.
- Roger Smeets MSc received the Haynes prize for the most promising young scholar(s) award (together with Maarten Bosker) and Best Reviewer Award at the Academy of International Business meeting 2008 in Milan.
- Dr Jonker received the 2008 Outstanding Paper Award from the Emerald Literati Network (with David Foster).
- Dr Henseler received the 'Promotionspreis Energie', which was donated by Saar Ferngas AG, in Saarbrücken, Germany, for his PhD thesis on customer switching behaviour in the German electricity market.

Dr Lagendijk was appointed editor-in-chief of the leading international journal *Regional Studies* for a period of five years. Further, Prof. Verbeek became editor of the Foreign Policy Analysis Series of Nijhoff Publishers. Dr de Vaal became Associate Editor of the open-access journal *Economics*.

External funded projects

The number of applications for external funded projects by members of the institute has grown significantly. Due to this, the share of externally funded research capacity increased to one third of the total research capacity. See Collaborations for projects that started in 2008 based on new partnerships. Within the context of existing partnerships, interesting new projects include:

- GaP: Transumo financed the project European Logistics Networks. Collaboration with Buck Consultants International, the HAN University of Applied Sciences and the Euregional Logistics Platform.
- GaP: An ex-post evaluation of EU Interreg programme III 2000-2006 was carried out together with NEA.
- GaP: An evaluation of the New Land Development Act was carried out for the Dutch Ministry of Housing, Spatial Planning and the Environment. Royal Haskoning and Metrum also participated in this project.
- NiCE: The WOTRO research programme PopDev provided a grant for the project 'Impact of reproductive health services on socio-economic development in sub-Saharan Africa'. This project is a cooperative venture with the Faculty of Social Science, UMC

St Radboud and The Muhimbili University of Health and Allied Sciences in Dar es Salaam.

- RE: A partnership on modelling complex decision making with Twijnstra Gudde, Vrije Universiteit Amsterdam was established (Profs. Vennix, van Kranenburg and van Deemen / Dr Rouwette).
- RE: A partnership with College van Zorgverzekeringen (CVZ) for training and research on group decision making in the health insurance industry was established.
- RE: The Dutch Ministries of Economic Affairs and of Education, Culture and Science finance participation in 'Gelderland Onderneemt (GO!)' to promote entrepreneurship in Gelderland.
- SHIFTS: A research project on European competition policy was started together with researchers at Copenhagen Business School.
- SHIFTS: Researchers participated in a 'High Potential' project in Utrecht entitled 'Successful implementation of innovations in organizations: A dynamic approach to self-regulation' (Dr Akkerman).
- SHIFTS: NWO provided a grant for the project 'Understanding women's labour market participation in Muslim countries'.

Societal impact

Part of the mission of IMR is to contribute to national and international debates on societal issues of economics, politics, spatial development, business organization and labour market development. In 2008 several IMR researchers gave lectures, wrote articles in newspapers, participated in advisory committees, and commented on topical issues on radio and television. Researchers at IMR are increasingly being invited to make such contributions. Below are some examples.

- Prof. Benschop gave presentations on gender in organizations, gender and leadership, and gender at work for companies such as BAM, ING Bank, KPMG, PWC, non-profit organizations including the police, Studium Generale (lectures on topics of general interest), and policy makers.
- Dr Essers took part in debates on entrepreneurship and ethnical minority groups in the Netherlands. For example, she gave a presentation at the Ministry of Economic Affairs in July, and was interviewed by television stations AT5 and MNO in February 2008.
- Dr van Gestel organized a conference on 'CAO 2008/9; How to deal with inflation and uncertainty' for policy makers in Utrecht.
- Prof. van der Heijden gave an invited lecture in Nieuwspoor, The Hague, on mobility management for members of Parliament in the context of a series of Eureka debates organized by NWO.
- Dr van Houtum took part in international debates on transnational migration, borders and identity. For example, he gave a keynote lecture in a seminar on these issues in June in Bergamo in Italy and organized an international expert meeting in January in Brussels.
- A lunch debate was organized by NiCE in October on the financial crisis with keynote speaker Paul Tang (Member of Parliament for the Dutch Labour Party; financial and tax spokesman).

Institute for Management Research

Key publications

Akkerman, A. (2008). Union Competition and Strikes : The Need for Analysis at the Sector Level. *Industrial and Labor Relations Review*, 61(4), 445-459.

Argioli, R., Heijden, R.E.C.M. van der, Bos, D.M. & Marchau, V.A.W.J. (2008). Intelligent transport systems and preferences for office locations. *Environment and Planning A*, 40(7), 1744-1759.

Beugelsdijk, S. (2008). Strategic Human Resource Practices and Product Innovation. *Organization Studies*, 29(6), 821-848.

Boedeltje, F. & Houtum, H.J. van (2008). The Abduction of Europe: a Plea for Less 'Unionism' and more Europe. *Tijdschrift voor Economische en Sociale Geografie*, 99(3), 361-365.

Boekema, F.W.M., Naerssen, A.L. van & Zoomers, E.B. (2008). Global Circulation and Territorial Development : Introduction to the Special Issue. *European Planning Studies*, 16(7), 893-898.

Dicke, W.M. & Meijerink, S.V. (2008). The Public-Private Divide in Flood Management. *International Journal of Water Resources Development*, 24(4), 495-498.

Furrer, O.F.G., Thomas, H & Goussevskaia, A. (2008). The Structure and Evolution of the Strategic Management Field: A Content Analysis of Twenty-six Years of Strategic Management Research. *International Journal of Management Reviews*, 10(1), 1-23.

Grössler, A., Löpsinger, T., Stotz, M. & Wörner, H. (2008). Analyzing price and product strategies with a comprehensive system dynamics model - A case study from the capital goods industry. *Journal of Business Research*, 61(11), 1136-1142.

Letterie, W., Hagedoorn, J., Kranenburg, H.L. van & Palm, F. (2008). Information gathering through alliances. *Journal of Economic Behavior and Organization*, 66(2), 176-194.

Mastenbroek, E. & Veen, T. van (2008). Forum Section. Last Words on Delegation? Examining The Powers of the Union. *European Union Politics*, 9(2), 295-311.

Rosenau, P. & Lako, C.J. (2008). An Experiment with Regulated Competition and Individual Mandates for Universal Health Care: The New Dutch Health Insurance System. *Journal of Health Politics, Policy and Law*, 33(6), 1031-1055.

Smeets, R.A.L.M. (2008). Collecting the Pieces of the FDI Knowledge Spillovers Puzzle. *The World Bank Research Observer*, 23(2), 107-138.

Staveren, I.P. van (2008). The gender bias of the poverty reduction strategy framework. *Review of International Political Economy*, 15(2), 289-313.

Wissenburg, M.L.J. (2008). *Political Pluralism and the State: Beyond Sovereignty*. London: Routledge.

Zhang, J. & Bloemer, J.M.M. (2008). The Impact of Value Congruence on Consumer-Service Brand Relationships. *Journal of Service Research*, 11(2), 161-179.

Dissertations:	12
Scientific publications:	258
Professional publications:	184

- Prof. Leyenaar advised the Turkish government on drafting a National Policy Plan for Promoting Gender Equality. She visited Ankara nine times, giving several speeches and presentations. For the Dutch government she conducted an inventory of different types of citizen's participation.
- Dr Reinalda joined a global project of the International Studies Association (ISA) Compendium on International Relations.

Several IMR researchers are engaged in research activities that are relevant to the region. A few examples:

- In the context of 'Radboud University meets Nijmegen', Dr van Houtum lectured on the NEC football club, Prof. van der Heijden gave a lecture on Nijmegen and the Waal and Dr de Vaal a lecture on fair trade.

- Prof. de Jong and Prof. Sent discussed the financial crisis in the media and in presentations for the Rotary Club in Nijmegen and the Business Club 52 Degrees.
- The City region Arnhem Nijmegen decided to sponsor a part-time professorship on City Marketing. Prof. Hospers was appointed and starts his work February 2009.
- Rabobank Nijmegen sponsors Prof. Boekema's chair in Euregional Management, which has resulted in lectures on cross-border policy making and research cooperation among companies.
- There are many regular contacts with consultants, companies and municipalities in the region, for example, for internships for Masters students and for research cooperation.

Director: Prof. Rob van der Heijden

In 2001 Rob van der Heijden came to the Nijmegen School of Management as Professor of Spatial Planning from Delft University of Technology, where he was Professor of Transport and Logistics. In 2008 he was appointed Vice-Dean of the Faculty alongside his role as Director of the Institute for Management Research. He has been a member of various scientific and professional advisory boards, including the National Safety Board, the Safety Committee for the High-speed Train (South), the Environmental Impact Assessment Committee and the Institute for Road Safety Research (SWOV). He specializes in complex decision making related to spatial infrastructures and urban development.



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Future research

In 2008 the research performance of the IMR was evaluated by an international review committee. The committee observed clear improvements in the past years and further improvements are considered likely. These improvements are visible in all IMR programmes. Considerable progress in research (in terms of growth in capacity, external funding, the number of dissertations defended and academic publications) has been achieved in recent years, despite reductions in the direct funding.

The evaluation scores by the review committee were on average good to very good. The policy of the IMR is to continue the initiatives taken in 2007 and 2008 to further increase productivity and academic quality. The review committee identified the need to improve the PhD success rate, to create more focus in research themes covered, to strengthen valorisation and acquisition.

In reaction, in 2008 three previous research programmes were bundled into one new programme focusing on business administration. The aim was to strengthen research synergy and improve research on the social processes within organizations. The remaining four IMR programmes have been planned with respect to content and programme management, and targets have been set for the years ahead. The IMR continues to participate in national and international academic networks. Wherever possible, new collaborations, such as that with the Centre for Water and Society (CWS; www.ru.nl/waterways) are established.

Further, the IMR introduced a policy of matching external funding for research, in particular in relation to PhD positions. The aim is to stimulate initiatives that will attract additional research funding. Extra attention will be paid to preparing applications to the Netherlands Organisation for Scientific Research. IMR intends to further enhance its valorisation policy by strengthening its multidisciplinary research projects.

Finally, IMR's rules for evaluating PhD progress, qualifying for publications and allocating research time have been made more transparent. Moreover, the capacity and skills of support staff from Finance, Communication, International Office and the Research Institute have been bundled to form a new staff department with the aim of supporting research initiatives by IMR researchers more effectively and efficiently.

Nijmegen Institute for Social & Cultural Research

The research groups within the Nijmegen Institute for Social & Cultural Research (NISCO) use an integrated cooperative and comparative approach to study a wide variety of phenomena and processes in a broad range of Western and non-Western societies. The common research framework reflects similarities in theoretical approaches, data collection, research design and data analysis. The research focuses on three themes: inequality, cohesion and rationalization. In order to arrive at a better understanding of societal phenomena and processes, NISCO examines 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). An accredited Research Masters programme has been established that is fully integrated within the institute. NISCO is a research institute of the Faculty of Social Sciences.



The three research themes at NISCO are defined as follows:

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. Ways in which individual and family resources affect outcomes such as cultural participation, media access and media use are also studied.

Cohesion

Here the focus is on describing and explaining social participation in formal organizations as well as in informal social networks, including families and other groups. There are three core topics. First, research explores developments in the relationships between social participation and both pro-social and antisocial behaviour, as well as variations in this relationship among 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 show exclusionist attitudes and behaviour towards particular out-groups. Third, representations of social reality in mediated communication (including public awareness campaigns), the production of such communication, and the reception and interpretation of these representations of social reality are studied in relation to social participation and exclusionism in societies whose democratic systems differ in terms of stability and longevity.

Rationalization

By comparing the secularization of Dutch society to rationalization processes taking place in other societies, 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, while comparing the systems of beliefs and meaning and the ideologies and practices of the members of these groups to those of non-members.



Whether unmarried Indian mothers freely hand over their babies for adoption was the topic of a study by Dr Pien Bos.

Staff

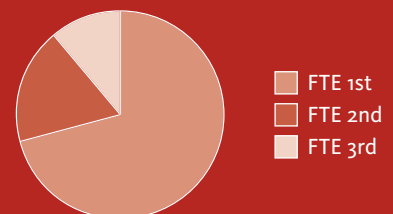
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 Prof. W.C. Ultee (o)
 Prof. F.P.J.F. Wester (o)
 Prof. T. Widlok (o)

Tenured

Full Professors	4.7 FTE
Associate Professors	4.4 FTE
Assistant Professors	6.9 FTE
Researchers	0.4 FTE

Non-tenured

Researchers	2.1 FTE
Doctoral candidates	20.9 FTE



Awards and grants

Researchers at NISCO received major additional funding from the Netherlands Organisation for Scientific Research (NWO) for an exercise in collecting large-scale panel data, entitled 'Panel Study of Social Dynamics in the Netherlands' to improve on answers to longitudinal questions. Other researchers received major funding from New Opportunities for Research Funding Agency Co-operation in Europe (NORFACE) to examine the 'Re-emergence of Religion as a Social Force in Europe' – a study that contains explicit cross-cultural and longitudinal comparative issues. The Ministry of Foreign Affairs (DGIS) and Cordaid funded an additional four internal and two external PhDs.

Research facilities

The Institute specializes in making and analyzing data collections both large and small, i.e. longitudinal data collections on individuals and their life courses within their social contexts – in the Netherlands as well as in several other countries – and cross-national collections that focus on a wide range of countries. These data are considered pertinent for comparative research in

this Institute as they provide useful possibilities for multidisciplinary cooperation. Moreover, other researchers have over the years collected huge samples of television programmes broadcast at prime time (in 1980-1985-1990-1995-2000-2005) that are used by researchers in several research groups within the Institute. Researchers also have access to collections of data on Official Development Assistance and development studies in general. This documentation is arranged into a number of sub-collections, which are also available on CD-ROM.

Collaboration

At the international level the Institute collaborates with the University of Oxford where several former members of NISCO research groups hold professorships, with Universidad Católica Cardenal Raúl Silva Henríquez (Chile), University of Aarhus (Denmark), Centre National de Recherche Scientifique (Paris, France), Max-Planck-Institut für Ethnologische Forschung in Halle, Universitas Gadjah Mada Yogyakarta (Indonesia), Australian National University (Canberra, Australia), Centre for Comparative Social Surveys in London, Universities of Edinburgh,

Nijmegen Institute for Social & Cultural Research



Dr Pien Bos defended her dissertation (*cum laude*) on the information given to Indian mothers who hand over their babies for adoption.

London and Southampton (UK), and Harvard University (USA). Members of the institute cooperate for lengthy time with partners from the departments of Sociology, Methodology and Communication Science of the Catholic University of Leuven, Belgium. There is also cooperation with the Department of Communication Science of the Westfälische Wilhelms-Universität at Münster in Germany, which is an International Research Universities Network (IRUN) partner.

The Institute also participates in several international networks, including 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 (ICA) and the International Association of Mass Communication Research (IAMCR).

In order to maintain useful contacts in the field of comparative research, members of the Institute also cooperate with counterparts in other Dutch research schools, including the Research School for Resource Studies for Development (CERES), Interuniversity Centre for Social Science Theory and Methodology (ICS) and the Netherlands Organization of Communication Research (NESCOR).

Research results

One important area of research is the anthropology of rituals, more particularly with regard to pilgrimages, death rites and the dynamics of rituals. This research includes a link with the Univer-

sity of Heidelberg, with whom there is a joint research project on Ritual, Media and Conflict and an interdisciplinary project on Refiguring Death Rites (hosted by the Religious Studies Faculty). The research findings underline the continuing relevance of ritual in social life across the world, including apparently 'secularized' countries.

Current research on 'Institutions in Development' focuses on the role of international networks that are engaged in poverty alleviation, empowerment and democratisation. Important topics are: (a) development cooperation & civil society organisation (b) value chains for Fair Trade Commodities (Solidaridad-funded), and (c) migration networks. Ongoing research on the changing roles and relationships between Northern and Southern civil society organizations has been extended with a new study on private initiatives. A large database has been compiled on the structure of Dutch NGO funding. The value chain programme published a comparative study on the impact of Fair Trade in six developing countries, which attracted broad international interest.

Sociological research on educational performance reveals that immigrant children from destination countries with low economic development perform less well at school. In a study on 28 European nations it was established that educational expansion reduces educational differences in both formal and informal social capital. Furthermore, the World Value Surveys show that the gap between belief and belonging to religious community is not growing. The relationship between the convictions of fathers and their children is investigated in a life-course-design study. Children of convicted

fathers appear to be much more likely to be convicted themselves in comparison to those whose fathers have never been convicted of a crime.

Dissertation projects in communication science focused on a content analysis of political websites in several European countries in relation to European elections. It concluded that websites in various EU member states communicate about Europe in a similar manner. A study on the interpretation of television news was also completed. This interview study concluded that people's interpretations of television news may differ depending on what they already know about the issues in the news. The third dissertation was about older adults' television use. Through interviews with older adults the study aims to develop a theoretical model of the role that television may play for older adults in a variety of circumstances.

Societal impact

As a spin-off of our scientific research, members of the Institute regularly participate as advisors to several public and private institutes. These advisory positions are in a variety of domains. Several relate to Dutch public and commercial television institutes (such as NOS/Kijk- en Luisteronderzoek, NPS/Sesamstraat, Nederlands Instituut voor de Classificatie van Audiovisuele Media, Bedrijfsfonds voor de Pers, Publieke Omroep and BNN). Other members are engaged in research with institutions that deal with international connections (such as Dutch ministries and 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, Oxfam, PSO, VNG International, VSO and ZOA Vluchtelingen zorg (a refugee care association).

Future research

The Anthropology group has strengthened its links with anthropologists working at the Religious Studies Faculty. Together, they have launched a joint research initiative on 'The Morality of Economics and Exchange' which will involve exchanges of staff and students with colleagues from IRUN partners at the University of Münster among others. Funded joint research on the topic of 'Ritual, Media and Conflict' will be expanded and, together with the newly established Centre for Thanatology, complemented by new research projects in the NWO funding area of Religion and Conflict.

The Development Studies group's research programme will be extended with new activities in the areas of: (a) Gender Mainstreaming in Development Programmes, (b) Cooperatives and Supply Chains (an NWO-WOTRO-funded integrated programme involving four PhDs and one postdoc), and (c) Migration and Conflict Management in the Great Lakes region of Africa (NWO pre-proposal approved). Interdisciplinary cooperation has been strengthened, particularly with Medical Sciences, following



Institute for Gender Studies (IGS)

Prof. W.H.M. Jansen

www.ru.nl/genderstudies

The interdisciplinary Institute for Gender Studies (IGS) works at the crossroads of the social sciences, arts, religious studies, philosophy, medical sciences, law and management sciences. With four professors, two associate professors, six university lecturers, and seven junior researchers, IGS is the largest gender studies institute in the Netherlands.

Mission of the research programme *The Dynamics of Gender. Body, Culture and Policies* is to contribute to the scholarly understanding of changes in gender, gender relations, and sexuality and to make the results available to society. The research starts from the premise that gender continually shows itself to be a crucial factor in the structuring of society and culture, that gender closely intersects with other divisions in society, and impacts greatly on people's lives. The research focuses on the dynamics of gender by studying individual and collective agents of change and the social, political and cultural constellations under which such changes occur.

Nijmegen Institute for Social & Cultural Research

Key publications

Aarts, O., Need, A., Te Grotenhuis, M. & Graaf N. D. de (2008). Does Believing accompany belonging? Correlations and trends in Western Europe and North America between 1981 and 2000. *Review of Religious Research* 50, 1, 16-34.

Bardoel, J. & d'Haenens, L. (2008). Reinventing public service broadcasting in Europe: Prospects, promises and problems, *Media, Culture & Society* 30, 3, 337-355.

Gesthuizen, M., Meer, T. van de & Scheepers, P. (2008). Education and dimensions of social capital: do educational effects differ due to educational expansion and social security expenditure? *European Sociological Review*, 24, 5, 617-632.

Guadalupe, F. (2008). *Chanting Down the New Jerusalem: Calypso, Christianity, and Capitalism in the Caribbean*. Berkeley, University of California Press, 255 pp.

Hendriks Vettehen, P. G. J., Nuijten, C.M. & Peeters, A. (2008). Explaining effects of sensationalism on liking of television news stories. The role of emotional arousal. *Communication Research*, 35, 3, 319-338.

Hoebink, P. (2008). A tale of two countries; perspectives from the South on the coherence of EU policies. In: P. Hebinck, S. Sloopweg and L. Smith (Eds.), *Tales of Development: People, Power and Space*. Assen: *Van Gorcum*, p. 187-204.

Levels, M., Dronkers, J. & Kraaykamp, G. (2008). Educational Achievement of Immigrants in Western Countries: Origin, Destination, and Community Effects on Mathematical Performance. *American Sociological Review*, 73, 5, 835-853.

Notermans, C. (2008). Local and global icons of Mary: An ethnographic study of a powerful symbol. *Anthropos* 103, 2, 471-481.

Rakt, M. van de, Nieuwebeerta, P. & Graaf, N.D. de (2008). Like father, like son? The relationships between conviction trajectories of fathers and their sons and daughters. *British Journal of Criminology*, 48, 4, 538-556.

Rosenbaum, J. E., Beentjes, J. W. J. & Konig R. P. (2008). Mapping Media Literacy: Key Concepts and Future Directions. In Christina S. Beck (red.), *Communication Yearbook* 32. New York: *Routledge*. (p. 312-353)

Ruben, R., (Ed). (2008). *The Impact of Fair Trade*. Wageningen: *Wageningen Academic Publishers*. (256 pp.)

Van Houte, M. & Davids, T. (2008). Development and Return Migration: from policy panacea to migrant perspective sustainability, *Third World Quarterly*, 29, 7, 1411-1429.

Vergeer, M. & Hermans, L. (2008). Analysing online political discussions: methodological considerations. *Javnost - The Public*, 15, 2, 37-56.

Widlok, Th. (2008). Good or bad, my heritage: customary legal practices and the liberal constitution of post-colonial states. *Anthropology Southern Africa* 31, 1-2, 13-19.

Dissertations:	14
Scientific publications:	158
Professional publications:	42

Director: Prof. Peer Scheepers

Peer Scheepers's entire academic career has been pursued at Radboud University Nijmegen. From 1991 to 2001 he was an Associate Professor of Empirical Sociology. He was an Endowed Professor of Societal Prejudice between 1994 and 2002 and since 2001 he has been a Full Professor of Social Science Research Methodology at the Faculty of Social Sciences. Since 2001 he has been appointed as the national coordinator of the European Social Survey. He was a member of the Board of the Netherlands Sociological Society from 1999 to 2002. Prof. Scheepers has been a member of the Royal Netherlands Academy of Arts and Sciences since 2004 and since 2005 he has held a chair in Research Methodology at the Faculty of Religious Studies at the University.



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approval of the NWO-WOTRO programme on 'Reproductive Health & Poverty Alleviation in Tanzania' (involving three PhD students, and 1.5 postdoc positions) and the start of the NISCO-funded PhD study on 'Health and Wealth linkages in Indonesia'.

The Sociology group focuses on publications containing life-course analyses and multi-level modelling on several topics such as the Dutch labour market in transition, media socialisation effects, social capital and health, abortion rules and abortion practices, cultural capital in schooling, the composition of neighbourhoods and their effects, attitudes to children's socialisation, and inter-ethnic prejudice and contacts. In particular, cross-national cooperation for research programmes on the latter topic will be further developed, hopefully supported by additional funding from NORFACE.

The Communication Science group aims to establish the effect of sensational television news. A second project relates to stereotypes of older people. A third project, which is carried out in cooperation with the University of Leuven, addresses the question how young people (15-25 years) use the news. Finally, the annual conference for communication scholars working in the Netherlands and Flanders is organized on the Radboud University Nijmegen campus (Etmaal van de Communicatiewetenschap, February 2009). More than 100 researchers will present papers and posters.

Centre for Language Studies

The Centre for Language Studies (CLS) aims to create a stimulating environment in which top-quality research can be carried out in Linguistics, Language and speech technology, and Communication studies. Key aspects are innovation, an interdisciplinary approach and a strong commitment to the acquisition of external research funds, which helps strengthen the profile of research done at the Centre in the Netherlands and abroad.



There are five research programmes at CLS:

- Grammar and Cognition
- Language in Time and Space
- Linguistic Information Processing
- Communicative Competences
- Professional Communication

Awards

Prof. Pieter Muysken was awarded a prestigious European Research Council Grant (Advanced ERC Grant). This grant – in addition to the Royal Netherlands Academy of Arts and Sciences (KNAW) grant he obtained last year – allows him to explore new directions in the field of language contact studies. In his research, Prof. Muysken will apply the scenario model for language contact studies to a number of settings which differ widely in their level of aggregation and time depth: the languages of the Amazonian fringe in South America, the complex multilingual setting of the Republic of Suriname, the multilingual interaction of immigrant groups in the Netherlands, and two groups of multilingual individuals. New methods from

structural phylogenetics will also be employed. By applying the scenario model at various levels of aggregation, a stronger link between language contact studies and historical linguistics can be established.

Dr Onno Crasborn received an ERC Starting Grant for the project ‘On the other hand: the linguistic impact of having two symmetrical articulators in sign language’. This grant, together with three other grants obtained by him in 2007 and 2008 (a Netherlands Organisation for Scientific Research (NWO) Vidi grant, an NWO Internationalization grant, and participation in an FP7 European project on the automatic recognition and translation of sign languages), will considerably advance his position in the international field of sign-language research.

The Language in Time and Space group organized a conference entitled ‘Transmission and Diffusion’, featuring Prof. William Labov as keynote speaker alongside many other prominent linguists.



Experiment in the 'Baby Lab', where the acquisition and speech of language is being studied.

Staff

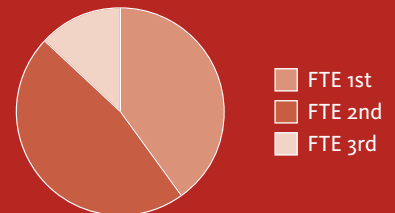
Prof. L.W.J. Boves (o)
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 Prof. A.F.J. Dijkstra (e)
 Prof. P. Fikkert (p)
 Prof. M. Gerritsen (p)
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 Prof. L.G. de Stadler (e)
 Prof. H. Steinhauer (e)
 Prof. C. Versteegh (o)

Tenured

Full Professors	7,3 FTE
Associate Professors	3,3 FTE
Assistant Professors	9,5 FTE

Non-tenured

Researchers	2,4 FTE
Postdocs	15,6 FTE
Doctoral candidates	31,7 FTE



Two associate professors were appointed as full professors: Prof. Margot van Mulken (who holds the chair for International Business Communication), and Prof. Peter Arno Coppens (who has the chair for 'Teaching methodology and curriculum development in the fields of language, culture and history').

Profs. Ben Knapen and David van Leeuwen were given special appointments on Media and Quality and *Speech Technology and its Applications*, respectively.

The Max-Planck Gesellschaft approved the start of the Max-Planck International Graduate School, with major participation by CLS and the Donders Institute for Brain, Cognition and Behaviour.

In 2008 eight dissertations were defended, one of which was awarded a *cum laude*: Elizabeth de Groot's 'English annual reports in Europe. A study on the identification and reception of genre characteristics in multimodal annual reports originating in the Netherlands and the United Kingdom.'

Research facilities

CLS research is becoming increasingly experimental. As a result, facilities such as experimental laboratories, experimental equipment, powerful computers, and software are becoming increasingly important. In 2008 the Executive Board of the University provided substantial amounts of additional finance to purchase research equipment and data storage devices for digital resources.

Collaboration

- There is long-standing collaboration with a number of groups at the Max Planck Institute for Psycholinguistics (which is located on campus), involving language processing, sign language and gesture studies, descriptive and comparative linguistics, databases and digital infrastructure, multilingualism (also involving the Donders Institute and the Behavioural Science Institute), and child language (also involving the Donders Institute).
- Collaboration with the Meertens Instituut with respect to the NWO-funded research projects 'Intonation in varieties of Dutch' (also involving Leiden University), the 'Dutch Bilingualism

Centre for Language Studies



Paula Fikkert, Full Professor of Dutch Language and Culture – in particular first language acquisition and phonology – studies how babies learn to master their mother tongue in such a short period.

Database’ (also involving the University of Tilburg), and ‘Roots of Ethnolects’.

- The Typological Database System (also involving Utrecht University), the Surinam Creole Archive, and the Dutch Sign Language Database were set up together with the University of Amsterdam.
- Collaboration with the Sint Maartenskliniek in Nijmegen and the OSTT Development Centre for Speech and Language Technology in a Communication Assessment project.
- Collaboration on an FP6 ACORNS project with the Royal Institute of Technology, Stockholm, the University of Sheffield, Technical University Helsinki and the University of Leuven
- Participation in NWO-STEVIN project MIDAS with the University of Leuven, and Nuance Inc.
- CLS collaborates in the Bsic Programme ICIS together with the DCC, Delft University of Technology, the University of Amsterdam, the University of Twente, TNO Defence and Security, Thales Research and Technology and the DECIS Lab
- The EURYI project (Dr Miriam Ernestus) collaborates with the Max Planck Institute for Psycholinguistics, the University of Glasgow (Rachel Smith), LIMSI, Paris (Martine Adda Decker), Université Paris 3 (Cecile Fougeron), University of Alberta (Harald Baayen), Northwestern University (Janet Pierrehumbert), University of Arizona (Natasha Warner), University of Manitoba (Kevin Russell), and the Hogeschool voor Wetenschap & Kunst (University College for Sciences and Arts) in Brussels
- Collaboration with the University of Limpopo (South Africa), the University of Tilburg (the Netherlands) and University of Stellenbosch (South Africa) in the HACALARA project in the context of HIV/AIDS intervention programmes.

Research results

Research carried out within the programme Grammar and Cognition showed that language users attach plurality values to linking elements, such as -n and -s, in Dutch. Linking elements in compounds in both Dutch and English have mainly been considered to be unrelated to plural and other semantically loaded morphemes, despite their formal similarity. This suggests a different view of the relationship between form and function that invalidates much of the popular words-and-rules theory.

Also within this programme, the role of prosodic position in presenting segmental features has been studied among children who are learning their first language. In production data, two developmental patterns have been attested: most children acquire contrast first in prosodically dominant positions (word and/or foot-initial), whereas with other children the opposite pattern is observed. The latter group also acquires coda clusters before onset clusters.

The construction of the sign language Corpus NGT has led to a unique innovative database that is available on-line, both to linguistic researchers and to the general public (www.corpusngt.nl). This pioneering methodology and related software development is setting the standard in the sign language research community world-wide.

Within the programme *Language in Time and Space* a project involving building a Limburg Dialect Dictionary was completed. This project was carried out in close collaboration with the University of Leuven. This huge lexicographical project, which was

started 45 years ago, comprises 39 volumes and extends to a total of 10,000 pages. The final research project on dialect dictionaries, the Gelderland Dialect Dictionary, was also completed. This project started seven years ago with more modest ambitions, i.e. to produce just six volumes. The last two volumes were presented at an official meeting in November 2008.

Within the same programme, the research group that works on the languages of the Pacific established interesting structural links between groups of languages in northern Australia and those of southern New Guinea, suggesting possible ancient contacts. A major article on the use of the phylogenetic method appeared in *Language*. In South America, links were established between Arikapu and Jabutí and the Macro-Ge family, and new insights were gained by applying structural phylogenetic methods to the Arawakan language family.

Prof. Ans van Kemenade published the initial results – together with Dr Tanja Milicev and Dr Harald Baayen – of a new method with which the relationship between syntax and discourse flexibility in older languages can be measured with greater precision.

Prof. Kees Versteegh published the fourth and final volume of the Encyclopaedia of Arabic Language and Linguistics.

In the programme *Linguistic Information Processing*, Dr Jort Gemmeke and Dr Bert Cranen introduced a promising new approach for noise-robust exemplar-based speech recognition, based on compressive sensing, a technique originally developed in image processing. In the ACORNS project Dr Louis ten Bosch, Prof. Lou Boves and Dr Michael Klein clarified the relationship between the neural and psychological models of language acquisition, using a cognitively plausible computational model that can learn up to 50 words without any priori meta-linguistic knowledge – a breakthrough in research on automatic language learning.

In the same programme, Dr Suzan Verberne, together with her supervisors, showed under what conditions information related to syntactic structure can contribute to answering *Why* questions, over and above clever use of the words in the question and in candidate answer passages. This research helped advance understanding of the possibilities and limitations of using language structure in finding and representing specific information in natural discourse.

Two corpora were completed and made available: the JASMIN corpus, which extends Spoken Dutch Corpus with speech of foreigners, children and elderly people and the AUTONOMATA corpus, which is used to build grapheme-to-phoneme converters for names.

For the programme *Communicative Competences* Dr Frans van der Slik studied the effect of the mother tongue on the speed with which a second language is learned. He has set up an extensive database comprising ten years of National Exams of Dutch as L2. Initial results show that typological distance is a key factor in the success of L2 learning.

Dr Ineke van de Craats focused on the L1-L2 interplay in verb placement and development of verbal morphology, based on the LESLLA (Low-Educated Second Language and Literacy Acquisition) corpus. The L1 was found to have a strong influence on acquisition because Moroccan learners of Dutch use word order patterns and morphological markers different from those of Turkish learners. This work was extended by Dr Loes Oldenkamp, who focused on the interaction between phonology and morphology in L1 and L2 with respect to inflection in L2 Dutch. The first results suggest increasing difficulty when two or more linguistic levels are involved. Dr Marianne Starren and Dr Suzan van Ierland's work on cognitive discourse preferences also reveals that L1 has a clear impact on information structure.

The Dutch Bilingualism Database project (involving Prof. Pieter Muysken and Dr Milly Crevels) was successfully completed. A large number of bilingual speech data and ELAN transcripts are stored with the relevant IMDI metadata in the central corpus data base of the Max Planck Institute for Psycholinguistics.

In the programme Professional Communication, the influence of argument quality on the persuasiveness of messages was investigated. Two experiments revealed that arguments respecting normative criteria from argumentation theory are generally also more persuasive than arguments not respecting normative criteria from argumentation theory, although the laymen criteria do not map to theoretical criteria in all respects.

Within the NWO programme on Language Acquisition and Multilingualism native Japanese data was collected at Kwansai Gakuein University in Japan and L2 data from Dutch learners of Japanese were collected at Leiden University. All datasets consist of eye-tracking data as well as verbalizations. For Japanese it was found that the use of the progressive clearly depends on the ongoing type of situation.

A study of the appreciation of low and rich information communication media in different cultures showed that cultures differ in the media they find appropriate for a certain business message. The values context and uncertainty avoidance can partly explain these cultural differences.

Societal impact

In December, many CLS researchers participated in the successful happening *Het Achtste Taalwonder* (The 8th Language Wonder), a researchers' night on language research targeting the general public

Centre for Language Studies

Key publications

Dunn, M., Levinson, S.C., Lindström, E., Reesink, G.P. & Terrill, A.H. (2008). Structural phylogeny in historical linguistics: Methodological explorations applied in Island Melanesia. *Language*, 84(4), 710-759.

Enschot-van Dijk, R. van, Hoeken, H. & Mulken, M.J.P. van (2008). Rhetoric in advertising: Attitudes towards verbo-pictorial rhetorical figures. *Information Design Journal*, 16(1), 35-45.

Goldin-Meadow, S., So, W., Özyürek, A. & Mylander, C. (2008). The natural order of events: How do speakers of different languages represent events nonverbally? *Proceedings of the National Academy of Sciences of the USA*, 105(27), 9163-9168.

Gullberg, M., Hendriks, H., & Hickmann, M. (2008). Learning to talk and gesture about motion in French. *First Language*, 28(2), 200-236.

Gussenhoven, C. & Peters, J. (2008). De tonen van het Limburgs. *Nederlandse Taalkunde*, 13, 87-114.

Heuvel, H. van den, Iskra, D., Sanders, E.P. & Vriend, F. de (2008). Validation of spoken language resources: an overview of basic aspects. *Language Resources and Evaluation*, 42, 41-73.

Hoop, H. de & Malchukov, A. (2008). Case-Marking Strategies. *Linguistic Inquiry*, 39(4), 565-587.

Hornikx, J.M.A. (2008). Comparing the actual and expected persuasiveness of evidence types: How good are lay people at selecting persuasive evidence? *Argumentation*, 22(4), 555-569.

Jacobs, H.M.G.M. (2008). Sympathy, Comparative Markedness, OT-CC and Latin syncope. *Probus. An international journal of Latin and Romance linguistics*, 20(2), 233-252.

Kooij, E. van der & Crasborn, O.A. (2008). Syllables and the word-prosodic system in Sign Language of the Netherlands. *Lingua*, 118, 1307-1327.

Kuperman, V., Ernestus, M.T.C. & Baayen, R.H. (2008). Frequency Distributions of Uniphones, Diphones and Triphones in Spontaneous Speech. *Journal of the Acoustical Society of America*, 124, 3897-3908.

Lemhöfer, K.M.L., Dijkstra, A.F.J., Schriefers, H.J., Baayen, R.H., Grainger, J. & Zwitserlood, C.M.E. (2008). Native language influences on word recognition in a second language: A mega-study. *Journal of Experimental Psychology A-Learning, Memory and Cognition*, 34(1), 12-31.

Mitterer, H. & Ernestus, M.T.C. (2008). The link between speech perception and production is phonological and abstract: Evidence from the shadowing task. *Cognition*, 108, 168-173.

Swanepoel, P. & Hoeken, H. (Eds.). (2008). *Adapting health communication to cultural needs*. Amsterdam: Benjamins.

Terrill, A.H. & Burenhult, N. (2008). Orientation as a strategy of spatial reference. *Studies in Language*, 32(1), 93-136.

Dissertations:	8
Scientific publications:	248
Professional publications:	75

that was held in the LUX cultural centre in Nijmegen. This event, which was completely sold out, was a great success.

Completion of the *Corpus of Sign Language of the Netherlands* (NGT) by Dr Onno Crasborn and his team has attracted considerable attention in both regional and national media.

The on-line continuation of the exhibition 'Bent u een goed verstaander?' (Are you a good understander?), featuring the results of research on optimal communication by Prof. Helen de Hoop and her colleagues in Groningen and Utrecht. This interactive website (www.let.rug.nl/verstaander) is a great success.

Prof. Roeland van Hout co-organized a successful national workshop on the theme of dialect and school.

Dr Milly Crevels finished a report for UNESCO on the language situation in the Amazonian lowlands of Bolivia.

The group led by Prof. Lou Boves successfully deployed existing models of language processing for developing computer-assisted language learning applications in a project funded by the Delft University of Technology.

Director: Prof. Ans van Kemenade

Ans van Kemenade held positions at the Universities of Utrecht, Leiden and VU Amsterdam before she was appointed as full professor of English linguistics at Radboud University Nijmegen in 1999. Her research specialism is language variation and change, with a special focus on the comparative historical development of the grammatical systems of Dutch and English. She has authored two high-impact research monographs and is about to publish two more books. She has a distinguished editorial track record, including four books and a number of collections for prestigious publishers and journals. She has been Principal Investigator (PI) or co-PI of several externally funded research groups and a member of various advisory boards and councils.



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Tools and resources being developed in the group led by Prof. Lou Boves that are designed to manage large collections of written and spoken documents (a line of research called 'eHumanities') will be applied to tapes containing interviews with veteran soldiers. It will be a showcase for these novel research methods in History, Anthropology and Communication. As one of Linguistics, also, the hybrid dependency parser under development in the TMP4IP project will be used for finding information in patents, patent applications, and technical texts.

Prof. Hans Hoeken was co-editor of a volume entitled 'Adapting health communication to cultural needs'. This volume presents state-of-the-art models on how to develop effective health communication campaigns, focusing on such campaigns tailored to the South African situation.

Future research

The following grants, which were obtained in 2008, will substantially strengthen research at CLS in the years ahead.

- On the other hand: the linguistic impact of having two symmetrical articulators in sign language, Onno Crasborn. ERC Starting Grant. Period: 2008-2013.
- SignSpeaker, FP7 grant (ICT-STREP programme). Dr Onno Crasborn together with CRIC Barcelona Université de Liège, RWTH Aachen, Telefonica and the European Union of the Deaf. Period: 2008-2011.
- Sign Linguistics Corpora Network (NWO, Internationalisation Grant), Dr Onno Crasborn. Period: 2008-2011.
- VAMOS, research project funded through the University of Tromsø, Prof. Paula Fikkert. Period: 2008-2011.
- Traces of contact: Language contact studies and historical linguistics, Prof. Pieter Muysken. ERC Advanced Grant. Period: 2009-2013.
- The phonological representation of affricates: a cross-linguistic study. Janine Berns MSc, Toptalent-grant by NWO. Period: 2008-2012.
- Creoles at birth? The role of nativization in language formation, Dr. Margot van den Berg. NWO Veni grant. Period: 2009-2012.
- Subordination strategies in South America, Dr. Rik Van Gijn. NWO Veni grant. Period: 2009-2012.
- BATS (Topic and Speaker Tracking in Broadcast Archives), Prof. Lou Boves and Prof. D. Van Leeuwen in collaboration with Prof. Hugo Van hamme, University of Leuven, ESAT, ICTRegie. Period: 2008-2012.
- MP4IP, Dr. Nelleke Oostdijk in collaboration with the Institute for Computer Science, MatrixWare Information Services. Period: 2008-2012.
- Veteran Tapes VP, Prof. Lou Boves in collaboration with DANS, Surf Foundation. Period :2009.
- The impact of corrective feedback on the acquisition of syntax in oral proficiency, Prof. Roeland van Hout together with Dr. Catia Cucchiari, NWO Programmatic Research. Period: 2009-2012.
- Visual metaphor: A psycholinguistic perspective, Prof. Hans Hoeken and Prof. Margot van Mulken together with the VU Amsterdam, NWO Programmatic Research. Period: 2008-2012.

Behavioural Science Institute



The mission of the Behavioural Science Institute (BSI) is to conduct research on the fundamental principles and processes that govern human behaviour. A distinctive feature is the BSI's emphasis on an integrative approach to human behaviour that transcends the traditional disciplinary boundaries that characterize contemporary research in psychology and education.



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). In 2008 BSI produced a mid-term self-evaluation covering the period 2002-2007. BSI is a research institute of the Faculty of Social Sciences.

BSI researchers investigate questions related to the nature and development of social cognition and behaviour, executive control and automatic processes, and the dynamic interplay between biological and social-contextual factors in the development of human behaviour. Both normative behaviour and psychopathology are studied. Research paradigms include advanced experimental and quasi-experimental methods, virtual reality technology, psychophysiological measurement, behavioural and social neuroscientific methods, behavioural genetics paradigms, randomized controlled trials, and intensive longitudinal designs.

BSI researchers are engaged in the following programmes: Cognitive processes in psychological dysfunctions, Developmental psychopathology, Learning and plasticity, Social cognition, Social development and Work, stress & health.

Awards

- Prof. A. Dijksterhuis won the Career Trajectory Award of the Society for Experimental Social Psychology (SESP).
- Dr G. Janzen received the Aspasia grant from Netherlands Organisation for Scientific Research (NWO) to stimulate the academic career of female researchers. She also received a Vidi grant from the NWO and an ERC starting grant.
- Dr G. Overbeek received the Young Scholar Award from the International Society for Behavioral Development (ISSBD).
- Dr H. van der Vorst received the 'Volksgezondheidsprijs' and the Premium Erasmianum for her doctoral thesis.
- Prof. D. Wigboldus won the *Teaching Award* from Radboud University Nijmegen.

Research facilities

The Behavioural Science Institute has excellent research facilities. Both the scale of these facilities (over 800 m²) and their scope are exceptional in Europe.

- The Virtual Reality (VR) Lab is equipped with a sophisticated computer, utilizing high-end stereoscopic video processors, projection, and tracking systems to create immersive, three-dimensional, computer generated environments. In 2008 a second VR lab has been installed.



Excessive drinking of alcoholic beverages at a young age is a major concern in society.

Staff

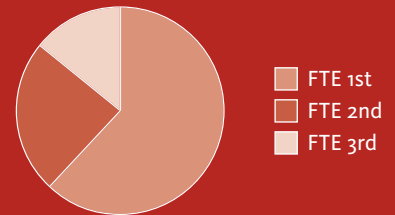
Prof. E.S. Becker (o)	Prof. L.T.W. Verhoeven (o)
Prof. A.M.T. Bosman (p)	Prof. R. Vonk (p)
Prof. J.A.M. Bransen (o)	Prof. R.W.H.J. Wiers (e)
Prof. A.H.N. Cillessen (o)	Prof. D.H.J. Wigboldus (o)
Prof. A.J. Dijksterhuis (p)	Prof. C.L.M. Witteman (o)
Prof. P.C.C. Duker (e)	
Prof. R.C.M.E. Engels (o)	
Prof. J.R.M. Gerris (o)	
Prof. G.J.M. Hutschemaekers (p)	
Prof. J.A.P.J. Janssen (o)	
Prof. J.M.A.M. Janssens (p)	
Prof. C.A.J. de Jong (e)	
Prof. A.F.M. Knippenberg (p)	
Prof. H.E.T. Knoors (e)	
Prof. M.A.J. Kompier (o)	
Prof. A. van Minnen (e)	
Prof. P. Moleman (e)	
Prof. H.L.I. Nijman (e)	
Prof. C.H.C.J. Nijnatten (e)	
Prof. J.M.A. Riksen-Walraven (p)	
Prof. C.P.F. van der Staak (p)	
Prof. T.W. Taris (p)	
Prof. J.W. Veerman (e)	

Tenured

Full Professors	9.9 FTE
Associate Professors	6.8 FTE
Assistant Professors	11.3 FTE
Researchers	1.1 FTE

Non-tenured

Researchers	6.7 FTE
Doctoral candidates	50.1 FTE



- The two BSI mobile labs, with flexible furnishing, can be used to accommodate different experimental set ups outside university (for example, EEG recordings, computerized tests and observations of interactions between subjects). This considerably facilitates the recruitment of young subjects (for example, children can be visited at schools).
- The Physiological Measurements laboratory houses state-of-the-art facilities for measuring neurocognitive (for example, EEG) and biochemical mechanisms involved in human behaviour.
- Eye-tracking equipment with a high temporal resolution (500-1250 Hz) is available for research on visual attention and eye movements.
- A Driving Simulator will be used to have an ecologically valid measurement of driving capacities and also to have the opportunity to study higher order cognitive processes.
- The observational laboratory comprises several rooms with one-way screens and multiple cameras. The rooms are child-proof, thus ideal for testing children.
- The computer laboratory consists of twenty-two identical cubicles, each equipped with a modern PC. The computer lab is the perfect place for conducting all kinds of computerized experiments (for example, experiments using reaction time paradigms). Licenses for many research-related software

packages are available, including packages that make it possible to carry out on-line research.

- The Bar Lab, which is equipped with unobtrusive cameras, recording devices and a professional beer tap, is used for observation studies of social behaviour in a natural setting.

Collaboration

BSI cooperates with the following International Research Universities Network (IRUN) partners: Université de Poitiers and University of Glasgow; and also with two preferential Radboud University partners: the University of North Carolina and the University of Leuven.

Researchers in Cognitive Processes in Psychological Dysfunctions are engaged in various collaborative ventures, including those with Dr Stefan Hofmann (University of Boston), Dr Emily Holmes, Dr Bundy Macintosh (Oxford University), with Prof. Peter Herman (University of Toronto), with the DICE (Decision, Intuition, Cognition and Emotion) group at the University of Bergen (Norway; also: visiting professorship, Prof. C. Witteman), and with many mental health clinics in the Netherlands and internationally, for example, with the GGz Breburg group, GGz Nijmegen, Venray, Salus Clinic Lindow (Germany). The Developmental Psychopathology

Behavioural Science Institute



Dr Haske van der Vorst won the Praemium Erasmianum prize for her dissertation on parental influence on children's alcohol consumption.



programme started a formal collaboration with the Trimbos Institute on testing and evaluation of primary and secondary prevention of alcohol use in youths. Collaborative ventures have been started with Prof. Mitch Prinstein (University of North Carolina), Prof. James Sargent (Dartmouth Medical School), and Prof. Luc Goossens (University of Leuven). In the field of Learning and plasticity, collaboration continued with the Learning Research and Development Center at Pittsburgh University, with the Psychology Department of Pennsylvania State University (there was also a visiting professorship, Dr J. van Hell), with the Department of Psychology of the University of Cincinnati, and with the National Technical Institute for the Deaf at Rochester. New lines of collaboration were started with the Université de Poitiers and the University of Glasgow. Researchers within the Social Cognition programme collaborate with Prof. Vincent Zyerbyt, the Catholic University of Louvain, on an ESF-funded project on emotions. Collaboration on VR research was continued with Prof. Henk Aarts of Utrecht University, the Netherlands. With Prof. John Bargh (Yale University) and Prof. Eli Finkel (Northwestern University), collaborative ventures continued. Within the Social development programme, there are collaborative research projects with Prof. Susan C. Crockenberg, University of Vermont, United States, and with Prof. David A. Kenny, University of Connecticut, United States. The Work, Stress and Health programme renewed its formal collaboration with TNO Work and Employment (Dr Irene Houtman, Prof. Paulien Bongers).

Research results

In the programme on Cognitive Processes in Psychological Dysfunctions, the role of automatic approach and avoidance tendencies was studied. Automatic avoidance behaviour is a central

mechanism in social anxiety (Lange *et al.*, 2008) and spider phobia (Rinck *et al.*, submitted), while automatic tendencies to approach alcohol stimuli are critical in heavy drinkers, especially in those with a genetic vulnerability (Wiers, Rinck, *et al.*, in press). Luckily, these unhealthy approach tendencies can be re-trained and reduced. This was shown for heavy drinkers among students as well as alcohol-addicted patients. Other experiments used virtual environments created in the RIVERlab to study automatic avoidance behaviour and imitation behaviour in anxiety disorders. In studies on eating style and overweight, the role of restrained eating, emotional and external eating was studied (Snoek *et al.*, 2008; van Strien & van de Laar, 2008), and the DEBQ questionnaire for children was developed (van Strien & Oosterveld, 2008). Other research has shown how mood influences clinical judgment and decision making (De Vries *et al.*, 2008a, 2008b).

Within the Developmental Psychopathology programme, research on the genetic basis of substance use revealed the fact that genetic factors mediate the association between adolescents' peer orientation and subsequent smoking (Harakeh *et al.*, 2008) and were most important for variations in early initiation, whereas they were less important for frequency of drinking (Poelen *et al.*, 2008). It was demonstrated that parenting and parental problem drinking were related to lower engagement in drinking over time (van der Zwaluw *et al.*, 2008). Interestingly, for smoking it turned out that smoking behaviour mainly shaped smoking-related attitudes, but that attitudes did not significantly affect smoking behaviour (De Leeuw *et al.*, 2008). Research on the influence of the media on body image and food intake showed that restrained females restrict their food intake when exposed to slim models in commercials (Anschutz *et al.*, 2008) and that the size of the models on TV affects food intake

(Anschutz *et al.*, 2008). Snoek *et al.* (2008) showed that the link between restraint and body-mass index (BMI) should primarily be explained by the effect of BMI on restraint behaviours.

Within the Learning and plasticity programme, the neural basis for language and literacy learning was further explored. In a series of experimental studies, the focus was on the memory consolidation of landmarks in good navigators (Janzen, *et al.*), the role of working memory in language impairment (van Daal, *et al.*, 2008), the modelling of vocabulary learning in deaf children (Hermans, *et al.* 2008), the nature of phonological awareness in relation to early literacy development (de Graaf, *et al.* 2008; Peeters, *et al.*, 2008), the learning of word decoding and word spelling among primary school children (Keuning & Verhoeven, 2008) and deaf children (Ormel, 2008), the effects of sentence context on lexical decision and word translation in older bilinguals (van Hell & de Groot, 2008), the social consequences of accelerating learning among gifted children (Hoogeveen, *et al.*, 2008), and the learning of mathematics in children with cerebral palsy (Jenks, *et al.*, 2008). Intervention studies demonstrated the positive outcomes of sheltered e-learning environments (Huygevoort, 2008) and the effectiveness of vocabulary training in hard-of-hearing children (Mollink, *et al.*, 2008). Another series of studies addressed the behavioural treatment of drooling (van der Burg), motor problems, eating problems, speech problems (Sigafos, *et al.*, 2008), social problems (O'Reilly, *et al.*, 2008), and environmental control problems (Green, *et al.*, 2008).

In Social Cognition, research on unconscious thought focused on how people choose without deliberation, and whether unconscious thought is a goal-directed process (Bos *et al.*, 2008), that depends on contextual factors (Smith *et al.*, 2008). Research on mimicry showed that being mimicked activates what is popularly known as the 'reward system' (Van Baaren *et al.*, 2008). Strick *et al.* (2008) showed that objects associated with the direct gaze of attractive faces trigger positive evaluations. Veling *et al.* (2008) illustrated automatic devaluation processes when approach tendencies towards wanted objects are inhibited. Finally, several studies demonstrated the effects of motivational orientation, which is induced by mood or approach avoidance motor actions, on behaviour regulation, cognitive control and intuition (Koch *et al.*, 2008; de Vries *et al.*, 2008). Dotsch & Wigboldus (2008) demonstrated ways in which implicit prejudice subtly affects people's physiological responses and impulsive behaviour towards stigmatized others in a virtual reality environment. It was shown that there are biases related to ethnic out-group faces in the implicitly prejudiced mind (Dotsch *et al.*, 2008). Karremans & Verwijmeren (2008) showed how behavioural mimicry serves an implicit self-regulatory function in relationship maintenance.

In the Social Development programme, studies by Profs. Riksen-Walraven & de Weerth (2008) produced insights into the role of physiological processes (HPA axis functioning) in explaining the

effects of early social experience on child development. The long-term effects of early experience were also addressed in the continuation of the Nijmegen Longitudinal Study, which showed that there are associations between the quality of parenting and different profiles of competence and adaptation in pre-school children. Cox *et al.* (1998) demonstrated that children with visual impairment have specific problems with motor control compared to children with normal vision that are not all directly related to their poorer vision. Prof. Cillessen & colleagues (2008), in a study on 4 to 14-year-old children and adolescents, demonstrated that the development of social competence depends on complex interactions among prosocial and dominant, self-assertive, or manipulative behaviours. They also addressed the personal impact of risk behaviours on 'perceived popular' teens and the broader influences of their behaviour on their less popular counterparts.

Within the Work, Stress and Health programme, Prof. Taris edited a special 'Work & Stress' issue on commitment to work. Studies were published on the causes and consequences of long working hours (Beckers 2008a, 2008b). Dr Beckers also defended her doctoral thesis on overtime work and well-being, demonstrating that extremely long working hours constitute a health risk, whereas the relationship between moderately long working hours and well-being depends partly on the amount of control an employee has over overtime hours. In a study among entrepreneurs, Prof. Taris *et al.* (2008) showed that an inability to detach oneself from work was associated with adverse health, taking into account the number of hours worked. Geurts *et al.* (2008) showed that worktime control plays a buffering role in the relationship between worktime demands and work-family interference.

Societal impact

- The BSI collaborates closely with the Academic Centre for Social Sciences (ACSW) within the University. This collaboration relates to joint externally funded projects on health-related topics carried out by BSI and ACSW.
- Prof. L. Verhoeven is head of the National Language Education Centre, which was set up to improve the teaching and learning of the Dutch language and literacy at Dutch primary schools.
- Dr T. van Strien is the Radboud University representative in the COTAN testing commission (Commissie Testaangelegenheden Nederland).
- The BSI has strong links with PONTEM, in which 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 multiply handicapped children. The BSI also collaborates intensively with institutions dedicated to working with those with a mental handicap (Winkelsteegh, Trajectum, Pluryn, Borg), physical handicaps (VMT, BOSK, Groot Klimmendaal, Werkenrode), and sensory handicaps (KEG-Viataal, Sensis).

Behavioural Science Institute

Key publications

Albers, E. M., Riksen-Walraven, J. M. A., Sweep, F. C. G. J. & de Weerth, C. (2008). Maternal behaviour predicts infant cortisol recovery from a mild everyday stressor. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 49, 97-103.

Anschutz, D., Van Strien, T. & Engels, R.C.M.E. (2008). Exposure to slim images in mass media: Television commercials as reminders of restriction in restrained eaters. *Health Psychology*, 27, 401-408.

Beckers, D.G.J., Van der Linden, D., Smulders, P.G.W., Kompier, M.A.J., Taris, T.W. & Geurts, S.A.E. (2008). Voluntary or involuntary? Control over overtime and rewards for overtime in relation to fatigue and work-satisfaction. *Work @ Stress*, 22, 33-50.

Braam, W.J., Didden, H.C.M., Smits, M. & Curfs, L.M.G. (2008). Melatonin for insomniac children with Angelman syndrome: A randomized placebo-controlled double-blind study. *Journal of Child Neurology*, 23, 649-654.

Dotch, R., Wigboldus, D.H.J., Langner, O. & van Knippenberg, A. (2008). Ethnic out-group faces are biased in the prejudiced mind. *Psychological Science*, 19, 978-983.

Geurts, S.A.E., Beckers, D.G.J., Taris, T.W., Kompier, M.A.J. & Smulders, P.G.W. (2008). Worktime demands and work-family interference: Does worktime control play a buffering role? *Journal of Business Ethics*, 84, 229-242.

Janzen, G., Jansen C. & Turennout, M.I. van (2008). Memory consolidation of landmarks in good navigators. *Hippocampus*, 18, 40-47.

Lange, W.-G., Keijsers G.P.J., Becker, E.S. & Rinck, M. (2008). Social anxiety and evaluation of social crowds: Explicit and implicit measures. *Behaviour Research and Therapy*, 46, 932-943.

Mayeux, L., Sandstrom, M. J. & Cillessen, A. H. N. (2008). Is being popular a risky proposition? *Journal of Research on Adolescence*, 18, 49-74.

Poelen, E.A., Derks, E.M., Engels, R.C.M.E., van Leeuwe, J.F.J., Scholte, R.H.J., Willemssen, G. & Boomsma, D.I. (2008). The relative contribution of genes and environment to alcohol use in early adolescents: Are similar factors related to initiation of alcohol use and frequency of drinking? *Alcoholism: Clinical and Experimental Research*, 32, 975-82.

Smeekens, S., Riksen-Walraven, J. M. A. & van Bakel, H. J. A. (2008). Profiles of competence and adaptation in preschoolers

as related to the quality of parent-child interaction. *Journal of Research in Personality*, 42, 1490-1499.

Smith, P.K., Dijksterhuis, A. & Wigboldus, D.H.J. (2008). Powerful people make good decisions even when they consciously think. *Psychological Science*, 19, 1258-1259.

Snoek, H., Van Strien, T., Janssens, J. & Engels, R.C.M.E. (2008). Restraint eating and BMI: A longitudinal study among adolescents. *Health Psychology*, 27, 753-759.

Stel, M., & van Knippenberg, A. (2008). The role of facial mimicry in the recognition of affect. *Psychological Science*, 19, 984-989.

Van Daal, J., Verhoeven, L. & van Balkom, H. (2008). Behaviour problems in children with language impairment. *Journal of Child Psychology and Psychiatry*, 48, 1139-1147.

Van Strien, T. & van de Laar, F. (2008). Intake of energy is best predicted by overeating tendency and consumption of fat is best predicted by dietary restraint. A four-year follow up of patients with newly diagnosed type-2 diabetes. *Appetite*, 50, 544-547.

Dissertations:	21
Scientific publications:	286
Professional publications:	82

- Research on the health effects of long working hours (thesis by Dr Beckers) attracted substantial media attraction (newspaper articles and interviews).
- Prof. Taris and Prof. Kompier served as consultants for UWV (Uitvoeringsinstituut Werknemers Verzekeringen; the Dutch equivalent of the Unemployment Benefits Office. Prof. Kompier also served as a scientific expert in a criminal law case.
- Prof. Hosman is Board Member of the World Consortium for Mental Health Promotion and Mental Disorder Prevention. Prof. Hosman chairs the Clifford Beers Foundation, an international organization dedicated to promoting mental health.

- Research by Dr Cox with visually impaired children has helped develop tools for assisting visually handicapped children in their daily functioning.
- Research on speed dating by Dr Overbeek, in particular a large speed-dating session in the Open Air Museum in Arnhem, and early screening of problematic behaviour by Dr Scholte attracted a great deal of media attention (newspaper articles and features on national television).
- Dr Van der Vorst and Prof. R. Engels collaborate with the Trimbos Institute on developing a national campaign designed to influence the role of parents in preventing juvenile alcohol use. A mass media campaign was launched early in 2008.

Director: Prof. Rutger Engels

Prof. Rutger Engels has been Professor in Developmental Psychopathology Education at Radboud University Nijmegen since 2001. Previously, he worked at the Universities of Groningen, Maastricht and Utrecht. Prof. Engels's research interests include substance use and misuse, eating behaviours, depression and externalizing problems. He has received more than 25 national and international grants (for example, Veni and Vidi) and co-authored more than 200 articles in international journals in the fields of addiction and psychology.



Behavioural Science Institute

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- Prof. A. Dijksterhuis is a member of the NWO Brain and Cognition group. Prof. R. Vonk and Prof. A. Dijksterhuis have made numerous media appearances.

Future research

The new Media Lab group focuses on the way the media affect human behaviour, cutting across various BSI research programmes. An NWO grant was obtained to study gene-media interactions and alcohol use (Prof. R. Engels), an EU grant was awarded to examine the effects of exposure to smoking in films, and two PhD projects were started: a first to examine body image and identification, and a second to study the effects of smoking portrayal in the media.

Collaboration with the Donders Institute for Brain, Cognition and Behaviour will be intensified, for example, by starting six interdisciplinary PhD projects.

Ongoing research will focus on anxiety disorders and depression, eating behaviour and clinical decision-making. Focal points in PhD projects will include the interaction of cognitive and genetic factors in depression, the re-training of automatic approach and avoidance tendencies in alcohol-addicted patients, and the role of automatic processes in unwanted, impulsive behaviours such as skin-picking.

An NWO Vidi programme on spatial navigation was started by Dr G. Janzen. Two new professors will be appointed: Prof. J. McQueen, who will occupy the chair on Learning and Plasticity and will focus on language learning, and Prof. B. Steenbergen, who will start up a new line of research on perception and action problems. The study of language and communication will be extended with PhD projects that cover the following cognitive domains: language, literacy,

numeracy, and perception and motor abilities (with grants from the NWO, the Dutch Ministry of Education and various other national institutions).

There is an increase in research on social influence, and more specifically, on the unconscious influence of the media on social behaviour. Secondly, a growing number of members of BSI programmes are getting involved in neuroscientific research in addition to behavioural research. An NWO grant has been obtained to study the neuropsychological basis of imitation (Dr R. van Baaren).

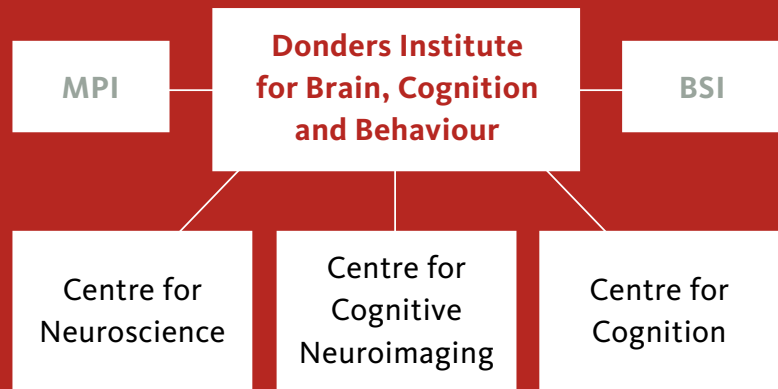
New research projects in social development focus on individual differences in stress reactions and coping among men who become new fathers; joint action in peer interactions among three to four-year-old children and the ways in which these influence the development of social competence; ways in which visually impaired children develop, as well as implicit perceptions of their peers and the implications of these perceptions for behaviour and interactions.

New projects will start with grants from the Dutch organization for health research and innovation (ZonMw) for testing the psychometric properties of the strength and difficulties questionnaire (SDQ) in children, the effectiveness of a school-based prevention programme on substance use (randomized clinical trial), the effectiveness of an on-line drinking test for youth, and the effectiveness of a home-based prevention programme on smoking.

With an NWO grant, studies on recovery from stress (Dr S. Geurts) and on neural mechanisms of task engagement under fatigue (Dr D. van der Linden) will start in 2009.

Donders Institute for Brain, Cognition and Behaviour

Cognitive Neuroscience is one of the key themes at Radboud University Nijmegen and Radboud University Nijmegen Medical Centre. Research focuses on cognition and behaviour in humans as well as on the neuronal substrate, including the genetic, molecular and cellular processes that underlie cognition and behaviour. This spectrum is reflected in the concept 'from Molecule to Man' which provides a broad framework for scientific exploration at the Institute.



Understanding the structure and function of the brain requires a highly interdisciplinary approach. To strengthen collaboration and to increase visibility, both nationally and internationally, all research in cognitive neuroscience on the Nijmegen campus has been integrated in the Donders Institute for Brain, Cognition and Behaviour. These efforts, which build on strong past collaborations, will provide plenty of room for new cutting-edge research ideas and projects.

The Donders Institute for Brain, Cognition and Behaviour – a joint endeavor of four faculties at Radboud University Nijmegen – includes researchers from the Centre for Cognition (part of the Faculty of Social Sciences), Centre for Cognitive Neuroimaging, Centre for Neuroscience (part of both the Faculty of Science and the Faculty of Medical Sciences), the world-leading on-campus Max Planck Institute for Psycholinguistics, in close collaboration with researchers from the Behavioural Science Institute (Faculty of Social Sciences) and the Centre for Language Studies (part of the Faculty of Arts). With over four hundred researchers, the institute combines leading scientists in a unique centre of expertise, stimulating them to excel at the national and international level.

Research themes

The research activities are concentrated around four major themes whose content is determined by the research leaders in bottom-up discussions. The research themes are:

1 Language and Communication

The objective here is to determine how core language operations are grounded in (or related to) other domains of cognition, including perception, action, memory, communication (social interaction) and how the human language facility is rooted in the neurobiological and genetic infrastructure that makes the human brain “language-ready”.

Subthemes include multilingualism, gesture and sign language, (contextual) flexibility of comprehension and production, individual variability (language processing across the life span in different sociological and linguistic backgrounds) and the neurobiological and genetic infrastructure for language and communication.

2 Perception, Action, and Control

The objective of this theme is to advance the study of the basic sensorimotor aspects as well as the cognitive, contextual and social components of perception-action coupling. Research methods include computational modelling, clinical and behavioural studies, neurophysiological and neuroimaging techniques, pharmacological

interventions and developmental approaches. The research domain is divided into three clusters:

- **Sensorimotor Integration.** The emphasis here is on how sensory processing and motor performance interact within the perception-action cycle. Key topics include multisensory processing, space perception, sensorimotor transformations, and motor coordination.
- **Intention and Control.** The focus is on the mechanisms that underlie the cognitive, motivational and emotional regulation of perception and action. Specific topics include voluntary action, motivational control, decision making and flexible behaviour.
- **Social Interaction.** Research in this area studies the mechanisms supporting our ability to perceive actions of others and act with them in a concerted fashion. Research topics include action-perception, joint action, agency, and embodied cognition.

3 *Learning, Memory & Plasticity*

The objective within this research theme is to study the mechanistic underpinnings and behavioural consequences of long-term changes in neural structure and function. Research methods include genetic, molecular and cellular neuroscience, animal models, neuroimaging, cognitive neuropsychology, and translation into clinical as well as educational neuroscience. The Research is divided into two sub-themes:

- **Development, Degeneration & Adaptation.** The determinants, mechanisms, and consequences of normal and abnormal development, neural degeneration and adaptation to specific internal and environmental factors are studied. This research is fundamental in nature with a strong translational drive towards clinical neuroscience. Examples include neurogenomics and child psychiatry for development; aging and neurodegenerative disorders for degeneration and stress-related changes, and compensation after brain damage (adaptation).
- **Learning & Memory.** Here the neural and psychological mechanisms underlying normal and impaired memory are investigated, also with a translational aspect (in the direction of both clinical and educational neuroscience).

4 *Brain networks and neuronal communication*

This research theme focuses on the interaction between and within groups of neurons, and with the outside world. Various approaches are used to address this topic, corresponding to the unique expertise in the various Principal Investigator-led groups:

- **Measurement.** Electrophysiological recordings in primates and rodents, MEG/EEG measurement, MR methods development
- **Analysis.** FieldTrip program for analysis of MEG/EEG data; DTI and resting state fMRI data analysis, connectivity measures, volume-based morphometry and cortical thickness analysis
- **Modelling.** Mean field theory, neural networks, computational modelling
- **Brain-computer interface and neural feedback.**

Activities in 2008

In addition to the research activities of the centres which are partners within the Donders Institute several joint activities were organized.

- September 1, 2008, marked the start of the Donders Institute for Brain, Cognition and Behaviour.
- The opening symposium, entitled 'Cognitive Neuroscience: from Molecule to Man' on November 28, drew a remarkable audience of more than 300 people from the Netherlands and abroad. This symposium, which was enthusiastically opened by Thom de Graaf, mayor of Nijmegen and strongly supported by Roelof de Wijkerslooth, president of the Radboud University Nijmegen in his presentation, featured eight top scientists covering the broad field of cognitive neuroscience.
- The Max-Planck Gesellschaft approved the start of the Max-Planck International Graduate School, with a major role for the Donders Institute and the Centre for Language Studies.

Future activities

- Joint meetings will be held with all researchers participating in the various research themes to create a better focus and collaboration between researchers in the different centres.
- A Donders Graduate School for Cognitive Neuroscience will be formed connecting the educational part of the Research Masters programme in Cognitive Neuroscience (coordinated by the Faculty of Social Sciences) and the PhD projects within the Donders Institute. This school has strong links with the Max Planck Research School for Language Sciences of the Max Planck Institute for Psycholinguistics, funded by the Max-Planck Gesellschaft.
- Researchers within the Donders Institute will further strengthen their collaboration with other institutes on campus, such as the Institute for Molecules and Materials and the Nijmegen Centre for Molecular Life Sciences within the imaging platform 'Molecule-2-Man'.

Donders Institute for Brain, Cognition and Behaviour Centre for Cognition

The Donders Centre for Cognition (DCC) conducts interdisciplinary research and offers a PhD programme in cognitive neuroscience, cognitive psychology, artificial intelligence and related disciplines. At DCC, scientists from different disciplines jointly study the psychological, formal and neurobiological principles of information processing in biological and artificial cognitive systems. The Centre, whose accreditation was renewed by the Royal Netherlands Academy of Arts and Sciences in the spring of 2008, continues to play a central role in the University's research focus on Cognitive Neuroscience.



The DCC has four research divisions, each with its own specific focus but all in line with the Donders mission statement.

Psycholinguistics

Psycholinguistics is the study of the cognitive processes and representations underlying the use of language, in interaction with other mental faculties such as attention and cognitive control. The research programme covers language production and comprehension, the mental lexicon, language development and deviant language behaviour. A wide range of research techniques are applied, including reaction time studies, eye-tracking, neuro-imaging and computational modelling.

Action, Intention and Motor control (AIM)

The objective of this division is to advance the study of the basic sensorimotor aspects as well as the cognitive, contextual and social components of perception-action coupling. Research methods include clinical and behavioural studies, neurophysiological and neuro-imaging techniques, developmental and genetic approaches, and computational modeling.

The research domain is divided into three clusters:

1. Sensorimotor Integration. The emphasis here is on how within the perception-action cycle sensory processing and motor performance interact.
2. Intention and Control. The focus here is on the mechanisms that underlie the cognitive, motivational and emotional regulation of perception and action processes.
3. Social Interaction. Research in this area focuses on the mechanisms supporting our ability to perceive and understand the actions of others and behave with them in a coordinated fashion.

Cognitive Neuroscience

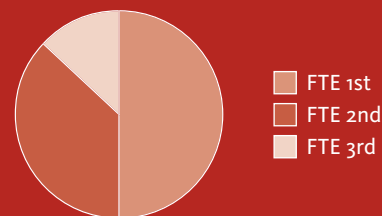
This division's research focuses on the way the brain focuses information. Taking a multidisciplinary approach, scientists study cognitive functions such as sensory processes, learning, memory, attention and alertness, and psychopathologies such as fear. The division combines animal research, behavioural studies and pharmacological and clinical studies in humans. Some of the research is translational.



Experimental setup for studying visual illusions.

Staff

Prof. H. Bekkering (o)
 Prof. E.A. Cutler (e)
 Prof. ir. P.W.M. Desain (o)
 Prof. A.F.J. Dijkstra (p)
 Prof. L. Fasotti (e)
 Prof. P. Hagoort (o)
 Prof. R.P.C. Kessels (o)
 Prof. G.K. Knoblich (p)
 Prof. H.H.J. Kolk (p)
 Prof. R.G.J. Meulenbroek (p)
 Prof. H.J. Schriefers (o)



Tenured

Full Professors	3.9 FTE
Associate Professors	3.8 FTE
Assistant Professors	4.7 FTE
Researchers	3.0 FTE

Non-tenured

Researchers	9.4 FTE
Doctoral candidates	24.2 FTE

Cognitive Artificial Intelligence

The research focus of this division is on cognition, as well as communication and cooperation among people, their environment and artificial systems. There are two main topics. The first is Brain-Computer Interfaces, in which a direct link between mental activity and computers is exploited, for example to allow fully paralyzed patients to communicate and control devices. The second topic is Theoretical Cognitive Science, in which the presuppositions and ramifications of cognitive neuroscience (for example new insights stemming from brain imaging studies or computational complexity analyses) are interpreted and placed in a fundamental framework of embedded embodied cognition.

Awards and acknowledgements

- Prof. Harold Bekkering was elected to the DANA Foundation, which advances public awareness about the progress and promise of brain research (see www.dana.org)
- Prof. Harold Bekkering was elected to the Scientific Advisory Board of the Leiden Institute for Brain and Cognition
- Prof. Harold Bekkering handed over a report on The Future of Cognitive Science (prepared by a committee of the Royal

Netherlands Academy of Arts) to the Minister of Science & Education (Dr Plasterk)

- Prof. Harold Bekkering was appointed Associate Editor for Psychological Research
- Dr Rob van Lier and Mark Vergeer, MSc have won the 'Best visual illusion of the year' award (2008) for their visual illusion 'Filling in the afterimage after the image'. This prize is awarded once a year by the Neural Correlate Society during the conference of the Vision Science Society in Florida (USA)
- Dr Pieter Medendorp was a member of the Netherlands Organisation for Scientific Research (now)-MAGW Veni Competition Grant Evaluation Committee
- Dr Bert Steenbergen was a member of the NWO-MAGW Veni Competition Grant Evaluation Committee
- Prof. Peter Desain was a member of the Royal Netherlands Academy of Arts and Sciences committee on Cognitive Science.

Research facilities

- A vestibular sled with combined EEG apparatus (96 channels) and motion-tracking devices
- A baby-lab including a Tobii eye-tracker and a 48-channel EEG

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Dr Rob van Lie, Associate Professor, an expert in perception, and doctoral candidate Mark Vergeer MSc won the 2008 'Best visual illusion of the year' award – a trophy made by the renowned sculptor Guido Moretti.

- Several EEG/ERP laboratories for measuring brain activity during cognitive tasks and online processing in Brain-Computer Interfacing
 - Laboratories with 2D and 3D motion-tracking systems for measuring movements and trajectories during the execution of tasks such as reaching, grasping and manipulating objects
 - 'Reach-in' 3D-visualisation and force-feedback machinery, allowing experiments on manual actions in three-dimensional virtual reality
 - A cognitive artificial intelligence laboratory, which is used to analyze human-computer interaction, the dynamics of intelligent behaviour, 'embedded embodied cognition' and information retrieval
 - A laboratory and studio for research on auditory perception and music cognition
 - Several laboratories for behavioural studies using visual/auditory stimuli
 - Animal laboratories for long-term electrophysiological recordings using rats with chronically implanted electrodes and learning studies
 - Facilities for stereotactic animal operations
 - A biochemical laboratory for identifying brain substances.
- In addition, DCC researchers have access to the brain-imaging facilities of DCCN (including sophisticated equipment such as fMRI, MEG and EEG).

Collaboration

The DCC collaborates with the following institutions, which are preferential partners of Radboud University Nijmegen in the International Research Universities Network (IRUN):

- Institute of Psychology, Jagiellonian University Kraków, Poland: on Emotion and Motivation
- The Catholic University of Leuven, Belgium: on Motor Control.

The DCC is also engaged in structural collaboration with many other academic institutions, including the following:

- Atma Jaya Universitas Katolik, Jakarta, Indonesia: Neuropsychological Tests
- Center for Psycholinguistics, Department of Language, Antwerp University, Belgium: Bilingualism
- Collaborative Antwerp Psychiatric Research Institute, Antwerp University, Belgium: Cognitive Psychiatry
- Department of Psychology, University of Leipzig, Germany: Lexical Processes in Language Production
- Johann Wolfgang Goethe-Universität, Frankfurt, Germany: Vigilance
- 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; Lomonosov Moscow State University, Department of Human and Animal Physiology: Absence Epilepsy

- UNESP, Marilia, Brazil: Philosophy of Science
- University of Minho, Portugal, Department of Mathematics and Department of Industrial Electronics.

Research results

Researchers in the Psycholinguistics division investigated executive control and attentional processes in monolingual and bilingual language use. Control issues were examined in bilinguals' language switches during speech and comprehension, and for form-similar translation equivalents (cognates). Other research was concerned with the structural properties of the monolingual and bilingual mental lexicon, both from the perspective of adults and children, and the extent to which language processing by adopted children shows remnants of a language (in this case Korean) acquired early in life but not used since adoption. A new topic influences the modularity or non-modularity of the language faculty, which was investigated by examining interactions between language and emotion, and by considering the effects of discourse context on sentence processing and of scene context relations on object naming. Innovative results included the analyses and simulations of response time distributions, the assessment of the relative impact of factors that contribute to word retrieval in a second language, and the co-activation of different languages in the brain.

Research in the Action, Intention and Motor control division in 2008 focused on the relationship between cognition and action. Using behavioural and neuro-imaging techniques, the setting to achieve behavioural goals in experiments was adjusted, i.e. participants were confronted either with a cooperative or a competitive task. Further adjustments on a trial-by-trial basis were related to the valence of the behavioural consequences (either harmful or helpful). By carrying out these and other experimental manipulations we studied the mechanisms underlying joint action, in particular in relation to the Mirror Neuron System, motor simulation and coordination. Special attention was paid to the interaction of language with perceptuomotor processes in human cooperative tasks, thus involving the expertise of the Psycholinguistics division. In addition, we investigated complex higher cognitive impairments in adolescents with Cerebral Palsy.

Furthermore, perceptual organization and object perception were investigated. In a binocular rivalry study, it was shown that similarity-based grouping may occur for elements outside visual awareness. Other studies focused on interactions between lightness and perceived depth relations, and color-contour interactions in after-image filling-in. Finally, 3-D object perception and occlusion were studied in four-month old infants.

Important results produced by the AIM section in 2008 involved using magneto-encephalography and functional magnetic imaging. With the former it was found that parietal gamma band synchronization reflects a mechanism for encoding the motor goals in the

visuomotor processing for saccades (Van Der Werf et al. 2008). With the latter, AIM's researchers were the first to outline the suggested complimentary roles of the action system (the mirror neuron system) and the mentalizing system (the theory of mind system) in understanding other agents' goal-directed actions. (de Lange *et al.*, 2008)

Researchers in the Cognitive Neuroscience division investigated – often in collaboration with other laboratories – how cognitive processes in humans and animals are altered by drugs and hormones, as well as by pathologies such as epilepsy and pain and in brain-diseased patients. Features of EEG parameters and signal-analytical tools are used to study basic properties of information processing and of brain oscillations and the mechanisms of epileptic seizures. The leading theoretical framework is the 'cortical focus' theory for absence epilepsy. Other studies involved examining attention and vigilance processes related to the sensory gating of perceptive processes. This work produced new insights into the mechanisms of attention. A new research line focuses on the neuro-cognition of normal ageing in healthy subjects and of memory for brain-diseased patients, as well as fMRI studies on episodic memory formation. Results show that the medial temporal lobe is involved in working-memory processing and that memory function is crucial for executive control.

The investigations in the Cognitive Artificial Intelligence division were focused on cognitive aspects of human-centred interactive technologies. The department developed close links with other divisions and Donder's themes (e.g., Perception and action, language, and neural communication). Many studies are experimental, sometimes by means of simulation and introduction of formal techniques from signal processing, machine learning and information theory, some studies work on the theoretical underpinnings and build on mathematical logic and conceptual analysis. In addition to several STW and other NWO projects, the department leads BrainGain, a large national SmartMix consortium on Brain-computer and computer-brain interfaces. In this project, but also in others, there is a close collaboration with large industries (like Philips) and with SMEs.

Societal impact

DCC researchers contribute to the dissemination of fundamental research and its technological and educational applications via teaching programmes, public conferences and the media.

DCC scientists presented their research on Dutch television (for example, Prof. Harold Bekkering was on the popular 'Noorderlicht news' program), in Dutch radio programmes such Radio Noorderlicht and in regional and national newspapers (Volkskrant, NRC). Members of the DCC participated in workshops and summer schools and gave various lectures at prestigious international conferences. Various books were published, including Prof. Herman Kolk's

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Key publications

Heuven, W.J.B. van, Schriefers, H., Dijkstra, T. & Hagoort, P. (2008). Language conflict in bilinguals. *Cerebral Cortex*, 18 (11), 2706-2716.

Knoblich, G. & Sebanz, N. (2008). Intentionality in basic social interactions. *Philosophical Transactions of the Royal Society B*, 363, 2021-2031.

Lange, F.P. de, Spronk, M., Willems, R.M., Toni, I. & Bekkering, H. (2008). Complementary systems for understanding action intentions. *Current Biology*, 18(6), 454-7.

Lemhofer, K., Dijkstra, T., Schriefers, H., Grainger, J. & Zwitserlood, P. (2008). Native language influences on word recognition in a second language: A mega-study. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 34, 12-31.

Newman-Norlund, R., Meulenbroek, R.G.J., Bosga, J. & Bekkering, H. (2008). Anatomical substrates of cooperative joint-action in a continuous motor task: A virtual lift and balance task. *Neuroimage*, 41(1), 169-177.

Oosterman, J., Harten, B. van, Vogels, R., Gouw, A, Weinstein, H., Scheltens, P. & Scherder, E. (2008). Distortions in rest-activity rhythm in aging relate to white matter hyperintensities. *Neurobiology of Aging*, 29, 1265-1271.

Pelt, S. van & Medendorp, W.P. (2008). Updating target distance across eye movements in depth. *Journal of Neurophysiology*, 99, 2281-2290.

Roelofs, A. (2008). Dynamics of the attentional control of word retrieval: Analyses of response time distributions. *Journal of Experimental Psychology: General*, 137, 303-323.

Rooij, I. van (2008). The Tractable Cognition thesis. *Cognitive Science*, 32, 939-984.

Schie, H.T. van, Koelewijn, T., Jensen, O., Oostenveld, R., Maris, E. & Bekkering, H. (2008). Evidence for fast, low-level motor resonance to action observation: an MEG study. *Social Neuroscience*, 3, 213-228.

Schie, H.T. van, Waterschoot, B.M. van & Bekkering, H. (2008). Understanding action beyond imitation: reversed compatibility effects of action observation in imitation and joint action. *Journal of Experimental Psychology: Human Perception and Performance*, 34(6), 1493-500.

Verhagen, L, Dijkerman, H.C., Grol, M.J. & Toni I. (2008). Perceptuo-motor interactions during prehension movements. *Journal of Neuroscience*, 28(18), 4726-35.

Vissers, C.Th.W.M., Kolk, H.H.J., Meerendonk, N. van de & Chwilla, D.J. (2008). Monitoring in language perception: Evidence from ERPs in a picture-sentence matching task. *Neuropsychologia*, 46, 967-982.

Werf, J. van der, Jensen, O., Fries, P. & Medendorp, W.P. (2008). Gamma band oscillatory activity in human posterior parietal cortex encodes the motor goal during delayed pro- and antisaccades. *Journal of Neuroscience*, 28, 8397-8405.

Wit, T.C.J. de, Vrins, S., Dejonckheere, P. & Lier, R. van (2008). Form perception of partly occluded shapes in 4-month-old infants. *Infancy*, 13, 660-674.

Dissertations:	12
Scientific publications:	153
Professional publications:	13

Director: Prof. Harold Bekkering

Harold Bekkering has been Professor of Cognitive Psychology at Radboud University Nijmegen since 2002. Previously, he worked at the Universities of Maastricht, St. Louis and Groningen and was a senior scientist at the Max-Planck Institute for Psychological Research in Munich. Prof. Bekkering's research interests include Developmental and Cognitive Psychology, Cognitive Neuroscience and the implementation of Cognition in Robotics. He has received prestigious national (Vici) and international grants and co-authored articles in journals such as *Science*, *Nature* and *Nature Neuroscience*.



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'Bewustzijn, van filosofie naar hersenwetenschap' (Consciousness, from philosophy to brain science).

Within the Donders Institute framework, a Graduate School designed to complement the research Masters Programme in Cognitive Neuroscience will be launched in September 2009.

Future research

The launch of the Donders Institute for Brain, Cognition and Behaviour in September 2008 strengthened the multi-disciplinary approach to studying the structure and function of the brain at the University. In line with the aims of the Institute, the DCC's research will continue to examine the functional architecture of cognitive systems, alongside research on cognitive and computational issues in the human interaction with artificial cognitive systems.

The collaboration with the Behavioural Science Institute (BSI), an affiliate member of the Donders Institute, will be accommodated by the start of six joint DCC/BSI projects on various cognitive-psychological projects such as adaptive behaviour, body-concepts, social development, anxiety, early phonetic learning and stress.

Research in 2009 will be strengthened by new grants gained in 2008, for example, a Netherlands Organisation for Scientific Research (NWO) Vidi grant for Prof. R. Kessels' project 'Buffering our past: An integrated perspective on working memory and episodic memory', and Dr S. Ruschmeijers NWO Veni grant for her project on 'Using Actions to Understand Language'. Other ongoing

projects are the European project on Joint Action (6th Framework Programme, Cognitive Systems), the ICIS projects VindIT and Trigraph, one Vici project (Bekkering), a Vidi project (Medendorp), two Veni projects (Lemhöfer and de Bruijn) and several open-competition projects funded by the NWO.

Furthermore, the DCC will take initiatives to increase the proportion of external funding. The number and quality of proposals submitted to various funding programmes, including NWO personal grants, but also European external funds should rise. Support staff will be involved in supporting these initiatives.

Donders Institute for Brain, Cognition and Behaviour Centre for Cognitive Neuroimaging

The mission of the Donders Centre for Cognitive Neuroimaging (DCCN) 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 recent rapid progress in this field is driven by the development of complex neuro-imaging techniques for the in-vivo scanning of activity in the human brain – an area in which the DCCN plays a leading role.



The research themes at the DCCN relate to central cognitive functions such as perception, action, attention, memory, language, learning and plasticity. The aim is to unravel these functions and understand how they are represented in the brain. This is done by identifying the networks of brain areas that are vital to each of the functions and determining the role of – and interactions – between regions. In order to achieve this, it is also necessary to understand how neurons make networks and how networks carry out cognitive functions – in other words, how to get from neurons to cognition. Another aim is to establish how the different brain areas coordinate their activity with very high temporal accuracy to enable human and animal cognition.

Another important aspect of the research is improving the imaging methods themselves, by optimally combining 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. In recent years, some aspects of both the cognitive and the methodological research have been combined in projects centred on the theme brain-computer interface, where both a deep understanding of brain functioning and technical excellence are required.

The DCCN research is organized in eight research groups, each headed by a Principal Investigator (PI):

Cognitive Control (in association with the department of Psychiatry at the Radboud-UMC, PI Dr R. Cools)
This group investigates the neurochemical mechanisms of the motivational and cognitive control of goal-directed behaviour.

Cognitive Neurology and Memory (in association with the department of Neurology at the Radboud-UMC, PI 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, developing new cognitive neuroimaging techniques for clinical application in neurology, psychiatry, geriatrics, and anaesthesiology plays a major role.

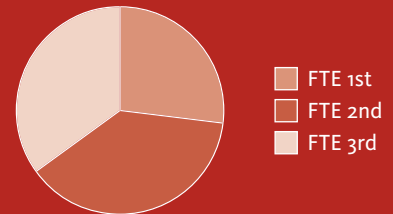
Neuronal Coherence (in association with the Faculty of Science at the Radboud-University, PI Prof. P. Fries)
This group investigates the mechanisms and functions of neuronal synchronization. The working hypothesis is that functional interactions among groups of neurons are subserved by rhythmic synchronization.



Volunteer entering an MR scanner, in order to measure brain activity under experimental conditions.

Staff

Prof. G.S.E. Fernández (o)
 Prof. P. Fries (p)
 Prof. P.Hagoort (o)
 Prof. D.G. Norris (p)
 Prof. D.J. Ruiter (p)
 Prof. J.P.J.M. van der Eerden (o)



Tenured

Full Professors	4.9 FTE
Researchers	9.0 FTE

Non-tenured

Postdocs	22.6 FTE
Doctoral candidates	44.3 FTE

Neurocognition of Language (in association with the Max Planck-Institute for Psycholinguistics, PI Prof. P. Hagoort)
 This group studies the neural basis of reading, speaking and listening.

Language and Multilingualism (in association with the Max Planck-Institute for Psycholinguistics, PI 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.

Neuronal Oscillations (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.

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

Intention and Action (in association with the Donders Centre for Cognition, PI Dr I. Toni)
 This group explores ways in which perception translates into action and investigates the brain circuitry that makes human action possible.


Awards and acknowledgements

- Peter Hagoort was awarded the senior Heymans Prize.
- Ivan Toni obtained a Vici award from the Netherlands Organisation for Scientific Research (NWO).
- Roshan Cools was awarded an NWO Vidi award and a Hersenstichting (Brain Foundation) Fellowship.

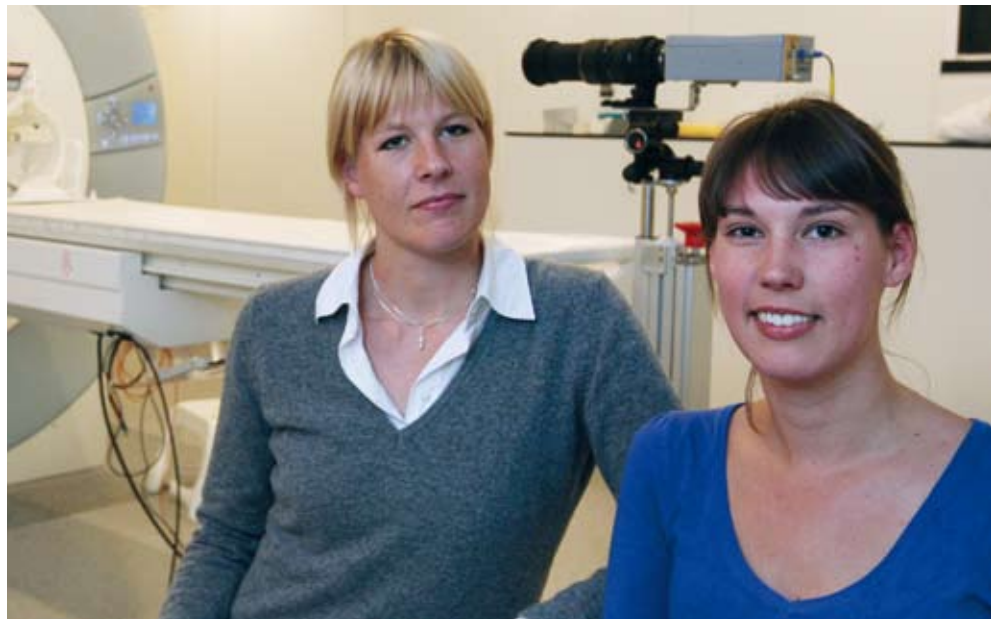
Research facilities

- 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, 275-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

Donders Institute for Brain, Cognition and Behaviour Centre for Cognitive Neuroimaging



Dr Roshan Cools (left) is Principle Investigator at the Centre and the winner of an NWO Vidi grant. She and doctoral candidate Martine van Schouwenburg MSc are studying the neurochemical mechanisms of goal-directed behaviour, combining the administration of drugs with MRI.



- a behavioural laboratory for collecting behavioural data
- integrated stimulus presentation facilities for auditory and visual presentation as well as activities such as somatosensory stimulation
- a computer infrastructure that combines personal desktop PC computation with centralized storage management and central computation power.
- a facility for awake monkey neurophysiology, allowing simultaneous recording from 256 sites across the brain.
- a laboratory for Transcranial Magnetic Stimulation which was installed in 2008 in collaboration with the Department of Neurology.

Collaboration

The DCCN is a research centre at Radboud University Nijmegen with participation by the Universities of Leiden, Maastricht, Tilburg and Twente as well as the Radboud University Medical Centre and the Max Planck Institute for Psycholinguistics in Nijmegen. It has formal collaborations with a large number of international institutions, including the Institute of Medicine of the Forschungszentrum Jülich, Department of Medicine of RWTH Aachen, Department of Medicine of the University of Bonn, Departments of Psychology and Medicine, MEG Center of the University of Münster, University of Düsseldorf, University of Hamburg, Max-Planck-Institute for Brain Research (Germany), Karolinska Institute in Stockholm, Umea University (Sweden), Norwegian University of Science and Technology (Trondheim), Helen Wills Neuroscience Institute and Department of Psychology at the University of California at Berkeley, Dept of Experimental Psychology, University of Cambridge, Department of Neurophysiology of the University of Oxford (UK), Cold Spring Harbor Laboratories in New York, Departments of Psychology

and Neuroscience of the University of Arizona, Department of Cognitive Science of the University of California at San Diego, Cornell University, New York University, McGovern Institute at MIT (USA), the Chinese Academy of Sciences (Beijing), Erasmus University Rotterdam, Neurospin Centre Paris, University of Basel, University of Zurich. 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 that was available to a Dutch research institute.

Research results

Dr Cools' Group

Research has focused on the role of dopamine in the motivational and cognitive control of goal-directed behaviour. A series of pharmacological neuroimaging studies (using either fMRI or neurochemical PET) in 2008 have revealed contrasting effects of dopaminergic drugs in healthy volunteers as a function of task demands, baseline levels of dopamine in associated fronto-striatal circuitry and impulsive personality. These effects of dopamine were particularly pronounced during tasks that involved measuring reward-directed behaviours. In parallel, the effects of serotonergic manipulations, which were more pronounced in punishment-directed behaviours, were investigated.

Prof. Fernández's Group

This research focuses on the neural underpinnings of memory, emotion and their interaction in healthy and diseased states. A fMRI study was carried out to explore ways in which progesterone, a key hormone involved in mood regulation modulates emotional processing. The results revealed that progesterone modulates amygdala responses that underlie emotional processing in a bi-

modal fashion. While intermediate levels of progesterone lead to large amygdala responses, low as well as high levels of progesterone lead to smaller responses. This finding might provide a mechanistic account for mental symptoms and disorders related to fluctuations in progesterone levels.

Prof. Fries' Group

This research focuses on rhythmic neuronal synchronization, the functions that it might serve and the mechanisms through which it might subserves these functions. The Communication Through Coherence (CTC) hypothesis was put forward, stating that the specific pattern of interactions among neuronal groups is governed by the specific pattern of synchronization. Experimental evidence in support of this hypothesis was provided.

Prof. Hagoort's Group

Research on the language system focuses on the combinatorial nature of language. In other words, how are different sources of information that are retrieved from memory and/or provided by sensory input unified into an interpretation (comprehension) or message (production) beyond the single word level?

A resting state study showed that the left perisylvian cortex reveals topographic organization, where the left inferior frontal cortex is connected to parietal and temporal areas in the left hemisphere, depending on the type of information (phonological, syntactic or semantic). Such a topographic pattern of connectivity is not observed in the right hemisphere. In fMRI studies it was found that areas in frontal cortex have a modulatory role on the memory areas in temporal cortex. It was possible to characterize the dynamic interplay between different neural nodes in the brain's language network. Patients with Autistic Spectrum Disorder were found to have an abnormal activation pattern, with a stronger reliance on the right frontal cortex to compensate for reduced functioning of the left frontal cortex.

Dr Indefrey's Group

Research showed that syntactic representations are functionally and neuronally shared between the first and the second language. Using EEG we have also shown that magnitude of the brain's error response, in an implicit language-learning paradigm, is predictive of learning success. A further EEG study revealed that bilinguals cannot help but activate multiple meanings of words that sound alike in their two languages (e.g., English and Dutch 'pet'), but the bilingual brain does give the context relevant language a substantial head start. In another series of experiments we are examining the timing of processing stages in second language word production.

Dr Jensen's Group

Numerous MEG studies from the group point to oscillatory activity playing an important role in shaping the functional architecture of the brain: activity in the gamma band (30-80 Hz) reflects neuronal

processing while alpha band (8-12 Hz) activity reflects disengagement of task-irrelevant areas. These principles have emerged from on memory, attention and perception. Additionally we have identified a mechanism showing that the modulations in oscillatory activity can create evoked responses.

Prof. Norris' Group

Conventional brain activation studies with fMRI are acquired with a spatial resolution of about 3 mm, which is believed to reflect the spatial extent of the activation-induced increase in local blood flow. At this spatial resolution it is impossible to distinguish activation in different layers of the human cortex, as these are typically approximately half a millimetre in thickness, and furthermore reside on a convoluted 3D surface. In previous work it was demonstrated that it is possible to measure activation in the human cortex at sub-millimetre resolution and in 2008 it was possible to demonstrate that this can be done at this resolution to show activation in the human in layer IV of the visual cortex. This result opens up the possibility of recording layer specific activation in a wide range of cognitive studies.

Dr Toni's Group

This group studies the cognitive and cerebral properties of movement plans, with particular emphasis on the mechanisms supporting the integration of rules, percepts, and concepts into the sensorimotor machinery. It has recently been demonstrated that cerebral control of action is structured in different parieto-frontal circuits: a dorsomedial circuit supports motor planning on the basis of advance visuospatial information, whereas a dorsolateral circuit adapts motor behaviour to current conditions by incorporating perceptual information into the motor plan.

Societal impact

According to the World Health Organization, diseases of the nervous system will become the most important medical priority this century. The costs of treating nervous system disorders are already 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 crucial to technologically advanced societies. According to the OECD, a brain-based learning science is urgently needed.

DCCN 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 software package for use in analyzing MEG and EEG data (source modelling) has been developed and made available to the neuroscience community. In addition, staff at the DCCN give numerous lectures for the general public.

Donders Institute for Brain, Cognition and Behaviour Centre for Cognitive Neuroimaging

Key publications

Buur, P. F., Norris, D. G., & Hesse, C. W. (2008). Extraction of task-related activation from multi-echo BOLD fMRI. *IEEE Selected Topics in Signal Processing* 2(6), 954 - 964.

Cools, R., Gibbs, S. E., Miyakawa, A., Jagust, W. & D'Esposito, M. (2008). Working memory capacity predicts dopamine synthesis capacity in the human striatum. *Journal of Neuroscience*, 28, 1208-1212.

Cools, R., Roberts, A. C. & Robbins, T. W. (2008). Serotonergic regulation of emotional and behavioural control processes. *Trends in Cognitive Sciences*, 12(1), 31-40.

Davidson, D. J., Indefrey, P. & Gullberg, M. (2008). Words that early second language learners are likely to hear, read, and use. *Bilingualism: Language & Cognition*, 11(1), 133-146.

De Lange, F. P., Spronk, M., Willems, R. M., Toni, I. & Bekkering, H. (2008). Complementary systems for understanding action intentions. *Current Biology*, 18, 454-457.

Fries, P., Womelsdorf, T., Oostenveld, R. & Desimone, R. (2008). The effects of visual stimulation and selective visual attention on rhythmic neuronal synchronization in macaque area V4. *Journal of Neuroscience*, 28(18), 4823-4835.

Hagoort, P. (2008). The fractionation of spoken language understanding by measuring electrical and magnetic brain signals. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363, 1055-1069.

Koopmans, P. J., Manniesing, R., Niessen, W. J., Viergever, M. A. & Barth, M. (2008). MR venography of the human brain using susceptibility weighted imaging at very high field strength. *MAGMA*, 21, 149-158.

Mazaheri, A. & Jensen, O. (2008). Amplitude modulations of brain oscillations generate slow evoked responses. *Journal of Neuroscience*, 28, 7781-7787.

Siegel, M., Donner, T. H., Oostenveld, R., Fries, P. & Engel, A. K. (2008). Neuronal synchronization along the dorsal visual pathway reflects the focus of spatial attention. *Neuron*, 60(4), 709-719.

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Dissertations: 4
Scientific publications: 100

In the region of Nijmegen the DCCN contributed to the Lux symposium 'The joy of education', gave a demonstration in the Science Café Nijmegen of the 'Computer-assisted brain', and a Neuro-Science Fiction Exposition during the university's lustrum market in Nijmegen, as well as several activities for high schools, a Master class in Physics for pupils and laboratory tours. Furthermore, the VIP BrainNetworks project within the 'Pieken in de Delta Oost Nederland' programme established a strong structural link with the University of Twente and a number of local businesses.

Future research

Dr Cools' Group

Future studies will extend this work by assessing the role of genetic predisposition in predicting the effects of dopaminergic and serotonergic manipulations on controlling flexible behaviour using reward and punishment by combining psychopharmacology with genetic imaging.

Prof. Fernández's Group

This group will continue to study the effects of steroid hormones on specific brain operations that underlie mood regulation, stress

Director: Prof. David Norris

Prof. Norris has been director of the Donders Institute's Centre for Cognitive Neuroimaging since January 2009. In July 2001 he was appointed as Principal Investigator of the research group MR Methods for Cognitive Neuroscience at the Institute. In 2003, he became Professor of MR Physics for Cognitive Neuroscience at Radboud University Nijmegen. His research interests include improving fMRI techniques, very high resolution fMRI, diffusion tensor imaging and resting-state connectivity. Prof. Norris is also one of the three directors of the Erwin Hahn Institute in Essen and a member of the medical faculty at the University of Duisburg-Essen. Furthermore, he is president of the International Society for Magnetic Resonance in Medicine, the most important scientific organization engaged in MR Imaging.



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perception and memory. Moreover, an attempt will be made to identify a mechanistic account of the stress effects on memory and mental health, incorporating three dimensions in a fully integrated approach: pharmacology, genetics and neural processes.

Prof. Fries' Group

Having established that selective synchronization does indeed result in selection interactions among neuronal groups, the next step will be to test whether this mechanism is used during normal cognitive functioning. Specifically, the group will use tasks in which cognitive top-down control alters the brain-wide pattern of interactions and assess whether this is achieved by altering synchronization patterns.

Prof. Hagoort's Group

This group is probing the genetic infrastructure of language by investigating structural and functional aspects of brain functioning in subjects with polymorphisms for language-relevant endophenotypes. This is the first study of speech production using the MR scanner in a repetition suppression paradigm.

Dr Indefrey's Group

Future experiments will be designed to establish whether between-language meaning activation is observed when bilinguals are listening to first language sentences. In another series of experiments the exact time course of processing stages in second language word production will be examined in order to better understand the peculiarities of second language production and collect necessary data for bilingual processing models.

Dr Jensen's Group

Further investigations will be made on how oscillatory brain activity is involved in shaping the functional architecture of the working brain. This will be done using new paradigms and cross-frequency analysis techniques. A second complementary research line is to develop brain-computer interfacing to be used as a research tool in cognitive neuroscience.

Prof. Norris' Group

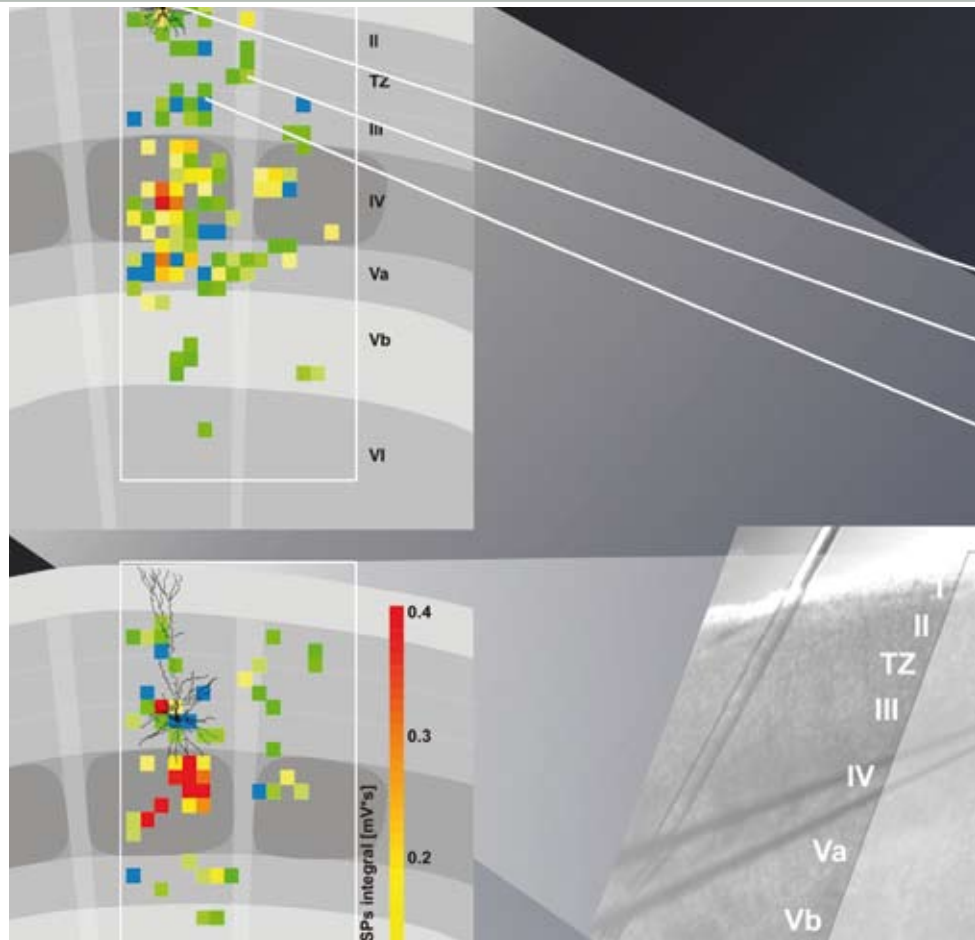
Work will continue on exploring the potential for detecting activation in specific layers of the human cortex. This will include exploring the possibilities associated with measuring GABA using spectroscopic techniques, as this represents a potential marker for neuronal inhibition. In the field of MR methods distortion-free imaging techniques for fMRI and diffusion imaging will be developed. In addition, a number of studies will examine connectivity in healthy and patient populations, strengthening the Centre's imaging methodology and analytical techniques for connectivity.

Dr Toni's Group

Two main lines of research will be pursued, targeting instrumental and communicative actions. With respect to the former, the plan is to study the mechanisms supporting the dependency of action selection on the history of actions recently selected by an organism. Concerning the latter, the intention is to study the mechanisms that support the generation of human communicative actions, as well as their alterations following psychiatric disturbances.

Donders Institute for Brain, Cognition and Behaviour Centre for Neuroscience

The human brain is an adaptive self-organizing system, whose potential for adaptation, which has genetic roots, is expressed through interaction with the environment. Research on animals and human subjects at the Donders Centre for Neuroscience (DCN) takes place at various levels: that of genes, biomolecules, neurons, networks of neurons, and the behaviour of the whole organism.



The DCN works at all of these levels, bringing together multi-disciplinary basic and clinical research groups from the Faculty of Science and the Radboud University Nijmegen Medical Centre. Researchers at the Centre use their expertise and skills to train students, researchers, physicians, specialists and professionals who are active in the field of neuroscience, while also applying knowledge and expertise in clinical practice.

In 2008 the research activities of the DCN were organized within the following three research themes:

Theme 1. Perception and action

Investigating the neuronal activity which underlies perception, action and higher cognitive functions. From 2009 on this theme will be incorporated into the Perception, Action and Control theme at the Donders Institute for Brain, Cognition and Behaviour.

Theme 2. Functional Neurogenomics

Investigating the genetic basis of neurodevelopment and neuro-degeneration. This theme is part of the Learning, Memory and Plasticity theme at the Donders Institute.

Theme 3. Neuro-informatics

Finding algorithms for computational neuroscience, brain-computer interfacing, and for implementing natural and artificial intelligence. Neuro-informatics will be part of the theme Brain Networks and Neuronal Communication at the Donders Institute.

Awards and acknowledgements

- Prof. J. Buitelaar and Dr B. Franke received a Netherlands Organisation for Scientific Research (NWO) Investment grant ('NWO Groot') for their application entitled 'From Gene to Neural Action in ADHD'.
- Dr A. Schenck received a NWO Vidi and ASPASIA grant for modelling mental retardation in *Drosophila*.
- Dr R. Cools received a NWO Vidi and ASPASIA grant on the variations in dopamine response among different people. She also received a Hersenstichting fellowship for research on cognitive problems in Parkinson's disease.
- Dr R. Kessels was awarded a NWO Vidi grant for his application entitled 'Buffering our past: An integrated perspective on working memory and episodic memory'.

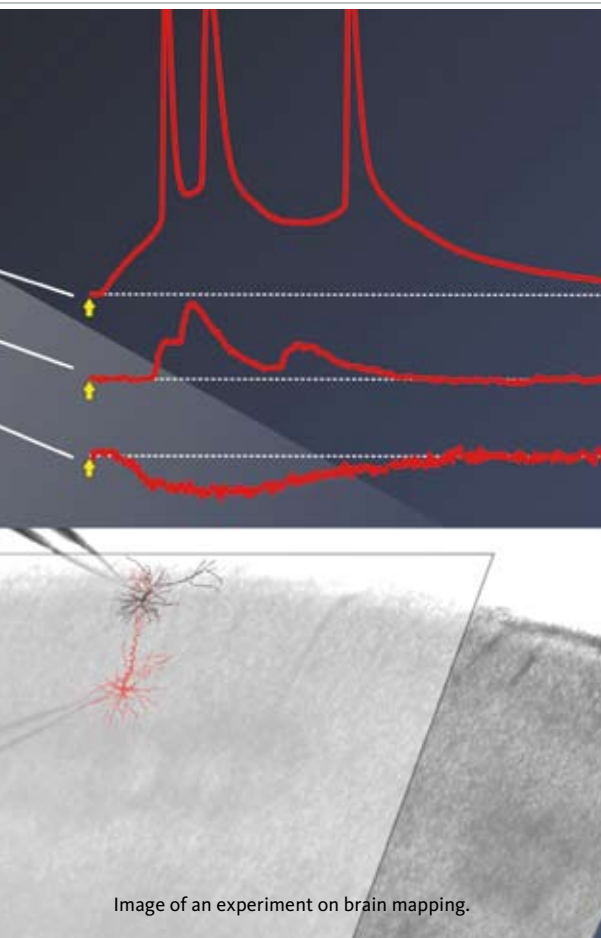
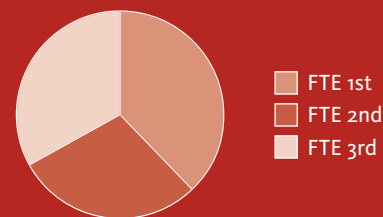


Image of an experiment on brain mapping.

Staff

Prof. B.R. Bloem (o)	Prof. D.J. Ruiter (p)
Prof. J.K. Buitelaar (o)	Prof. G.J. Scheffer (o)
Prof. A.R. Cools (p)	Prof. A.F.M. Snik (e)
Prof. C.W.R.J. Cremers (o)	Prof. D.F. Stegeman (p)
Prof. J.R.M. Cruysberg (o)	Prof. K.C.P. Vissers (o)
Prof. B.G.M. van Engelen (o)	Prof. R.A. Wevers (p)
Prof. G.S.E. Fernández (o)	Prof. M.J. Zwarts (o)
Prof. P. Fries (p)	
Prof. A.C.H. Geurts (o)	Tenured
Prof. C.C.A.M. Gielen (o)	Full Professors 7.1 FTE
Prof. K. Graamans (o)	Associate Professors 3.7 FTE
Prof. J.A. Grotenhuis (o)	Assistant Professors 11.5 FTE
Prof. A. Heerschap (o)	Researchers 8.8 FTE
Prof. T. M. Heskes (p)	
Prof. H.J. Kappen (p)	Non-tenured
Prof. R.P.C. Kessels (o)	Researchers 29.0 FTE
Prof. J.E.E. Keunen (o)	Postdocs 11.2 FTE
Prof. R. Kötter (o)	Doctoral candidates 59.2 FTE
Prof. H.P.H. Kremer (o)	
Prof. G.J.M. Martens (o)	
Prof. D.G. Norris (p)	
Prof. M.G.M. Olde Rikkert (o)	
Prof. A.J. van Opstal (p)	
Prof. G.W.A.M. Padberg (o)	
Prof. J.J. Rotteveel (o)	
Prof. E.W. Roubos (o)	



- Prof. B. Bloem and Prof. J. Kremer (professor at the Department of Obstetrics & Gynaecology) and co-workers were awarded a subsidy for the project MijnZorgNet.
- S. Pillen (a PhD Student at the Department of Neurology), received three awards in 2008: 1) best presentation from the 'Vereniging voor Klinische Neurofysiologie', 2) the Jacobus Willemsse prijs, a biennial prize for Young investigators in child neurology research from the 'Nederlandse Vereniging voor Kinderneurologie' and 3) the president's Research Initiative Award of the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM).
- Dr M. Verbeek and Prof. M. Olde Rikkert are part of the Leiden Alzheimer Research Nederland (LeARN) consortium which is one of the nine consortia which received funding from the first subsidy round of the Center for Translational Molecular Medicine (CTMM).
- Dr H. Scheffer received a ZonMw 'Middelgroot' Investment grant for 'High-throughput medical resequencing of candidate disease genes and genomic regions' together with Dr J. Veltman. He also received a FP7 Marie Curie Fellowship called CRANIO-TECHGENE. This is a program for high-throughput molecular

- diagnostics of the mutation negative syndromic and non-syndromic craniosynostoses. He is also a coordinator of a FP7 Collaborative Project called TECHGENE on technological innovation of high-throughput molecular diagnostics of clinically and molecularly heterogeneous genetic disorders.
- Dr A. Kiliaan received an FP7 grant for work on 'Therapeutic and preventive impact of nutritional lipids on neuronal and cognitive performance in ageing, Alzheimer's disease and vascular dementia (LIPIDIET)'.
 - Prof. S. Gielen was awarded an NWO grant in the programme Computational Life Science for his project 'from spiking neurones to brain waves'.
 - Dr B. van de Warrenburg received a grant from the Prinses Beatrix Fonds to study the role of the cerebellum in dystonia. Together with Prof. M. Zwarts he received a grant from Ipsen Pharmaceuticals to study the effect of botulinum toxin injections at the motor end plate in cervical dystonia.
 - Dr R. Oude Voshaar (Department of Psychiatry) received a ZonMw Clinical Fellowship for the application 'The neurotrophic hypothesis of depression. Pathophysiological link between depression and cardiovascular disease?'.

Donders Institute for Brain, Cognition and Behaviour Centre for Neuroscience



Dr Dirk Schubert, Postdoc Neurophysiologist, constructs connectivity maps of neurons in the brain using a combination of optical stimulation and electrophysiological recordings in rat brain slices.



- Dr R. Melis (Department of Geriatrics) received a Rubicon grant with which he is now using to work on dementia research at the Karolinska Institute.
- Dr M. Graff was nominated for the 'Zorg voor Morgen Prize' and received the CAN 5-year research award.

Research facilities

The DCN has unique research facilities and access to various cohorts of patients for studies of diseases such as Alzheimer, ALS and Parkinson. It also has access to large samples of genetically hearing-impaired families, families with age-related hearing impairment and clinical otosclerosis, and to a large number of genetically visually impaired families and populations with age-related macula degeneration. In addition, the centre has access to advanced equipment for virtual reality stimulation, genomics and proteomics facilities, and to advanced neuroimaging facilities, such as the fMRI setups of the Donders Centre for Cognitive Neuroimaging.

Perception and Action

The fully equipped Radboud Transcranial Magnetic Stimulation (TMS) Laboratory and the Nijmegen Gait and Balance Unit are used for ground-breaking research on human motor control. In addition, non-invasive high density EMG systems with up to 130 channels per muscle, ultrasound facilities for neuromuscular diagnostics and EEG recording facilities up to 64 channels are available to explore the role of the peripheral motor system in the coordination of movement. There is a 3D virtual reality stimulus generator and a vestibular chair for research on visuo-vestibular

interaction. For research on auditory perception (single-unit recordings in auditory cortex) and sensori-motor integration (multisensory integration, eye-head coordination, sound localization studies with human subjects, and electrophysiological recordings with head-unrestrained macaques) the DCN possesses three fully equipped laboratories to perform high-level behavioural sensori-motor experiments. The Centre also houses neuropsychological test facilities and a Near Infrared Spectroscopy (NIRS) lab.

Functional neurogenomics

Besides groups of patients within the clinical departments of the Radboud University Nijmegen Medical Centre, researchers within DCN have also established a large DNA cohort of well characterized Parkinson's disease patients (n=500).

In addition, to the standard equipment we are provided with advanced laboratory facilities for morphology, electron microscopy, cell physiology, electrophysiology, pharmacology, isotopes and molecular biology such as quantitative PCR, proteomics facilities, *Xenopus* transgenesis facility, cell-tissue culture and animal models (*Xenopus*, mice, rat, monkey). Specifically for behavioural experiments with rats there are rewarding/aversive conditioned place preference tests, water maze tests and forced swim tests. For mice there are eight phenotyper cages available in which the behaviour can be monitored via a video-based complete observation system.

Researchers within DCN have developed a Biobank for CSF and serum of neurological disorders, Transgenic mouse model for

Alzheimer Disease, a TgSwDI mouse strain, transgenic knock-out mouse models and primary cerebral cell cultures available.

The DCN also houses a fully equipped lab for slice electrophysiology including patch-clamp recordings, micro-electrode recording arrays, UV-flash photolysis of caged compounds, fluorescence microscopy and equipment for post-mortem tracing in brain slices.

Neuro-informatics

For research within informatics the DCN has a database of primate brain connectivity (www.cocomac.org) and a computer lab for neuro-imaging analysis including spatial normalization, cortical thickness measurements, graph-theoretic measures and multivariate analysis techniques. A PC cluster is available for fast parallel computations.

Collaboration

Local

Besides collaboration within the Donders Institute, researchers at the Donders Centre for Neuroscience also cooperate with several research institutes on campus including IGMD, NCEBP, NCMLS, IMM and ICIS.

National

- Erasmus University Rotterdam/ErMC
- Free University Amsterdam/ VUMC
- Leiden University (Medical Centre)
- Maastricht University/AZM
- Technical University Eindhoven
- Twente University
- University of Amsterdam/ AMC/ NIN
- University of Groningen/ UMCG
- Utrecht University, UMCU and Hubrecht Lab
- Wageningen University

International

- University of Bonn, Germany
- NIH, Bethesda, USA
- Queen's University, Kingston, Ontario, Canada
- Aalborg University, Aalborg, Denmark
- University of Minneapolis, USA
- The Salk Institute, La Jolla, USA
- Institute of Neurology, London, UK
- University of Washington School of Medicine, Seattle, USA
- King's College, London, UK
- SUNY Upstate Medical University, Syracuse, USA
- Heinrich-Heine-Universität Düsseldorf
- University of Freiburg, Germany
- VA Devel. Center, Palo Alto USA
- IMP/VDRC, Vienna, Austria
- University of North Carolina at Chapel Hill, Chapel Hill, USA

Preferred partners of Radboud University Nijmegen

- Catholic University of Leuven, Belgium
- Universitat de Barcelona, Spain
- Péter Pázmány Catholic University, Budapest, Hungary
- Università degli Studi di Siena, Italy
- University of Iowa, USA

Results

Theme 1

Breakthroughs in neuromuscular diseases

The ALS Center is embedded within the department of Clinical Neurophysiology and within the Laboratory for Transcranial Magnetic Stimulation. Fasciculations (so-called muscle twitches) are the clinical hallmark of ALS and have been recognized for more than a century. Researchers studied the fasciculations with their in-house-developed EMG techniques in a non-invasive manner and discovered the coexistence of two types of fasciculations within the same muscle, one of axonal (type 1) or neuronal (type 2) origin.

Dystonia is a neurological movement disorder. Using eye blink conditioning Dr B. van den Warrenburg and colleagues proved that implicit motor learning in dystonia is disrupted, which implies cerebellar pathology in dystonia.

Encoding in the auditory system

The group led by Prof. J. van Opstal investigates the acoustic tuning characteristics of auditory neurons in the midbrain inferior Colliculus (IC) of alert macaque monkeys. Sounds with characteristics that resemble natural sounds were used to demonstrate strong spectral-temporal tuning of IC neurons to such stimuli. Although frequency and time in natural sounds are tightly coupled, IC neurons have uncoupled these variables so their activity can be independently modulated by variations in time and sound spectrum.

Competition in visual stimulation

Using simulations of biological neural networks Prof. S. Gielen revealed the mechanism for selective attention. Selective attention is the phenomenon that we select only the relevant information and ignore information that is not relevant. He showed that a simple feedforward model with fixed synaptic conductance values can reproduce these two phenomena using synchronization of neuronal activity in the gamma (40 Hz) frequency range to increase the effective synaptic gain for the responses to the attended stimulus.

Breakthroughs in memory research

Prof. R. Kessels unraveled the neurocognitive mechanisms of episodic working memory function, providing new insights into models of human memory, specifically the notion that working memory and episodic memory are not two independent systems.

Donders Institute for Brain, Cognition and Behaviour Centre for Neuroscience

Key publications

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Dissertations:	29
Scientific publications:	451
Patents:	2

The group led by Prof. G. Fernández took another approach. They focused on the neural underpinnings of memory, emotion and their interaction in healthy and diseased states. For instance, a fMRI study was conducted probing the mechanisms how progesterone – a key hormone relevant for mood regulation – modulates emotional processing. The data revealed that progesterone modulates amygdala responses underlying emotional processing in a bi-modal fashion: while intermediate levels of progesterone lead to large amygdala responses low as well as high levels of progesterone lead to smaller responses.

Dr R. Cools studied the role of dopamine in the motivational and cognitive control of goal-directed behaviour. A series of neuro-imaging studies (using either fMRI or neurochemical PET) has revealed contrasting effects of dopamine receptor stimulation as a function of task demands, baseline levels of dopamine in associated fronto-striatal circuitry and impulsive personality.

Theme 2

Mental retardation in fruitflies

The research line of Dr H. van Bokhoven and Dr A. Schenck goes all the way from the clinic to model organisms via the genetics lab and back. It covers various topics such as molecular and cellular (neuro)biology. As a proof-of-concept for this research pipeline a severe mental retardation syndrome -9q subtelomeric deletion syndrome- is studied, which is caused by heterozygous mutation of the EHMT1 gene. This condition was modelled in fruit flies (*Drosophila melanogaster*) and mice, which revealed significant defects in behaviour as well as in learning & memory due to ablation of the EHMT1 gene.

Genetic basis of deafness

Prof. C. Cremers, Dr H. Kremer and co-workers identified two novel deafness genes, one of which is a fusion gene with transcripts that encode two completely different proteins that both are mainly expressed in hair cells. The second gene encodes an estrogen-related receptor that is involved in the differentiation of specific cells in the stria vascularis of the inner ear. Both genes point toward novel pathways in inner ear function.

Genome linkage studies of ADHD

Researchers at the Department of Psychiatry (Prof. J. Buitelaar, Dr B. Franke and co-workers) performed whole genome linkage studies for genes responsible for ADHD. No linkage was observed on the most established ADHD-linked genomic regions of 5p and 17p, but suggestive linkage signals on chromosomes 9 and 16 were found.

Genetic adaptation studies

Researchers Prof. E. Roubos and Dr T. Kozicz focused on the mechanisms that control adaptation in animals and man to their continuously changing environment. The focus of research is on

Donders Institute for Brain, Cognition and Behaviour Centre for Neuroscience

two control centres in the brain: the hypothalamo-hypophyseal system and the Edinger-Westphal (EW) system. These systems were studied from the genetic level up to the organismal level, with the frog *Xenopus laevis* as model to obtain insight into fundamental cellular communication mechanisms.

Molecular basis of neurodevelopmental disorders

Prof. G. Martens and co-workers were successful to unravel the molecular genetic basis of a rat model with schizophrenia-related features to understand the highly complex molecular regulatory mechanisms underlying the development of this disorder. For two rat lines, the researchers found neuroanatomical and behavioural differences, searched for genomic copy number variations (CNVs), determined the distribution of single-nucleotide polymorphisms (SNPs), and performed mRNA expression profiling revealing genes that are differentially expressed in all adult brain regions tested as well as during embryonic development. Next, they correlated the established DNA/RNA markers with a number of behavioural phenotypes.

Dr J. Homberg found that serotonin transporter knockout rats show increased responding for positively (sucrose pellets) and negatively (footshock) reinforced behaviours during extinction, but increased adaptive behaviour during a test for goal directed behaviour. As this knockout rat may model the widely-studied human serotonin transporter polymorphism, the data lead to the intriguing hypothesis that this polymorphism is not only associated to (negative) emotionality, but also to increased cognitive functions leading to increased adaptive behaviour.

Theme 3

Structure of the primate brain

The group headed by Prof. R. Kötter worked on the databasing of the primate brain. In order to map the brain, information about connectivity of various brain regions are gathered from the literature. Comparing information from the non-human primate brain and the human brain allows us to relate structure and function, such that lesions of the brain can be related to changes in function. For this purpose open source software for brain visualization and analysis was developed.

Neuronal activity in the brain

The group led by Prof. S. Gielen tested the hypothesis that the function of synchronized oscillations of neuronal activity in the gamma frequency range is to make a particular sensory signal more effective, thus reducing neuronal responses to neuronal signals related to other sensory stimuli. These simulations of neuronal networks are the first theoretical studies that provide support for this hypothesis.

Societal impact

Media appearances

- A documentary featuring Prof. C. Cremers en Prof. A. Snik on hearing aids for children called 'het verhaal van Marije' (Marije's story) was nominated for 'De Gouden Reiger' prize.
- The publication by Prof. E. Roubos and Dr T. Kozicz in April 2008 on gender differences in adaptation, and the role of urocortin-1 in stress, depression and suicide received considerable attention from radio, television, press and professional journals.

Scientific boards and committees

- Dr H. van Bokhoven became a member of the Horizon programme committee of the Netherlands Genomics Initiative (NGI) and a member of the Editorial Advisory Board of the 'Encyclopedia of Life Sciences'
- Prof. J. Buitelaar is a member of the Committee of Cognitive Neurosciences of the KNAW.
- Prof. C. Cremers was appointed honorary member of the scientific association 'Vlaams-Nederlandse Werkgroep voor Paediatrische Otorhinolaryngologie'.
- Prof. B. van Engelen was elected to the scientific committee of the European Neuromuscular Centre (ENMC).
- Prof. S. Gielen was appointed as a member of the board of the committee of Biochemistry and Biophysics of the KNAW. He is also a member of the board of the Physics of Life committee of Foundation for Fundamental Research on Matter (FOM) and the Cognitive Neurosciences committee of the KNAW.
- Prof. B. Kremer is a member of the scientific advisory board of the Huntington's Disease Association of the Netherlands and president of the scientific advisory board of the Dutch Autosomal Dominant Cerebellar Ataxia Association. He is also a member of the scientific board of the Prinses Beatrix Foundation, a member of the ZonMw TOP grants committee and chairman of the scientific board of the Dutch Brain Foundation 'Hersenstichting Nederland'.
- Prof. G. Martens was appointed as a member of the NWO Rubicon committee and of the Scientific Advisory Board of Laboratory School (HLO).
- Prof. M. Olde Rikkert is a member of the International Research Forum of Alzheimer Nederland, which was founded in 2008. He is also Board member of the European Alzheimer Research Consortium.
- Prof. E. Roubos was elected Honorary President of the European Society of Comparative Endocrinologists.
- Dr H. Scheffer hosted the European Molecular Quality Network (EMQN) Best Practice Meeting Myotonic Dystrophy on 1 November 2008 in Nijmegen and was Chairman of the Dutch Society of Clinical Genetic Laboratory Specialists (VKGL)
- Dr B. van de Warrenburg is a member of the medical advisory board of both the Dutch Society for Dystonia patients and the Dutch Organisation for Hereditary Spastic Paraplegia/Primary Lateral Sclerosis patients.

Director: Prof. Stan Gielen

Stan Gielen has been a Full Professor of Biophysics since 1988 with appointments in the Faculty of Science and at the Radboud University Nijmegen Medical Centre. He is an expert in neuronal information processing, focusing on cognition as an emergent property of the brain and on various applications in Artificial Intelligence. Prof. Gielen is a member of the Editorial Board of several scientific journals. In 2007 he was awarded a Knighthood in the Order of the Netherlands Lion.



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Economic and societal valorization

- Prof. G. Martens applied for a patent on the gene variants in neurodevelopmental and neurodegenerative disorders together with the company Lundbeck.
- Researchers at the Department of Otorhinolaryngology are involved in a patent application on the genetic basis of Age Related hearing Impairment (ARHI).
- Researchers at the department of neurology are developing – together with Twente University (Prof. P. Veltink) and the company Nedap NV in Groenlo – a miniaturized movement monitor (MMM: the Micro Movement Monitor) as a potentially commercial tool that can be used by clinicians to measure involuntary movements (e.g. in patients with Parkinson's Disease) and base treatment decisions on.
- Several researchers collaborate with a range of regional, national and international companies including Synthon (genetic risk factors for neurodevelopmental disorders), Lundbeck (susceptibility pathways and drug targets for psychosis) and Schering-Plough (in several areas). There is also close collaboration with the MS Centre Nijmegen on CSF biomarkers in multiple sclerosis.
- The ALS Center at the University works with three University hospitals on a single disorder generating positive publicity and strongly influencing the treatment options for many patients with ALS.
- The Alzheimer Centre in Nijmegen collaborates closely with the other centres in Amsterdam, Groningen and Maastricht as well as the Alzheimer Foundation. The collaborative venture Alzheimer Research Nederland (ARN), which is directly linked to the Foundation, has strong connections with several other clinics. This joint effort is expected to deliver a number of breakthroughs in research on this disease.

Future research

Within the Donders Institute's Functional Neurogenomics theme, there are strong links with the NCMLS and IGMD. These will be further strengthened by a research group on Molecular Neurobiology, including a professor and an assistant/associate professor. This group will combine the research activities in the RUNMC departments of CNS and Human Genetics.

The connection with industry will be extended by creating a chair in Translational research in dementia, which will be financed by Schering-Plough.

Research within the Molecular Animal Physiology department will be strengthened by the appointment of a new assistant professor.

The Donders Institute's theme Neuro-informatics will be strengthened by a new research group including a professor and an assistant/associate professor. Within this theme there are also strong links with the research groups within the ICIS.

There are opportunities for the Donders Institute within the M2M Platform (see page 111). The DCN aims to develop new brain-imaging techniques for molecular and cellular processes linked to the experience in optical imaging in the NanoLab of the IMM.

Finally, the DCN aims to strengthen its collaboration with a number of regional academic centres and companies. A joint project on brain and food together with organizations in the Wageningen region is in preparation.

Institute for Genetic and Metabolic Diseases

At the Institute for Genetic and Metabolic Diseases (IGMD) scientists from a range of disciplines engage in research on genetic and metabolic diseases, using a bench-to-bedside approach. Within the Institute's nine inter-related research themes, fundamental, applied and clinical researchers work closely together to answer specific, patient-related research questions that are designed to reduce the incidence of mortality as well as the severity and duration of morbidity resulting from genetic and metabolic diseases. The intention is to elucidate the pathophysiology of specific diseases, introduce novel diagnostic methods and develop innovative forms of treatment.



Research themes

Functional imaging

Functional imaging and monitoring is of vital importance for the diagnosis, treatment and follow-up of patients. The goal of the Functional Imaging Group is to develop and clinically evaluate innovative, non-invasive functional imaging and monitoring techniques such as 2D and 3D Echography, NMR spectroscopy, Near Infrared Spectroscopy (NIRS) and radioisotope imaging (PET and SPECT) for timely detection of tissue damage in early life as well as in adults and the aging population.

Molecular gastro-enterology and hepatology

The research programme centres on achieving a comprehensive understanding of human gastrointestinal diseases at the molecular level. The final goal is to discover novel paradigms for effectively treating patients. The starting point is disease gene discovery through positional cloning in order to understand the genetic bases for the diseases, followed by functional studies to understand

cellular pathogenesis. The main focus is on polycystic liver disease, an autosomal dominant disorder. Although this is a rare disorder, it provides a unique opportunity to study human cystogenesis. The other research lines include identifying genetic aspects of chronic pancreatitis and the molecular pathology of inflammatory bowel diseases.

Genomic disorders and inherited multi-system disorder

Genetic factors are important in most human diseases and traits. This group focuses on finding such genes in order to be able to provide better patient care. Topics include mental retardation, congenital abnormalities, psychiatric disorders, brain development and individual responses to treatment due to pharmacogenetic factors.

Glycosylation disorders

This research focuses on the complex biosynthetic and catabolic pathways of glycans in health and disease with a clinical and biochemical emphasis on Congenital Disorders of Glycosylation



Prof. Nine Knoers and colleagues at the Human Genetics Laboratory.

Staff

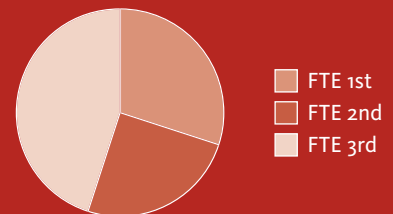
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Tenured

Full Professors	8.0 FTE
Associate Professors	6.3 FTE
Assistant Professors	12.2 FTE
Researchers	9.6 FTE

Non-tenured

Researchers	21.0 FTE
Postdocs	27.8 FTE
Doctoral candidates	64.0 FTE



(CDG). Glycosylation is a biochemical process of post-synthetic modification that occurs in most proteins and in all celltypes. In parallel with developing novel analytic techniques, the research group applies a broad range of biochemical, genetic and cell biological methods in order to identify new disease entities, improve current diagnostics and better understand pathophysiological mechanisms. These aspects are of prime importance for developing future therapeutic strategies.

Healthy aging / healthy living

Remarkable advances in medicine have allowed humans to live to quite unprecedented ages: average human life expectancy has increased from 45 years at the beginning of the 20th century to over 75 years at the beginning of the 21st century. Understanding the process of healthy ageing, as well as the role of exercise and activity in senescence, is the main topic of this research programme that covers human in-vivo approaches down to the genetic level. Living longer, however, does not necessarily mean living better. The metabolic syndrome, the central infirmity of the 21st century,

is one of the major focuses of this research programme. Risk factors contributing to the metabolic syndrome such as dyslipidemia, hypertension and insulin sensitivity are studied both separately and combined in patients with multiple risk factors. The overall goal is to improve the health – or vitality – of individuals as they age.

Hormonal regulation

This research programme focuses on two main topics, i.e. adrenal disorders and bio-markers. Within the first line of research the emphasis is on e.g. pheochromocytoma and congenital adrenal hyperplasia. The second part includes research on developing new bio-marker read-outs.

Iron metabolism

This research is designed to arrive at a full understanding of iron metabolism, in particular the identification and characterization of novel factors that mediate dysregulation of iron homeostasis in various human disorders among which some of the world's most prevalent diseases, including anaemia related to chronic kidney

Institute for Genetic and Metabolic Diseases



Nine Knoers, Full Professor of Human Genetics, studies inherited forms of kidney disease. In 2008 she has been appointed as member of the Dutch Health Council.



disease, rheumatic diseases, hereditary haemochromatosis, iron loading anaemia's, bacterial and malarial infections, cardiovascular disease and mild non-hereditary hepatic iron overload associated with alcohol abuse, hepatitis C and the metabolic syndrome. Among the most recent achievements is developing a mass spectrometry assay for the recently discovered iron regulatory hormone peptide hepcidin that is currently the subject of several translational studies.

Mitochondrial medicine

Within this group fundamental and applied studies ranging 'from molecule to man' are carried out under the guidance of scientists with a clinical, cell biological or bio-chemical background. The information gathered is used to develop new forms of treatment for diseases and adverse-health conditions in which the mitochondrial energy capacity is reduced. Defects of the human oxidative phosphorylation system are amongst the most frequently encountered inborn errors of metabolism and the study of patients with these devastating disorders has revealed important information about the role that mitochondria play in the normal process of ageing and in neurodegenerative diseases such as Parkinson.

Renal disorder

The kidneys play an essential role in several processes in our body including volume and osmo-regulation, electrolyte balance, and the excretion of metabolites and drugs. Within this theme the regulation of the physiological development of the kidney is studied in order to better understand the pathogenesis, to diagnose and ultimately cure or prevent kidney disorders. These disorders include

acquired and inherited forms of kidney diseases. The research projects are carried out on the genetic (gene defects, polymorphisms), molecular (transport proteins), and cellular (glomerular and epithelial cells) level. The results of fundamental and clinical research are integrated.

Awards

- Prof. Jack Wetzels received an award as 'MEDNET Toparts 2008 (best MEDNET doctor in 2008)'.
- Dr Anneke den Hollander and Dr Hans Koenderink received the prestigious Vidi grant in 2008.
- Richard Lopata received the Young Investigator Award at Euroson 2008.
- Prof. D. Swinkels and Prof. F. Sweep received the Noyons Stipendium for developing a serum assay for soluble hemojuvenile, a novel biomarker of iron homeostasis.

Research facilities

IGMD research and patient care requires an excellent laboratory infrastructure. State-of-the-art technology platforms are at the heart of this infrastructure, offering unique research opportunities. These include a DNA sequencing facility, genome scanning facility, expression array facility, proteomics facility and a metabolomics and glycomics facility. These platforms are the building blocks used to successfully apply genomics, proteomics and metabolomics approaches and to bring the data together in a holistic systems biology approach to genetic and metabolic disease. The technology platforms are largely hosted by the Department of Human Genetics and by the Laboratory of Genetic, Metabolic and Endocrine

Disorders. For researchers it is a challenge to make use of these facilities in their work and to incorporate this high-tech infrastructure in grant applications.

Collaboration

There is frequent and fruitful collaboration with researchers from the other research institutes at the University and the Radboud University Nijmegen Medical Centre. Researchers from IGMD are active in a wide range of national and international networks. For example, Prof. Jan Smeitink coordinates an IOP-Genomics research programme involving three Dutch universities in the Dutch MEN-1 Study Group and Renal Disorder researchers participate in the TOP Institute Pharma.

Researchers in the Functional Imaging group participate in a European FP7 network on Beta cell Imaging (BetaImage) and those working in the Renal disorders group participate in the European Network for the study on Orphan Nephropathies (Eunefron). Researchers engaged in Genome Disorders participate in the FP7 Collaborative Project TECHGENE (Technological innovation of high throughput molecular diagnostics of clinically and molecularly heterogeneous genetic disorders).

The IGMD collaborates with the following partners:

- University of Leuven, Belgium
- University of Hannover, Germany
- University of Birmingham, UK
- University of Denver, US
- NIH, Bethesda, USA
- University of Aarhus, Denmark
- University of Zurich, Switzerland
- University of Sydney, Australia
- Karolinska Institute, Stockholm, Sweden
- Max Planck Institute on Aging, Cologne, Germany

Research results

IGMD researchers received prestigious grants from ZonMw, NWO/ALW, the Dutch Kidney Foundation, STW, the Dutch Heart Foundation and in the European Framework Programmes.

In the European 7th framework programme Prof. Martin Gotthardt is the coordinator of a research project on the use of innovative strategies for beta-cell imaging in diabetes mellitus (BetaImage). Partners are from Geneva and Lausanne (Switzerland), both Universities in Brussels (Belgium), the Universities of Marburg and Freiburg (Germany), as well as Turku in Finland plus a commercial partner in Munich (Germany).

Prof. Hans Scheffer coordinates a research project on high throughput molecular diagnostics in individual patients for genetic diseases with heterogeneous clinical presentation (TECHGENE). University partners in this project are from Leuven, Prague,

Tübingen, Barcelona, Naples, Trieste, Manchester, and Toulouse, and a commercial enterprise in Tartu (Estonia) is also involved.

Prof. Joost Drenth established a pan-European Working Party on Alcoholic Chronic Pancreatitis (ACP) assembling researchers from 21 different sites in 12 European countries. This collaborative effort has enabled him to collect 2,585 well-phenotyped ACP cases and 2,980 ethnically matched controls in order to perform a Wellcome Trust funded case-control genome-wide association study. He also initiated a Dutch National Initiative on Autoimmune Hepatitis consisting of 11 Hepatologists from the University Medical Centres. The goal is to start investigating the epidemiology of the disease, to collect biological samples, and to investigate novel treatments.

In 2008 the Integrated FP6 Research Programme Eumitocombat, which is coordinated by Prof. Jan Smeitink, was successfully completed. This European Research consortium has been given an outstanding assessment by external reviewers. An application for extending this research programme has been submitted to the European Commission.

Societal impact

IGMD members take part in numerous patient organizations and frequently promote research at meetings involving the general public, conferences and other broadcastings. The Institute has developed an active policy on industrial-academic collaborations. Prof. Nine Knoers has been appointed as member of the Dutch Health Council. Prof. René Bindels is invited as a keynote speaker by the American Society of Nephrology.

Future research

Given the recent establishment of the institute, the priority is to ensure genuine cooperation among researchers working on the themes and activities identified by the task forces. The coming year (2009) will be used to formulate a sound research plan.

The research focus in Functional Imaging is on multi-modality imaging for cardiac and cerebral applications, in order to identify vulnerable plaque and diabetic patients; the group will work on developing and characterizing novel tracers for beta-cell imaging in animal models of diabetes.

The Molecular gastro-enterology and hepatology group intends to publish the results of the first randomized clinical trial on pharmacological treatment of polycystic liver disease in 2009. They will develop and genotype a new mouse model for polycystic liver disease in order to study the pathogenetic mechanisms that lead to polycystic liver disease and use it as a model to study the effect of pharmacological interventions designed to reduce or prevent polycystic livers.

Institute for Genetic and Metabolic Diseases

Key publications

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Dissertations:	17
Scientific publications:	522

Director: Prof. Jan Smeitink

Jan Smeitink has been Head of the Department of Metabolic and Endocrine Disorders at the University Children's Hospital of the Radboud University Medical Centre since 1996. In 1997 he set up the Nijmegen Centre for Mitochondrial Disorders, which has become internationally recognized as a centre of excellence for patient care, diagnostics and research on patients suffering from disturbances in the mitochondrial energy metabolism. In 2001 he became an extraordinary Professor and in 2006 a full Professor in Mitochondrial Medicine. In 2006 he was appointed for six years as Foreign Adjunct Professor at the Karolinska Institutet, Stockholm, Sweden. In August 2006 he received the Prinses Beatrix Foundation Award from the Dutch Queen for his research on mitochondrial medicine.



Institute for Genetic and Metabolic Disease

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Healthy Aging research focuses on the mechanisms involved in chronic diseases caused by inactivity. The final aim of the Mitochondrial Medicine group is to make a substantial contribution to developing a treatment for mitochondrial disease.

In Iron Metabolism new insights into mitochondrial iron homeostasis, soluble hemojuvelin and hepcidin will be translated into novel diagnostic assays and therapeutic strategies that can be implemented in the clinic.

The goal of research in Renal Disorders is to further strengthen the group's international research position in the field of genetic renal disorders and to become the top national reference centre for patients with these disorders. Furthermore, effort is being put into the use of pharmacological chaperones for the treatment of certain genetic tubular disorders.

Research Institute for Oncology



The Research Institute for Oncology aims to advance innovation in translational research in oncology and to reduce the morbidity and mortality of cancer. Researchers from several disciplines unravel the pathology of tumours, develop new diagnostics and therapies, and improve care.



New gene defects that cause colorectal cancer were found by Dr. Marjolijn Ligtenberg, Dr. Roland Kulper (photo), and colleagues.

The Institute was founded in 2008 as one of six research institutes of the Radboud University Nijmegen Medical Centre to enhance coordination and to strengthen research in oncology and oncology-related topics. Built on the tradition and strong reputation of existing research groups, the Institute operates in close association with the clinical service for patients with cancer under the umbrella of the Radboud University Nijmegen Medical Centre for Oncology.

Research within the Institute is organized in five themes, which form the basis for future research and for the appointment of new chairs/professorships. All current 'good to excellent' research is represented by these themes.

The basic principles underpinning the themes are:

- Research is patient-centred and related to patient care
- Research is arranged in themes, which are multidisciplinary and offer extra value when compared to the existing structures
- Close cooperation with NCMLS and NCEBP is very important.

The five themes of the Institute are:

Hereditary cancer and cancer-related syndromes

This theme focuses on the cause and early detection of hereditary and other cancer-related syndromes, develops improved detection methods for specific forms of hereditary cancer, and studies health-care and psychosocial aspects.

Age-related aspects of cancer

Cancer has several aspects that differ per age group. This theme investigates the cause of cancer in the young, the age-related pathology of tumours and its consequences, the need for specific approaches for special age groups, including pharmacology, developing programmes for early clinical trials in children, and adapting treatments for the elderly.

Translational research

This theme links research on tumour biology with clinical practice. Studies that focus on tumour immunology, tumour

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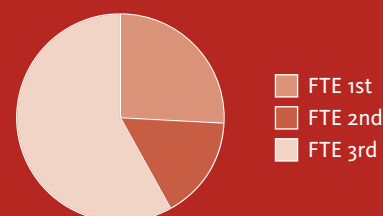
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 Prof. C.J.A. Punt (o)
 Prof. J. Ritskes (o)
 Prof. J.A. Schalken (p)
 Prof. L.J. Schultze Kool (o)
 Prof. P.J. Slootweg (o)
 Prof. C.G.J. Sweep (o)
 Prof. D.W. Swinkels (p)
 Prof. A.L.M. Verbeek (p)
 Prof. M.J.F. Vernooij-Dassen (p)
 Prof. K.C.P. Vissers (o)
 Prof. P. Wesseling (o)
 Prof. G.J van der Wilt (o)
 Prof. J.A. Witjes (o)
 Prof. T.J.M. de Witte (o)
 Prof. Th. Wobbes (o)

Tenured

Full Professors	11.6 FTE
Associate Professors	2.8 FTE
Assistant Professors	15.5 FTE
Researchers	14.1 FTE

Non-tenured

Researchers	38.4 FTE
Postdocs	11.0 FTE
Doctoral candidates	46.1 FTE



microenvironment interactions and tumour genomics will lead to new approaches for patients with certain tumour types and, in conjunction with industry Phase 1 and 2 trials, to their introduction in patient care. Much of the basic research that is conducted in the NCMLS will open up possibilities for cancer patients in this area.

Quality of care

Health care aspects include Quality-of-Life cost effectiveness, clinical decision making and implementation issues which are largely covered by the NCEBP. In this theme the new knowledge and tools that are coming out of this type of research are used to improve care for cancer patients.

Aetiology, screening and detection

This theme includes all research on genetic and lifestyle causes for the non-Mendelian forms of cancer and the role of such factors in cancer prognosis. A second focus is on the efficacy and effectiveness of policies for cancer screening (general population) and routine follow-up (clinical population).

Research facilities

In addition, the Institute supports technological and other platforms which are crucial to its research and which generally also serve other research institutes, such as the microscopy centre, functional imaging, medical technology assessment, genomics and proteomics, bioinformatics and biostatistics.

The following multi-institutional platforms are supported:

- Imaging
- High-throughput genomics
- Proteomics
- Unit for clinical application of new drugs
- Unit for psychosocial research tools
- Biostatistics
- Microscopy centre
- Central Animal Facility
- Bio-informatics
- Centre for minimal invasive treatment (Mitec)

Research Institute for Oncology

Key publications

Bartels, R.H., Linden, Y.M. van der & Graaf, W.T. van der (2008). Spinal extradural metastasis: review of current treatment options. *Ca. Cancer J. Clin.* 58, 245-59.

Benítez-Ribas, D., Tacke, P., Punt, C.J., de Vries, I.J. & Figdor, C.G. (2008). Activation of human plasmacytoid dendritic cells by TLR9 impairs Fc gammaRII-mediated uptake of immune complexes and presentation by MHC class II. *J. Immunol.*, 181(8), 5219-24.

Bussink, J., Kogel, A.J. van der & Kaanders, J.H.A.M. (2008). Activation of the PI3-K/Akt-pathway and implications for radiation resistance mechanisms in head and neck cancer. *Lancet Oncol.*, 9, 288-296.

Gutiérrez-Fernández, A., Fueyo, A., Folgueras, A.R., Garabaya, C., Pennington, C.J., Pilgrim, S., Edwards, D.R., Holliday, D.L., Jones, J.L., Span, P.N., Sweep, F.C., Puente, X.S. & López-Otín, C. (2008). Matrix metalloproteinase-8 functions as a metastasis suppressor through modulation of tumor cell adhesion and invasion. *Cancer Res.*, 68(8), 2755-63.

Hasselaar, J.G., Reuzel, R.P., Muijsenbergh, M.E. van den, Koopmans, R.T., Leget, C.J., Crul, B.J. & Vissers, K.C. (2008). Dealing with delicate issues in continuous deep sedation. Varying practices among Dutch medical specialists, general practitioners, and nursing home physicians. *Arch. Intern. Med.*, 168(5), 537-43.

Jones, P.A., Archer, T.K., Baylin, S.B., et al. (2008). Moving AHEAD with an international human epigenome project. *Nature*, 454(7205), 711-715.

Kiemeny, L.A., Thorlacius, S., Sulem, P., Geller, F., Aben, K.K.H., Stacey, S.N., Gudmundsson, J., Jakobsdottir, M., Bergthorsson, J.T., Sigurdsson, A., Blondal, T., Witjes, J.A., Vermeulen, S.H., Hulsbergen-

van de Kaa, C.A., Swinkels, D.W., Ploeg, M., Cornel, E.B., Vergunst, H., Thorgeirsson, T.E., Gudbjartsson, D., Gudjonsson, S.A., Thorleifsson, G., Kristinsson, K.T., Mouy, M., Snorraddottir, S., Placidi, D., Campagna, M., Arici, C., Koppova, K., Gurzau, E., Rudnai, P., Kellen, E., Polidoro, S., Guarrera, S., Sacerdote, C., Sanchez, M., Saez, B., Valdivia, G., Ryk, C., de, Verdier, P., Lindblom, A., Golka, K., Bishop, D.T., Knowles, M.A., Nikulasson, S., Petursdottir, V., Jonsson, E., Geirsson, G., Kristjansson, B., Mayordomo, J.I., Steineck, G., Porru, S., Buntinx, F., Zeegers, M.P., Fletcher, T., Kumar, R., Matullo, G., Vineis, P., Kiltie, A.E., Gulcher, J.R., Thorsteinsdottir, U., Kong, A., Rafnar, T. & Stefansson, K. (2008). Sequence variant on 8q24 confers susceptibility to urinary bladder cancer. *Nat. Genet.*, 40(11), 1307-1312.

Rossum, L.G. van, Rijn, A.F. van, Laheij, R.J., Oijen, M.G. van, Fockens, P., Krieken, H.H. van, Verbeek, A.L., Jansen, J.B. & Dekker, E. (2008). Random comparison of guaiac and immunochemical fecal occult blood tests for colorectal cancer in a screening population. *Gastroenterology*, 135(1), 82-90.

Smits, K.M., Schouten, L.J., Dijk, B.A. van, Hulsbergen-van de Kaa, C.A., Wouters, K.A., Oosterwijk, E., et al. (2008). Genetic and epigenetic alterations in the von hippel-lindau gene: the influence on renal cancer prognosis. *Clin. Cancer Res.*, 14(3), 782-7.

Wageningen, S. van, Breems-de Ridder, M.C., Nigten, J., Nikoloski, G., Erpelinck-Verschueren, C.A., Löwenberg, B., Witte, T. de, Tenen, D.G., Reijden, B.A. van der, Jansen, J.H. (2008). Gene transactivation without direct DNA binding defines a novel gain-of-function for PML-RARalpha. *Blood*, 111(3), 1634-43.

Dissertations:	13
Scientific publications:	511
Patents:	1

Collaboration

Researchers at the Institute are actively involved in a range of national and international research networks. The institute participates in the following organizations:

- The Biobanking and Biomolecular Resources Research Infrastructure (BBMRI) of the Netherlands Department of Education, Culture and Sciences
- Several EU FP6 programmes, including the POLYGENE consortium (with, for example, deCODE Genetics of Iceland)
- Several EU FP7 programmes, including the PROMARK consortium, the METOXIA consortium and the BIOMALPAR and HEROID networks

- The Children Oncology Group (COG)
- The European Network for Information on Cancer and Genetics
- The European Organisation for Research and Treatment of Cancer (EORTC): in the Executive Board of EORTC STBSG, as chairman of Translational Research Advisory committee (TRAC), as chairman of the Laboratory Research Division, as secretary of the Pathobiology Group (PBG), and as a member of the EORTC Imaging Platform. The Radboud University Nijmegen Medical Centre is one of 18 European Institutes that form the Network of Core Institutions (NOCI) of the European Organisation on research and Treatment of Cancer (EORTC).

Director: Prof. Han van Krieken

Prof. Han van Krieken is a pathologist with special expertise in the fields of haemato-pathology and the pathology of the gastrointestinal tract. He has been Professor of Tumour Pathology since 1999 and since 2005 has held the chair of Pathology and been Head of the Department of Pathology at the Radboud University Nijmegen Medical Centre. His research interests focus on the understanding of disease, in particular the development of cancer of the immune system and colorectal cancer. He is the treasurer of the European Association for Haematopathology, the secretary/treasurer of the European Society for Pathology (ESP), and the treasurer of the Dutch Colorectal Cancer Group. He is Chief Editor of the Journal of Hematopathology and a member of the editorial boards of the American Journal of Surgical Pathology and the Journal of Pathology.



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Research results

MRI imaging of the prostate is constantly improving, thanks to improved imaging techniques, such as 3-Tesla imaging and MR spectroscopy and the use of MRI equipment, such as endorectal coils, tools designed to perform directed endorectal biopsies with MRI and MRI contrast agents. Due to these improvements, local staging of prostate cancer, grading of the tumour and detection of disease outside the prostate (in lymph nodes or in bone marrow) is now possible with very high specificity and sensitivity. MRI can also be used to detect cancer in patients with proven prostate cancer during follow-up after therapy.

The Institute is very successful in acquiring research funds from the Dutch Cancer Society (KWF) and the Netherlands Organisation for Scientific Research (NWO). Projects funded by KWF and NWO are carried out within all themes. A few examples:

- Pre-targeted PET imaging and radio-immunotherapy of colorectal cancer.
- Multimodality imaging in the prediction of response to systemic treatment in colorectal cancer.
- Physiological and neurophysiological determinants of fatigue in cancer survivors.
- A Fellowship in orthopaedic oncology.

Prof. Jelle Barentsz, (radiologist) received a personal grant from the Dutch Cancer Foundation for the application of new MRI techniques to detect prostate cancer and its metastasis.

Prof. Leon Massuger received a ZonMW AGIKO clinical research grant for the project 'The role of differentiated VIN in the oncogenesis of HPV unrelated vulvar squamous cell carcinoma' of Hedwig van den Nieuwenhof.

In addition, grants were received from the KiKa foundation, the Quality of Life Foundation, and Pink Ribbon. Dr Hanneke van Laarhoven received a Veni grant. Furthermore, many studies are carried out in collaboration with industrial companies.

Societal impact

Cancer – a major health problem in developed countries – has an enormous physical and mental impact on patients and their families. Improving prevention, diagnosis and therapy as well as psycho-social assistance are important for the wellbeing of society as a whole. Researchers at the Institute are members of various national and international advisory boards.

Future research

The Institute formulates ideas based on the current situation and will use 2009 to establish whether the themes it has defined represent useful additions to existing structures. After a year, an initial evaluation will be carried out to assess the themes in terms of vitality and innovative strength. On the basis of this evaluation the Principal Investigators (PI's), junior PI's, theme leaders and other key researchers will formulate a research plan for the period from 2009 to 2014.

Nijmegen Institute for Infection, Inflammation and Immunity

The Nijmegen Institute for Infection, Inflammation and Immunity (N4i) consists of several strong research groups that deal with infectious diseases, inflammation and immunity – areas that are intimately connected. N4i's ambition is to achieve national and international leadership in research in these fields. This research, which is inspired by observations at the bedside, is designed to improve the diagnosis, treatment and prognosis of patients with infection, inflammatory and immunological disorders.



Infection

The primary focus of N4i is infection. Infectious diseases are of great importance worldwide. In developing countries infectious diseases remain a leading cause of death and of morbidity, with poverty adding a pivotal factor for vulnerability to infection and its outcomes. Infections such as tuberculosis, AIDS and malaria are among those that take the greatest toll; these infections are investigated in depth within N4i (facilitated by the PRIOR network which is governed by the Nijmegen group).

At the other end of the spectrum are the infections of medical progress, such as sepsis and fungal infections. These are associated with sophisticated medical treatments given to immunocompromised and frail patients. Research within N4i is aimed at understanding and strengthening host defence mechanisms. Emerging infections and new developments in non-antimicrobial therapy for infectious diseases (immunotherapy) are among the research challenges within N4i.

Inflammation

N4i has a strong focus on inflammation, the basic response of the host to tissue damage. Although infectious agents are among

the prime causes of inflammation, other kinds of tissue damage will also evoke an inflammatory response. In addition to the classic inflammatory diseases such as rheumatoid arthritis and psoriasis, it has become clear that many disease processes that were classically seen as non-inflammatory (such as atherosclerosis and 'degenerative' damage to joints) have an important inflammatory component. A new concept is that of auto-inflammatory disorders, in which an exaggerated inflammatory response results from a minor stimulus. Basic research on the inflammatory response yields important new insights into the pathogenesis of many diseases, facilitates the diagnostic process and leads to new approaches to treatment.

Immunity

The intertwined processes of inflammatory response and innate immunity are areas of intensive research within N4i. The adaptive immune response, in turn, is intimately linked to the innate immune response, together composing the third focus of research within N4i, i.e., immunity. Like inflammation, immunity may be deregulated, either leading to hypo-reactivity and immunodeficiency or to hyper-reactivity (leading to damage through autoimmunity or allergy). Research on autoimmunity focuses on the initiation of the



Dr Peter Pickkers (left), internist and intensivist, is working on improving methods for curing sepsis.

Staff

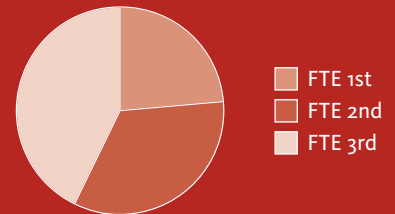
Prof. J.H.M. Berden (o)
 Prof. W.B. van den Berg (o)
 Prof. R.P. Bleichrodt (o)
 Prof. O.C. Boerman (o)
 Prof. P.N.R. Dekhuijzen (o)
 Prof. W.M.V. Dolmans (o)
 Prof. J.M.D. Galama (o)
 Prof. R. de Groot (o)
 Prof. Y.A. Hekster (o)
 Prof. P.W.M. Hermans (o)
 Prof. J.G. van der Hoeven (o)
 Prof. A.J. Hoitsma (e)
 Prof. P.C.M. van de Kerkhof (o)
 Prof. B.J. Kullberg (o)
 Prof. J.W.M. van der Meer (o)
 Prof. M.G. Netea (o)
 Prof. W.J.G. Oyen (o)
 Prof. P.L.C.M. van Riel (o)
 Prof. R.W. Sauerwein (o)
 Prof. J. Schalkwijk (o)
 Prof. G.J. Scheffer (o)
 Prof. P.H.M. Spauwen (o)
 Prof. D.W. Swinkels (p)
 Prof. P.E. Verweij (o)
 Prof. A. Voss (p)

Tenured

Full Professors	6.9 FTE
Associate Professors	3.4 FTE
Assistant Professors	9.8 FTE
Researchers	17.8 FTE

Non-tenured

Researchers	22.8 FTE
Postdocs	6.8 FTE
Doctoral candidates	57.0 FTE



immune response and consequent damage to various tissues such as skin, joints and kidneys. In transplant and transfusion immunology, research concentrates on delineating the processes that underlie immune tolerance, with a focus on monitoring and modulating the immune response after transplantation or transfusion and developing cell-based immunotherapy.

The Institute's research is structured within five themes:

- 1 Pathogenesis of the inflammatory response
- 2 Invasive mycoses and compromised host
- 3 Poverty-related infectious diseases
- 4 Mechanisms in modulation of inflammation
- 5 Auto-immunity and transplantation

Awards

- Prof. Ronald de Groot received the Bill Marshall Award from the European Society for Paediatric Infectious Diseases (ESPID).
- Dr Adilia Warris received the MSD Research Award and the ESPID Research Fellowship Award on behalf of Stefanie Henriët MSc.
- Prof. Peter Hermans received the Vienna Spot of Excellence Research Award.

- Prof. Jos van der Meer was one of the recipients of the leadership award of the Alliance for the Prudent Use of Antibiotics.
- Prof. Joost Schalkwijk received the Wyeth award 'Advances in psoriasis research'.
- The American Society of Medical Microbiology chose a paper by Hamza et al. (*Clin. Infect. Dis.*, 47(10), 1270-6) as one of the ten major publications on fungal infections in 2008.
- Dr Ellen Kreijveld received the Jon J. van Rood award for the best thesis in basic transplantation research.
- Shahla Abdollahi received the Gordon Van Arman Award of the Inflammation Research Association, USA.
- The NUCI award was presented to Jakko van Ingen, MSc.
- Dr Angelique Rops received the Best Thesis Award (2008) from the Netherlands Federation of Nephrology/Dutch Kidney Foundation.

Research facilities

N4i is a centre for clinical translational research that merges research at the bedside and the bench – in both directions. Both clinical departments (General Internal Medicine, Paediatrics, Nephrology, Dermatology, Rheumatology, Haematology, Pulmonary diseases, Intensive Care Medicine and Nuclear Medicine) and

Nijmegen Institute for Infection, Inflammation and Immunity

Key publications

Abdollahi-Roodsaz, S., Joosten, L.A.B., Koenders, M.I., Devesa, I., Roelofs, M.F., Radstake, T.R.D.J., Heuvelmans-Jacobs, M., Akira, S., Nicklin, M.J.H., Ribeiro-Dias, F. & Berg, W.B. van den (2008). Stimulation of TLR2 and TLR4 differentially skews the balance of T cells in a mouse model of arthritis. *J. Clin. Invest.*, 118, 205-216.

Bavel, C.C. van, Fenton, K.A., Rekvig, O.P., Vlag, J. van der & Berden, J.H. (2008). Glomerular targets of nephritogenic autoantibodies in systemic lupus erythematosus. *Arthritis Rheum.*, 58(7), 1892-9.

Emonts, M., Uitterlinden, A.G., Nouwen, J.L., Kardys, I., Maat, M.P., Melles, D.C., Witteman, J., Jong, P.T., Verbrugh, H.A., Hofman, A., Hermans, P.W. & Belkum, A. (2008). Host polymorphisms in interleukin 4, complement factor H, and C-reactive protein associated with nasal carriage of *Staphylococcus aureus* and occurrence of boils. *J. Infect. Dis.*, 197(9), 1244-53.

Hollox, E.J., Huffmeier, U., Zeeuwen, P.L., Palla, R., Lascorz, J., Rodijk-Olthuis, D., Kerkhof, P.C. van de, Traupe, H., Jongh, G. de, Heijer, M. den, Reis, A., Armour, J.A. & Schalkwijk, J. (2008). Psoriasis is associated with increased beta-defensin genomic copy number. *Nat. Genet.*, 40, 23-25.

Joosten, L.A., Heinhuis, B., Abdollahi-Roodsaz, S., Ferwerda, G., Lebourhis, L., Philpott, D.J., Nahori, M.A., Popa, C., Morre, S.A., Meer, J.W. van der, Girardin, S.E., Netea, M.G. & Berg, W.B. van den (2008). Differential function of the NACHT-LRR (NLR) members Nod1 and Nod2 in arthritis. *Proc. Natl. Acad. Sci. USA.*, 105(26), 9017-22.

Koenen, H.J., Smeets, R.L., Vink, P.M., Rijssen, E. van, Boots, A.M. & Joosten, I. (2008). Human CD25^{high}Foxp3^{pos} regulatory T cells differentiate into IL-17-producing cells. *Blood*, 112(6), 2340-52.

Lasonder, E., Janse, C.J., Gemert, G.J. van, Mair, G.R., Vermun, A.M., Douradinha, B.G., Noort, V. van, Huynen, M.A., Luty, A.J., Kroeze, H., Khan, S.M., Sauerwein, R.W., Waters, A.P., Mann, M. & Stunnenberg, H.G. (2008). Proteomic profiling of *Plasmodium* sporozoite maturation identifies new proteins essential for parasite development and infectivity. *PLoS Pathog.*, 4(10), e1000195.

Netea, M.G., Brown, G.D., Kullberg, B.J. & Gow, N.A. (2008). An integrated model of the recognition of *Candida albicans* by the innate immune system. *Nature Rev. Microbiol.*, 6(1), 67-78.

Snelders, E., Lee, H.A. van der, Kuijpers, J., Rijs, A.J., Varga, J., Samson, R.A., Mellado, E., Donders, A.R., Melchers, W.J. & Verweij, P.E. (2008). Emergence of azole resistance in *Aspergillus fumigatus* and spread of a single resistance mechanism. *PLoS Med.*, 5(11), e219.

Dissertations: 20
Scientific publications: 428
Patents: 1

research laboratories (those directly connected to the clinical departments as well as the laboratories Medical Microbiology, Clinical Pharmacy, Blood Transfusion and Transplantation Immunology and Tumour Immunology) are therefore the core components of the Institute. The Institute makes use of the following platform facilities which are available within the Radboud University Nijmegen Medical Centre:

- Animal facility (CDL). The university has excellent, up-to-date facilities for animal research with high-quality technical support. Expert advice on alternatives to animal experiments (reduction, refinement and replacement) can be obtained through the 3V Research Centre of the CDL.
- Imaging platform (Molecule-2-Man). The Microscopic Imaging Centre (MIC) at NCMLS, which is part of this platform, is a state-of-the-art facility for imaging of biological specimens, using light microscopy, electron microscopy and sophisticated digital imaging. In addition there is access to atomic force microscopy, flow cytometry, FRET and FRAP. In-vivo NMR facilities for animals and humans (7 Tesla) are available within this platform.
- Genomics. The Micro-array Facility Nijmegen offers facilities for gene expression profiling; a sophisticated sequencing facility and genotyping facility are also available.
- Proteomics. The Nijmegen Proteomics Facility (NPF) offers the fundamental technology for proteomics research. Equipment includes 2D electrophoresis, SELDI-TOF and Mass spectrometry (MALDI-TOF, MALDI-LTQ and nano-LC LTQ-FT MS).
- The Centre for Molecular and Biomolecular Informatics (CMBI), see p. 111. The research topics at CMBI are Comparative genomics, Bacterial genomics, Computational drug design and the Bioinformatics of macromolecular structures.
- The Clinical Research Centre Nijmegen CRCN helps carry out high-quality scientific research on humans according to ICH-GCP guidelines.
- GMP facility is used for clinical and translational research.

Collaboration

The research at N4i is embedded in international and national research networks within the fields of infection, inflammation and immunity. Apart from collaborations with outstanding laboratories in the western world, research at N4i also takes place within fruitful partnerships with developing countries, in particular in Tanzania (KCMC, Moshi) and Indonesia (Eijkman Institute, University of Indonesia and University Bandung).

International partners in research are: University of Colorado, USA; University of Aberdeen, UK; University of Barcelona, Spain; Boston University USA; Kilimanjaro Christian Medical Centre, Tumaini University Moshi, Tanzania; Eijkman Institute and University of Indonesia, Jakarta; Padjadjaran University Bandung, Indonesia; University of Manchester, UK; University of Tromsø, Norway; University of Erlangen, Germany; Hadassa University, Jerusalem, Israel.

Director: Prof. Jos van der Meer

Prof. Jos van der Meer was trained in internal medicine in Leiden, with a subspecialization in infectious diseases. After being appointed as Professor of Internal Medicine at Nijmegen in 1988, he became Head of the Department of General Internal Medicine and head of the specialty training programme for Internal Medicine in 1992. He is a member of the Royal Netherlands Academy of Sciences, where he became Vice-president and Chairman of the Department of Natural Sciences in 2005. He is a Knight in the order of the Dutch Lion.



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Research results

Patients with psoriasis have an increased number of copies of the b-defensin gene. b-defensin, which is produced by the skin, plays an important role in inflammation. The inappropriate inflammatory response in psoriasis is probably at least partially explained by the increased number of copies of the gene.

Prof. Peter Pickkers received a ZonMw AGIKO clinical research grant on behalf of Mirrin Dorresteyn MSc for the project 'HEME OXYGENASE: a novel pharmacological target in the treatment of sepsis' and Prof. Joost Schalkwijk received a AGIKO grant for the project 'The inflammasome and skin diseases: Fundamental and clinical aspects', on behalf of Heleen de Koning MSc. Dr Martin Boeree received a grant for research on tuberculosis from the European and Developing Countries Clinical Trials partnership.

Societal impact

Infectious disease is the number one reason for morbidity and mortality in the world and many aspects of the programme, such as poverty-related infection, vaccines and antibiotics designed to tackle this problem. Inflammation and immunity not only underlie infectious diseases but disorders of Inflammation and Immunity also play a major role in other diseases, which are studied within the framework of N4i. Researchers within N4i are actively involved in national and international organizations such as the KNAW, the Young Academy of KNAW, European Academic Scientific Advisory Council, Health Council of the Netherlands, the Centre for Infection (RIVM), ZonMw committees, European and Developing

Countries Clinical Trial Partnership, SWAB, ESCMID, the Dutch Working Party on SLE and several other professional societies.

Future research

By bringing together researchers to work on infection, inflammation and immunity, the critical mass for research on these fields has increased considerably in 2008. As N4i is based on common interests in the response of the host to exogenous and endogenous stimuli, it provides a platform for cross-fertilization in multi-disciplinary research.

Areas that will be explored in future collaborative research are:

- The role of pattern recognition and inflammasome activation in infection and inflammation disorders
- Natural immunity to infection in the evolution of mankind
- Resistance to antifungal drugs and its implications in clinical medicine
- Exploring the pathophysiology of major pathogens (pneumococci, staphylococci, malaria parasites and others) and developing vaccines
- Modulation of inflammatory and immunological responses using humoral and cellular tools (e.g. regulatory T cells)
- Exploration of the role of epithelial barriers in disease (e.g. psoriasis, atopic mucosal damage)
- Exploring the correlates of protection in poverty-related infections
- The role of apoptosis induced auto-antigen modifications on the initiation of autoimmunity.

Nijmegen Centre for Evidence-Based Practice

The Nijmegen Centre for Evidence-Based Practice (NCEBP) collects research evidence that can be used to optimize clinical practice and public health. In doing so, the NCEBP aims to: 1) translate concepts and mechanisms into evidence-based medicine, and 2) to translate evidence-based medicine into applied clinical practice and public health (implementation). In order to achieve this, the focus is on clinical and population studies, and on the development and application of innovative and valid methods for such studies. By taking a multidisciplinary approach, the NCEBP addresses two fundamental questions: what can be defined as effective, efficient and acceptable prevention and patient care, and how can we ensure that every patient receives such care? Such information is lacking in various areas of health care. Answers to these questions are of great importance for physicians, nurses, allied health care workers, patients, managers and policy makers.



Young patient participates in research by Dr Ria Nijhuis-van der Sanden.

The NCEBP intends to be a national and international centre of excellence in this field combining the expertise from the various disciplines and working on joint research themes, particularly in the field of prevention of and care for important chronic diseases.

The Centre has extensive ties with national and international health care-related organizations and institutions, and its research scientists are frequently invited to participate in or chair professional symposia and conferences. The social impact of the research carried out at NCEBP is both immediate and far-reaching, as every man, woman and child is affected by public health issues and primary care.

The core programmes include generic issues and methodologies as well as research on specific patient groups and conditions. A wide range of methodological expertise is available, comprising biostatistics, epidemiology, implementation science, evaluation of

complex medical interventions, research on quality of primary and hospital care and on nursing and allied health care, public health, research on psychological determinants of chronic illness and health care ethics. A number of research themes focus on clinical issues, such as human reproduction, COPD, sensorimotor problems and fatigue, cardiovascular diseases, mental health, Alzheimer's disease and infectious diseases. The NCEBP does research in 14 main areas.

Molecular epidemiology (Prof. B. Kiemeny)

This theme correlates molecular/metabolic and genetic factors with disease risks and disease outcomes. The theme has a strong focus on cancer but may include other multifactorial diseases, where there are overlapping specific mechanistic pathways (such as the 1-carbon metabolism) or overlapping research methodologies (such as whole genome genetic association analyses). Aetiology, diagnostic, prognostic and intervention research-related issues are all covered.

Staff

Prof. T. van Achterberg (o)
 Prof. C. de Baat (e)
 Prof. S.J. Bergé (o)
 Prof. J.J. van Binsbergen (e)
 Prof.G. Bleijenberg (p)
 Prof. J.D. Blankensteijn (o)
 Prof. B.R. Bloem (o)
 Prof. W.J.H.M. van den Bosch (o)
 Prof. D.D.M. Braat (o)
 Prof. J.K. Buitelaar (o)
 Prof. N.H.J. Creugers (o)
 Prof. G. Elwyn (o)
 Prof. B. G.M. van Engelen (o)
 Prof. R.J. van der Gaag (o)
 Prof. A.C.H. Geurts (o)
 Prof. W.T.A. van der Graaf (o)
 Prof. R.P.T.M. Grol (o)
 Prof. H.A.M.J. ten Have (o)
 Prof. M.T.E. Hopman (o)
 Prof. M.C.D.N.J. Huysmans (o)
 Prof. A. van Kampen (o)
 Prof. C. Katsaros (p)
 Prof. P.C.M. van de Kerkhof (o)
 Prof. L.A.L.M. Kiemeneij (o)
 Prof. R.T.C.M. Koopmans (o)
 Prof. F.W. Kraaimaat (o)
 Prof. J.A.M. Kremer (o)
 Prof. A.M. Kuijpers-Jagtman (o)

Prof. R.F.J.M. Laan (p)
 Prof. A.L.M. Lagro-Janssen (o)
 Prof. E. van Leeuwen (o)
 Prof. J.W.M. Lenders (o)
 Prof. F.K. Lotgering (o)
 Prof. J.M.H. de Moor (e)
 Prof. M.G.M. Olde Rikkert (o)
 Prof. R.A.B. Oostendorp (e)
 Prof. A.J.P.M. Overbeke (e)
 Prof. W.H. van Palenstein Helderma (e)
 Prof. P.L.C.M. van Riel (o)
 Prof. E.W. Roscam Abbing (p)
 Prof. P.H. Schoof (o)
 Prof. L.J. Schultze Kool (o)
 Prof. J.L.R.M. Smeets (o)
 Prof. P.A.G.M. de Smet (e)
 Prof. P.A.B.M. Smits (o)
 Prof. A.E.M. Speckens (o)
 Prof. A.F.H. Stalenhoef (o)
 Prof. P.M.J. Stuyt (p)
 Prof. H.A. van Swieten (o)
 Prof. G.J. Truin (o)
 Prof. J. van der Velden (o)
 Prof. A.L.M. Verbeek (p)
 Prof. N.J.J. Verdonschot (o)
 Prof. F.W.A. Verheugt (o)
 Prof. M.J.F.J. Vernooy-Dassen (p)
 Prof. K.C.P. Vissers (o)

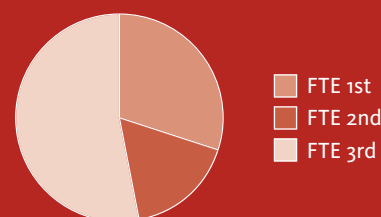
Prof. P.F. de Vries Robbé (o)
 Prof. C. van Weel (o)
 Prof. G.J. van der Wilt (o)
 Prof. J.A.. Witjes (o)
 Prof. J.R.L.M. Wolf (o)
 Prof. G.A. Zielhuis (o)

Tenured

Full Professors	10.6 FTE
Associate Professors	5.3 FTE
Assistant Professors	14.6 FTE
Researchers	25.9 FTE

Non-tenured

Researchers	46.1 FTE
Postdocs	3.4 FTE
Doctoral candidates	74.9 FTE



Evaluation of complex medical interventions (Prof. G.J. van der Wilt)
 This theme focuses on the multidimensional relationship between context, problem definition, intervention with multiple components, quantification of the potential of improvement, and evaluation. Complexity means extending beyond the intervention to include the major endpoint, which consists of combinations of clinical, individual and societal components. Furthermore, the inherent dynamics of interventions over time are of pivotal importance.

Implementation science (Dr M. Wensing)
 This theme focuses on improving health-care practice, with a specific focus on primary care. It includes the development and evaluation of performance indicators, interventions to achieve sustainable change, and the factors associated with changes in performance. The interventions studied include methods of professional education, organizational interventions, patient-mediated interventions and market-oriented interventions.

Quality of hospital and integrated care (Dr H. Wollersheim)
 Research within this theme is designed to measure and improve the quality and safety of patient care in hospitals, home care and nursing homes. In addition, handovers between these three settings or handovers with general practice are studied. Research covers clinical patient care across a wide range of diseases. It comprises the development and evaluation of quality indicators and effective implementation strategies, including integrated care systems.

Health care ethics (Prof. E. van Leeuwen)
 Health care ethics encompasses the study of the ethical aspects involved in change processes. On a philosophical level, a conceptual analysis is made of theories and concepts that underlie the processes of change. Together these studies make it possible to evaluate existing care in the light of changing norms and values, and they contribute to improving decision-making and the quality of care.

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Ria Nijhuis-van der Sanden, Full Professor in Allied Health Sciences, specialized in paediatric physical therapy, studies the effectiveness of muscle strength training on skill learning and locomotor development in young children.



Quality of nursing and allied health care (Prof. Th. Van Achterberg)

Research on nursing and allied health care sciences is a relatively young field. Challenges include searching for scientific evidence to support clinical practice and professional development. While medical care focuses on aetiology, diagnostics and treatment of diseases and cure, nursing and allied health care focus on disease prevention and the consequences of illness and disease for functioning, activities and participation.

Effective primary care and public health (Prof. C. Van Weel)

This research programme was established to support health care in the (primary care) population. The main challenges are to promote and preserve the health and functioning of ageing populations. In pursuing this, health care has to be directed at all patient groups in the community (regardless of health problems, gender, age or social class) while combining a variety of approaches: health promotion, disease prevention, diagnosis and treatment of diseases, rehabilitation, support of patients and palliation of suffering.

Psychological determinants of chronic illness (Dr A. Evers)

The research includes two related topics. The first topic concerns 'Psychological factors in chronic somatic illnesses' and focuses on the psychological risk factors and treatments of chronic somatic illnesses in adults and children (e.g., heart and lung diseases, rheumatic diseases, skin diseases, cancer and infertility). The second topic concerns 'Cognitive disorders' and relates to the sensitivity and specificity of cognitive profiles in relationship to the types of disorders, diagnostic and treatment methods and their consequences in adults and children (e.g., developmental speech and language disorders in children, mild cognitive impairment, Alzheimer and Parkinson's disease).

Mental health (Prof. A. Speckens)

The aim of this research is to study the determinants, prevalence, prognostic significance and treatment of mental health problems from a patient-centered perspective. The theme focuses in particular on mood disorders, somatoform disorders, partner violence, Attention Deficit / Hyperactivity Disorder (ADHD) and Autistic Spectrum Disorders (ASD). Many projects apply a developmental perspective and study the precursors, longitudinal course, and the age-related manifestations of these disorders.

Sensorimotor problems and fatigue (Prof. S. Geurts)

Various chronic conditions affect physical ability and fitness and may cause (severe) fatigue. As a result a vicious circle of reduced activity and further decline in fitness may occur. By focusing on specific neurological, orthopaedic and oncologic diseases and on chronic fatigue syndrome, it is possible to disentangle the generic determinants from the disease-specific determinants of movement disability, reduced activity and fatigue. By doing so, assessment and intervention strategies can be improved, resulting in better perceived health and quality of life.

Alzheimer Centre (Prof. M. Vernooij-Dassen)

The Nijmegen Alzheimer Centre (NAC) focuses on developing and evaluating support programmes in order to directly improve the quality of care and the quality of life for people with dementia and their families. Efficiency studies of these programmes are carried out to contribute to high-quality care at acceptable cost. In addition, NAC contributes to fundamental knowledge on Alzheimer's disease.

Human reproduction (Prof. J. Kremer)

Human Reproduction is a stormy developing research topic, due to the increase in demand, growing awareness of prevention, diagnostic and therapeutic possibilities, and available evidence. Patients and society keep track of these developments and have relevant questions about the aetiology and prevention of reproductive and developmental disorders, as well as about the safety, effectiveness, and patient-centeredness of reproductive and obstetric care. This research theme is designed to provide answers to these questions.

Infectious diseases and international health (Dr A. van der Ven)

The mission within this theme is to improve population health in low and high income countries by developing an evidence base for decision-making. The research activities are integrated, combining clinical, public health and economic disciplines. Project activities centre on i) poverty-related diseases, ii) public health and health systems in developing countries, and iii) general infectious diseases.

Cardiovascular diseases (Dr G. Rongen)

The focus of this theme is on 'mechanisms of vascular injury' on the one hand, and the 'consequences of vascular injury' on the other hand. This theme covers the first two steps of translating fundamental research into clinical practice. This involves human *in vivo* proof-of-concept-studies and studies from concept to evidence-based medicine. The genetic and metabolic causes of atherosclerosis and thrombosis – and of their risk factors – are investigated. Regulating vascular tone in health and disease is an important research topic.

Awards and acknowledgements

- On behalf of the researchers of the Nijmegen Biomedical Study, Prof. D. Swinkels received the first prize in the category 'Business Management' for her presentation at the Dutch Society for Clinical Chemistry.
- N. Gerlach, MSc received The Marten Hut prize for the best lecture on a validation study, concerning the reproducibility of nerve tracking in the mandibula.
- S. Spillekom van Koullil, MSc, received the award for best presentation during the Annual Dutch Conference on Rheumatology.
- Dr M. Graff was awarded the 2nd prize of the programme 'Pfizer Care for Tomorrow'.
- Dr E. de Laat received the Anna Reynvaan award for the best publication in this field.
- Prof. C. van Weel received the Maurice Wood award, the most prestigious international award for research in the field of primary care.
- 'MijnZorgNet', an initiative by one of the NCEBP partners, was elected as one of the most innovative care initiatives of The Netherlands by the Innovation Platform. The award was granted by the Dutch Minister of Health, during the 'Top conference Innovative Care Initiatives, Innovations within Reach' on 15 May, 2008.
- The Parkinson Centre Nijmegen (ParC) was recognized as Centre of Excellence by the National Parkinson Foundation.
- Prof. M. Vernooij-Dassen was appointed as an honorary visiting professor at the University of Bradford.
- A. van Beek, MSc, was awarded the Frye stipendium.
- Ir. R. Lopata received the Young Investigator Award at Euroson 2008, Timisoara Rumania for his presentation: 'Cardiac Strain Imaging for Diagnosis of Chronic Heart Failure'.
- M. Nillesen, MSc, received the Student Poster Prize at Nieuwlicht, the 35th anniversary conference of the Dutch Society for clinical Physics for her presentation: 'Cardiac Output Assessment in non-standard echocardiographic images'.
- Dr N. Riksen was awarded the yearly dissertation prize by the Dutch Society for Clinical Pharmacology & Biopharmacy, the Einthoven Dissertation Prize 2008 from the Dutch Society for Cardiology and Inter-university Cardiology Institute, the Vascular Medical Science Prize 2008 by the Dutch Society for Vascular Medical Science. Dr N. Riksen also received an honorary mention in relationship to the Dr Roos Award by the Dutch Internist Association.

Research facilities

Within the NCEBP, ICT networks, databases and registries are of the utmost importance because of the research focus on clinical and population studies. The following facilities are used:

- A General Practice Academic Network comprising primary care and public health practices and institutions, a Nursing Home network, and a National General Practice Registration Network (LINH).
- Registries on COPD and asthma in primary care; on patients with Parkinson's disease (ParkNet), patients with Prader Willi Syndrome and patients with neuromuscular diseases.
- A large database, entitled 'The Nijmegen Biomedical Study'
- 'MijnZorgNet', an innovative platform designed to improve care
- Databases on urology patients; patients with psoriasis and eczema; cohorts exposed to pesticides and/or organic solvents with referent populations (non-exposed men and women); follow-ups of IVF and ICSI children; fertility episodes and IVF treatments; cohorts of preterm infants; patients with low back pain and neck pain
- AGORA databank with DNA and environmental data on parents and children with congenital malformations or childhood cancer
- Nijmegen Continuous Morbidity Registration (CMR)
- Nijmegen Monitoring Project (NMP)
- European Information Network Ethics in Medicine and Biotechnology (Eurethnet);
- 'Safe or Sorry' database on the incidence of pressure ulcers, falling incidents and urinary tract infections in hospital and nursing home wards
- Cancer Registry of the Comprehensive Cancer Centre (IKO)
- 'String of Pearls Initiative' (PSI), a clinical biobank.

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Key publications

Albers, M., Schermer, T., Heijdra, Y., Molema, J., Akkermans, R. & Weel, C. van (2008). Predictive value of lung function below the normal range and respiratory symptoms for progression of chronic obstructive pulmonary disease. *Thorax*, 63, 201-7.

Boonstra, T.A., Kooij, H. van der, Munneke, M. & Bloem, B.R. (2008). Gait disorders and balance disturbances in Parkinson's disease: clinical update and pathophysiology. *Curr. Opin. Neurol.*, 21, 461-71.

Graff, M., Adang, E.M.M., Vernooij-Dassen, M., Dekker, J., Johnsson, L., Thijsen, M., Hoefnagels, W. & Olde-Rikkert, M. (2008). Cost-effectiveness of community occupational therapy for older patients with dementia and their care givers. *Brit. Med. J.*, 336, 134-138.

Grol, R., Berwick, D.M. & Wensing, M. (2008). On the trail of quality and safety in health care. *Brit. Med. J.*, 336, 74-76.

Hamza, O.J., Matee, M.I., Brüggemann, R.J., Moshi, M.J., Simon, E.N., Mugusi, F., Mikx, F.H., Lee, H.A. van der, Verweij, P.E. & Ven, A.J. van der (2008). Single-dose fluconazole versus standard 2-week therapy for oropharyngeal candidiasis in HIV-infected patients: a randomized, double-blind, double-dummy trial. *Clin. Infect. Dis.*, 47, 1270-1276.

Hasselaar, J.G., Reuzel, R.P., Muijsenbergh, M.E. van den, Koopmans, R.T., Leget, C.J., Crul, B.J. & Vissers, K.C. (2008). Dealing with delicate issues in continuous deep sedation. Varying practices among Dutch medical specialists, general practitioners, and nursing home physicians. *Arch. Intern. Med.*, 168, 537-543.

Janssens, H.J.E.M., Janssen, M., Lisdonk, E.H. van de, Riel, L.C.M. van & Weel, C. van (2008). Use of oral prednisolone or naproxen for the treatment of gout arthritis: a double-blind, randomised equivalence trial. *Lancet*, 371, 1854-1860.

Kiemeny, L.A., Thorlacius, S., Sulem, P. *et al.* (2008). Sequence variant on 8q24 confers susceptibility to urinary bladder cancer. *Nat. Genet.*, 40, 1307-1312.

Knoop, H., Meer, J.W.M. van der & Bleijenberg, G. (2008). Guided self-instructions for people with chronic fatigue syndrome: randomised controlled trial. *Brit. J. Psych.*, 193, 340-341.

Nelen, W.L., Pluijm, R.W. van der, Hermens, R.P., Bergh, C., Sutter, P. de, Nygren, K.G., Wetzels, A.M., Grol, R.P. & Kremer, J.A. (2008). The methodological quality of clinical guidelines of the European Society of Human Reproduction and Embryology (ESHRE). *Hum. Reprod.*, 23, 1786-92.

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Rijken, R. van der, Hulstijn-Dirkmaat, G., Kraaiaam, F., Nabuurs-Kohrman, Nijveld, A., Maassen, B. & Daniëls, O. (2008). Open-heart surgery at school age does not affect neurocognitive functioning. *Eur. Heart J.*, 29, 2681-8.

Riksen, N.P., Hausenloy, D.J. & Yellon, D.M. (2008). Erythropoietin: ready for prime-time cardioprotection. *Trends Pharmacol. Sci.*, 29, 258-267.

Rommelse, N.N., Arias-Vasquez, A., Altink, M.E., Buschgens, C.J., Fliers, E., Asherson, P., Faraone, S.V., Buitelaar, J.K., Sergeant, J.A., Oosterlaan, J. & Franke, B. (2008). Neuropsychological endophenotype approach to genome-wide linkage analysis identifies susceptibility loci for ADHD on 2q21.1 and 13q12.11. *Am. J. Hum. Genet.*, 83, 99-105.

Thanks to close relationships with clinical researchers, the NCEBP has access to the following facilities or techniques:

- The Clinical Research Centre Nijmegen – a facility that encourages and supports clinical trials within the Radboud University Nijmegen Medical Centre
- Automated high-speed scanners for data entry (questionnaires, CRFs, Teleform);
- Toxicology laboratory for developing and assessing novel biomarkers
- A facility for genetic epidemiological consultancy and analyses
- CANTAB®, revised CAMCOG®, ANT®, Sway star®, EASYCare®, Transcranial Doppler measurement device and expertise (TCD)

and Cranial near infrared spectroscopy (NIRS), Affymetrix DNA SNP chip technology, EMMA

- Nijmegen Motor Unit, Radboud Laboratory for Transcranial Magnetic Stimulation, Laboratory for electro-neurophysiological research in children with developmental and speech-language disorders
- E-health and test organizer for medical psychological screening and treatment of patients at risk
- European Influenza Surveillance Scheme
- PINCH: European programme on environment & child health
- Telefysiek Consulting system
- Numerous human in-vivo models for 'proof-of-concept' studies.

Schouten, L.M.T., Hulscher, M.E.J.L., Everdingen, J.J.E. van, Huijsman, R. & Grol, R.P.T.M. (2008). Evidence for the impact of quality improvement collaboratives: systematic review. *Brit. Med. J.*, 336, 1491-1494.

Schouwenberg, B.J., Veldman, B.A., Spiering, W., Coenen, M.J., Franke, B., Tack, C.J., Galan, B.E. de & Smits, P. (2008). The Arg16Gly variant of the beta2-adrenergic receptor predisposes to hypoglycemia unawareness in type 1 diabetes mellitus. *Pharmacogenet. Genomics* 18, 369-372.

Spijker, A., Vernooij-Dassen, M., Vasse, E., Adang, E., Wollersheim, H., Grol, R. & Verhey, F. (2008). Effectiveness of nonpharmacological interventions in delaying institutionalization of patients with dementia: a meta-analysis. *J. Am. Geriatr. Soc.*, 56, 1116-28.

Vries, R.B.M. de, Oerlemans, A.J.M., Trommelmans, L., Dierickx, K. & Gordijn, B. (2008). Ethical Aspects of Tissue Engineering: A Review. *Tissue Engineering: part B*, 14, 4, 367-375.

Wilt, G.J. van der & Zielhuis, G.A. (2008). Merging evidence-based and mechanism-based medicine. *Lancet*, 372, 519-20.

Wouts, L., Oude Voshaar, R.C., Bremmer, M.A., Buitelaar, J.K., Penninx, B.W. & Beekman, A.T. (2008). Cardiac disease, depressive symptoms, and incident stroke in an elderly population. *Arch. Gen. Psychiatry*, 65(5), 596-602.

Dissertations: 38
Scientific publications: 989

Collaboration

National

- Minimal Invasive Technology expert Centre (Radboud University Nijmegen Medical Centre and University of Twente)
- Several KNAW-accredited research schools
- National Expert and Training Centre for Breast Cancer Screening (LRCB) and Erasmus Medical Centre, Rotterdam
- Integral Network of Infertility Care East (INF-O, Ede)
- Alzheimer Centres from Amsterdam and Maastricht
- In the fields of mental health problems and alcohol: Universities of Amsterdam (VU), Leiden, and Groningen, the Netherlands Institute for Health Sciences Research, Trimbos, NHG, CBO

- In cancer research: KWF, IKO, RIVM, and Wageningen University
- The Consortium Mental Retardation ('Consortium VG Oost Nederland'): Institutes for the Mentally Retarded
- Radboud University Medical Centre takes part in a national biobank initiative from the Dutch Federation of University Medical Centres (NFU). The purpose of this 'String of Pearls Initiative' (PSI) is to create a research infrastructure for future studies on the (genetic) determinants, diagnosis and prognosis of eight selected diseases. The clinical biobank connects DNA and other biomaterial of hundreds of patients to detailed phenotype information. In this way a national database is built up to support high-quality clinical and epidemiological studies.

International

- European Geriatric Network GERONTONET (Department of Geriatrics)
- European Breast Cancer Network, International Consortium for Prostate Cancer Genetics, for Childhood Cancer, and European Prospective Investigation into diet and Cancer (EPIC)
- University of North Carolina
- Center on Birth Defects and Developmental Disabilities, Centres for Disease Control and Prevention, Atlanta, USA
- EU 6th Framework STREP programme POLYGENE
- Arizona State University, the Medizinische Hochschule Hannover, University of Central Florida, University of Toronto, and University of Wisconsin-Madison
- European IVF Monitoring taskforce (EIM), Brussels, Belgium
- Institute of Neurology (London), the Universities of Basel, Southampton, Johns Hopkins, Hamburg, Kiel, Tel-Aviv, Lübeck and Vancouver
- Universities of Berlin, Lübeck, Basel, Umea and Vienna
- WHO regional Centre for Oral Health Services Research in Damascus, Syria; Ege University, Izmir, Turkey; Witswatersrand University, Johannesburg, South Africa; and the Pan-American Health Organization (PAHO), Oral Health Department, Washington, USA
- APRIORI is a collaborative venture between Radboud University Nijmegen Medical Centre, LUMC, Kilimanjaro Christian Medical Centre in Tanzania, AHRI Ethiopia and MRTC Mali
- The IMPACT programme is an EU-funded consortium, with RUNMC as European coordinator. The partners are Cordaid, UM, University of Antwerp, Padjadjaran University Bandung, Indonesia
- The Research Centre for Allied Health Sciences participates in developing core-sets of the International Classification of Functioning, Disability and Health for various patient groups, coordinated by the University of München (Germany)
- Participation in the Cochrane Collaboration Field 'Primary Care'
- SUNY Upstate Medical University, Syracuse, New York, Institute of Psychiatry, University College London, London, Universität Duisburg-Essen, Essen, Germany

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- Department of Cognitive and Neural Systems, Boston University
- IRUN partner University of Münster, Department of Dermatology

Research results

In 2008, PhD theses were defended successfully in all 14 themes. In total a number of 36 PhD theses from the NCEBP were defended, three of them with *cum laude*:

- Dr Th. Rosemann: 'Patients with osteoarthritis in primary care'.
- Dr M. Graff: 'Effectiveness and efficiency of community occupational therapy for older people with dementia and their caregivers'.
- Dr T. Gerrits: 'A medical anthropologist view on a patient-centered IVF clinic'.

The NCEBP thematic groups were also successful in acquiring grants and starting new PhD projects. Within the Alzheimer Centre impressive grants were awarded, one from the Centre for Translational Molecular Medicine (CTMM) and a Vidi grant for Prof. R. Kessels.

In 2008, the DIMCA project on Chronic Obstructive Pulmonary Disease was finished successfully. The most important result is that early detection of COPD by spirometry and subsequent treatment improves the quality of life of these patients considerably. However, pharmacotherapy was not able to slow down the fall in pulmonary function.

The ParkinsonNet trial was also finished successfully with a positive evaluation by the Netherlands Organisation for Health Research and Development (ZonMw).

In 2008, further results became available from the EU 6th Framework project POLYGENE. In close collaboration with deCODE Genetics, whole genome association studies were conducted. New genes and additional candidate genomic regions were identified and published in high-impact journals.

In 2008, the department, which is led by Prof. R. Grol, was restyled and renamed 'Scientific Institute for Quality of Healthcare', abbreviated as IQ Healthcare. This new name was introduced during a highly successful conference on patient safety, with an introductory lecture by the Minister of Health, Dr A. Klink.

Societal impact

The societal impact of NCEBP research is not only reflected by the large number of invitations for keynote lectures at home and abroad, but also in memberships of numerous advisory boards and committees. Many scientists at NCEBP are members of influential Netherlands scientific committees such as the Health Council, the Medicine Evaluation Board, Royal Netherlands Academy of Arts and Sciences (KNAW), ZonMw, the Netherlands Organisation for Scientific Research (NWO), the Dutch Cancer Society, Council of

Health Research, the Asthma Foundation, the Diabetes Research 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 2008:

- Active presentation of research in the popular press by Prof. J. Kremer, especially in the field of *in vitro* fertilisation, patient centeredness and the role of internet in health care.
- Based on scientific results from the NCEBP, the international guideline on the detection of hereditary colorectal cancer has been changed.
- The NCEBP was involved in the organization of several meetings on patient safety.
- Development and realization of the first renewed course on neurorehabilitation for physiotherapists and occupational therapists, organized by the Netherlands Paramedical Institute (NPI).
- Significant contributions to guidelines, for example on 'Prevention of falls' and on 'exercise intervention in osteoporosis'.

Future research

In 2009 special attention will be paid to the following issues:

The interrelationship between primary care and public health will be intensified. One example of such an interaction is the research on epidemics of Q fever in animals and in man. Preventing these outbreaks is important in densely populated areas with intensive animal husbandry. To this end, databases from general practitioners and from health service centres will be combined.

In 2009, the NCEBP will also focus on several aspects of patient safety, including transmurial aspects and medication safety.

In 2008 the infrastructure of a national biobank initiative from the Dutch Federation of University Medical Centres (NFU) was set up with major contributions of groups from NCEBP. This 'String of Pearls Initiative' (PSI) starts with the inclusion of patients in spring 2009. Soon thereafter PSI will come into full operation and preparations will be made to utilize the database for studies within the context of NCEBP as well. In addition, the project will be used as a model for Radboud University Nijmegen Medical Centre to build a sustainable biobank research infrastructure covering the full range of patients. The Nijmegen Biomedical Study (NBS) serves as a general reference population for patient groups from this and other biobanks.

Recently, the 'Nijmegen Fall Simulator' was introduced within the NCEBP with a grant obtained by the Netherlands Organization

Director: Prof. Paul Smits

Paul 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 vascular medicine. Prof. Smits is a member of the Dutch Medicines Evaluation Board, the Health Council of the Netherlands and the Dutch Pharmacological Society.



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for Scientific Research (NWO). In several new PhD projects this autumn, the simulator will be the central scientific tool.

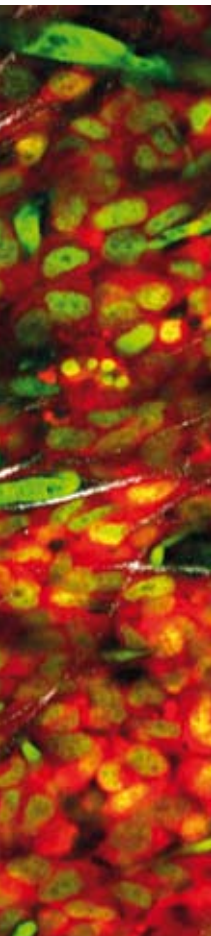
A more general future issue for the NCEBP is our growing interest in mechanisms of diseases. Although evidence-based medicine is the central focus of the NCEBP, the research institute will increasingly pay attention to mechanism-based medicine.

In fact, one of the future aims of the NCEBP is to combine these two paradigms for the following four reasons. First, the questions of an intervention's effectiveness and its mechanism are closely linked: interventions are based on an idea or a model of how the symptoms of a disease present, and how an intervention might work. This model and its empirical basis might, however, become obscured over time. Second, an intervention can be effective, even though it is based on an erroneous assumption about its mechanism of action. Third, the effectiveness of an intervention can be assessed, without inquiring into its mechanism. Although such a study might produce important information, it does not improve knowledge of the underlying pathophysiological processes. Not having such knowledge might hinder developing novel and potentially more effective interventions in the long term. Fourth, efficacy and mechanistic issues can be addressed in a single study, but the underlying model needs to be made explicit and additional data obtained to test it (see reference Wilt van der G.-J. & Zielhuis G. (2008). *Lancet*, 372, 519-20).

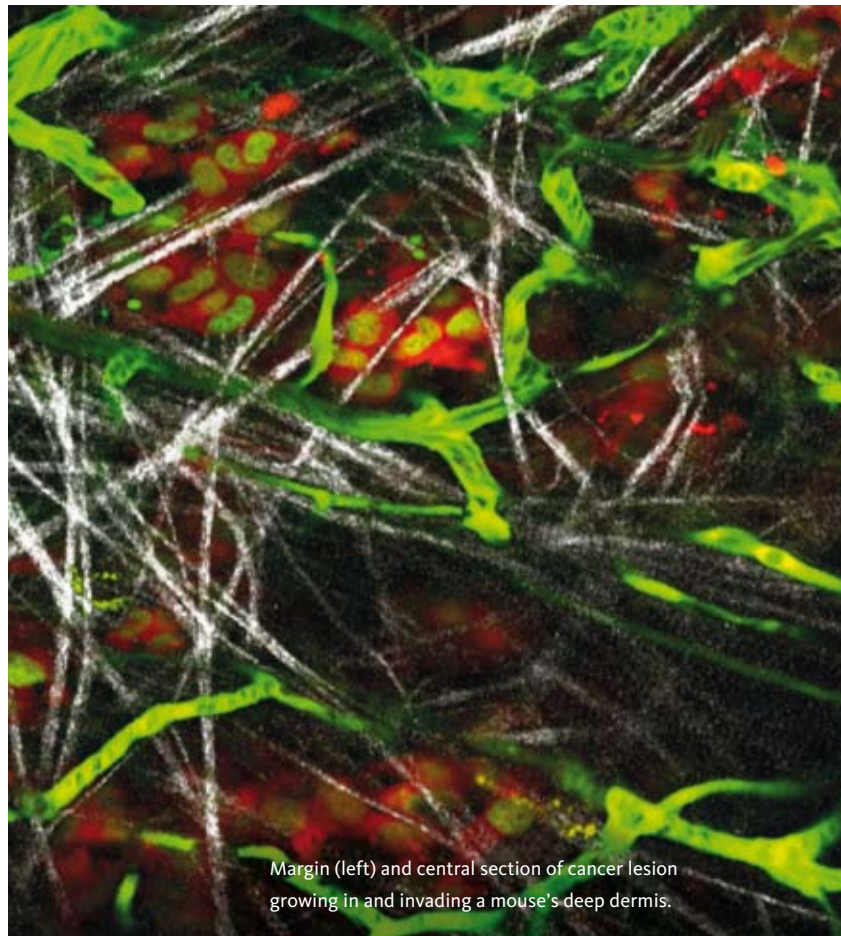
In the near future, the NCEBP will try to integrate this line of thinking in ongoing research projects on evidence-based medicine.

Finally, a new theme was introduced recently, entitled 'Cardiovascular diseases'. Cardiovascular morbidity and mortality is still the number one health problem in the Netherlands. Future plans for this theme include mechanism-based clinical studies on the causes and on the consequences of cardiovascular injury.

Nijmegen Centre for Molecular Life Sciences



The Nijmegen Centre for Molecular Life Sciences (NCMLS) seeks to achieve greater insights into the complexity of living cells in order to obtain comprehensive knowledge of both normal and pathological processes. NCMLS pursues its goals in the interests of curiosity-driven research and education. The NCMLS aims to advance innovation in translational research, based on integrating diverse areas of scientific expertise within the molecular and medical sciences.



Margin (left) and central section of cancer lesion growing in and invading a mouse's deep dermis.

The NCMLS is a leading multidisciplinary research school that is accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW) and operates within the domain of molecular mechanisms of disease and particularly in the fields of molecular medicine, cell biology and translational research. The NCMLS accommodates research groups from both the Radboud University Nijmegen Medical Centre and the Faculty of Science. Research takes place within three main research themes in keeping with the mission towards 'Understanding the cellular basis of disease': (1) Infection, immunity & tissue regeneration; (2) Metabolism, transport & motion; and (3) Cell growth & differentiation.

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 that 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 research is aimed at repairing or replacing 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 is taken to define the molecular basis of immune regulatory circuits, events that trigger or fuel immune-related disorders and infectious diseases, and tissue pathology and regeneration as well as stem cell behaviour and differentiation.

Staff

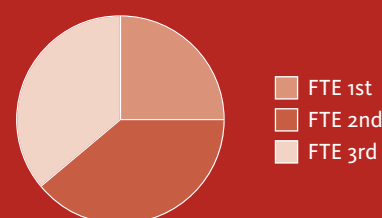
Prof. G.J. Adema (p)	Prof. J.W.M. van der Meer (o)
Prof. J.O. Barentsz (o)	Prof. M.G. Netea (o)
Prof. W.B. van den Berg (o)	Prof. R.J.M. Nolte (o)
Prof. R.J.M. Bindels (o)	Prof. G.J.M. Pruijn (o)
Prof. O.C. Boerman (o)	Prof. C.J.A. Punt (o)
Prof. R.E. Brock (o)	Prof. A.E. Rowan (o)
Prof. H.G. Brunner (o)	Prof. F.G.M. Russel (o)
Prof. P. Buma (o)	Prof. F.P.J.T. Rutjes (o)
Prof. F.P.M. Cremers (p)	Prof. R.W. Sauerwein (o)
Prof. J.P.H. Drenth (o)	Prof. J.A. Schalken (p)
Prof. C.G. Figdor (o)	Prof. J. Schalkwijk (o)
Prof. P.H.A. Friedl (o)	Prof. R.J. Siezen (e)
Prof. J.M.D. Galama (o)	Prof. J.A.M. Smeitink (o)
Prof. C.C.A.M. Gielen (o)	Prof. P.H.M. Spauwen (o)
Prof. W.J. de Grip (e)	Prof. S.E. Speller (o)
Prof. J.C.M. van Hest (o)	Prof. H.G. Stunnenberg (o)
Prof. A. Heerschap (o)	Prof. P.E. Verweij (o)
Prof. P.W.M. Hermans (o)	Prof. J. de Vlieg (e)
Prof. P.M. Hoogerbrugge (o)	Prof. G. Vriend (o)
Prof. M.A. Huijnen (o)	Prof. R.A. Wevers (o)
Prof. J.A. Jansen (o)	Prof. P. Wesseling (o)
Prof. R. Kötter (o)	Prof. B. Wieringa (o)
Prof. J.H.J.M. van Krieken (o)	Prof. T.J.M. de Witte (o)
Prof. B.J. Kullberg (o)	Prof. E.J.J. van Zoelen (o)
Prof. N.H. Lubsen (p)	

Tenured

Full Professors	15.5 FTE
Associate Professors	8.7 FTE
Assistant Professors	12.8 FTE
Researchers	10.5 FTE

Non-tenured

Researchers	31.3 FTE
Postdocs	60.9 FTE
Doctoral candidates	112.0 FTE



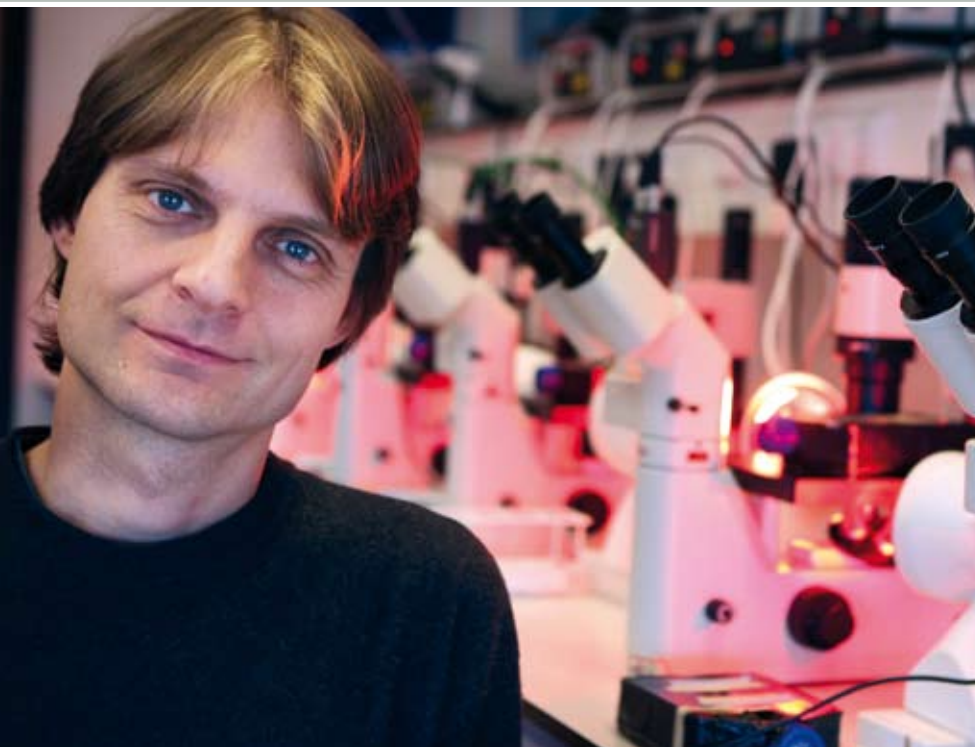
Theme 2: Metabolism, transport and motion (Prof. B. Wieringa)
Energy and redox metabolism (Prof. B. Wieringa) and Membrane transport and cell dynamics (Prof. R. Bindels).

The study of disease at the molecular level – but in the context of the multi-molecular world of cellular organelles, the intact cell, or organs and tissues in the entire organism – is central to ongoing work within Theme 2 of the NCMLS. Intrinsic genetic problems or extrinsic factors causing cellular energy deprivation, ion and metabolite and water transport failure, toxic accumulation of metabolic intermediates, or ischemia and anoxia due to cerebrovascular obstruction, are all features that underlie a broad range of diseases, including cancer, neuropathy and myopathy, degenerative disorders such as Alzheimer's and Parkinson, organ failure, exercise intolerance and fatigue and renal tubulopathy and retinopathy. In addition, for conditions such as obesity and type II diabetes, as well as aspects of ageing, it is well established that there is a direct link to metabolism, transport physiology and cell dynamics.

We therefore consider it not surprising that there are close links at many levels between the different Theme 2 topics. Metabolites such as ATP and NAD(P)(H) produced in key pathways such as glycolysis and mitochondrial respiration are consumed as fuel or needed as co-factors for ion-transport ATPases, drug-transporters and the acto-myosin motor and sliding machinery involved in organelle dynamics and cell movements. Forms of renal disease, cardiomyopathy, and brain and muscle disorders are caused by defects in the production or assembly of ATPases, water channels, or the mitochondrial OXPHOS machinery. Often defects in metabolic signalling are also involved. Defects in the structure and/or functioning of cilia (hair-like protrusions on epithelial cells with signalling abilities) have recently been identified as important causes of renal disease often in combination with blindness, deafness and brain disorders and are also topics within Theme 2.

Theme 3: Cell growth and differentiation (Prof. H. van Bokhoven)
Genetic and epigenetic pathways of disease (Prof. H. van Bokhoven); Chemical and physical biology (Prof. J. van Hest)

Nijmegen Centre for Molecular Life Sciences



Peter Friedl, Full Professor of Cell Biology – with a special focus on microscopical imaging of the cell – received the prestigious German Cancer Award.



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. Studying the 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 blueprint of all cellular decisions and a functional genomics approach is pursued that ranges from deciphering the genome in terms of actively transcribed genes under defined cellular circumstances (such as normal differentiation versus unregulated proliferation) to specific disease-linked genomic studies. Since the single cell cannot be viewed in isolation from its cellular surroundings, decisions within the cell need to be linked to external cues and constraints, and the translation of this approach within cells is at the core of research on signalling networks. In order to understand the molecules that convey the information packaged in the functional genomic blueprint as well as the signals from the cellular outside world, it is also necessary to gain a better understanding of the protein structure and design of these molecules that finally convey the growth and differentiation decisions. Valuable insights can be gained from investigating a specific differentiation programme and neural development is studied as a special case.

Awards and prizes

Teun Bousema MSc (Department of Medical Microbiology) received a Netherlands Organisation for Scientific Research (NWO) Rubicon fellowship to work for two years at the London School of Hygiene and Tropical Medicine.

Prof. Roland Brock (Department of Biochemistry of Integrated Systems) has been appointed as Visiting Professor at the Shanghai Medical College at Fudan University in China.

Prof. Carl Figdor (Department of Tumour Immunology) and Prof. John Jansen (Department of Periodontology and Biomaterials) were elected as members of The Royal Netherlands Academy of Arts and Sciences (KNAW).

Prof. Peter Friedl (Department of Cell Biology) received the prestigious German Cancer Award at the occasion of the 28th German Cancer Congress in Berlin.

Dr Ronald van Rij is the second person to receive the NCMLS tenure-track research fellowship. Dr Ronald van Rij is group leader in the section Virology at the Department of Medical Microbiology and is interested in the mechanism of RNAi-mediated antiviral defense, its role in viral pathogenesis, and its relation to other defense mechanisms.

Dr Ester Piek (Department of Applied Biology) received a MEERVOUD grant from NWO. The MEERVOUD programme is designed to help women postdocs become university lecturers.

Research facilities

These are grouped in the following six categories:

Animal models

Medical scientific research is ultimately about whether or not results can be applied effectively in humans. Animal models are therefore of great importance to molecular life scientists engaged in biomedical research. The NCMLS has excellent links to the Central Animal Facility (CDL), which provides expert advice and access to facilities for animal testing and has several disease-related models available, for example, arthritis, cancer, kidney disease, tissue engineering, heart transplantation, neural disorders, metabolic disorders, osteoporosis, haematopoiesis, fungal and bacterial septicaemia and malaria (*P. falciparum*).

Molecular imaging

Imaging at the sub-cellular and cellular levels is an essential tool for molecular life scientists. The Microscopic Imaging Centre (MIC) at the NCMLS is a state-of-the-art facility for imaging of biological specimens that uses light microscopy (bright-field, confocal and fluorescence), conventional scanning and transmission electron microscopy, and sophisticated digital imaging. The facility offers access to other techniques such as, Atomic Force Microscopy Flow cytometry, FRET and FRAP. Access to magnetic resonance facilities for in vivo NMR and MRI of animals and humans (7 Tesla) is also available.

Translational research (cellular therapy)

A GMP facility with clean rooms is available for innovative translational research projects. Current projects include immunotherapeutic cell therapy, stem cell transplantation and gene therapy.

In 1997 the Departments of Tumour Immunology, Medical Oncology and Haematology started applying dendritic cell-based anti-cancer vaccines in melanoma patients. To date, more than 250 patients have been treated with this experimental form of therapy.

Genomics

DNA sequencing as well as micro-array technology for gene expression profiling are rapidly becoming standard everyday laboratory tools. The Micro-array Facility in Nijmegen is one of the core facilities of the Radboud University Medical Centre. The department also harbours a sequencing facility and a genotyping facility. The facility focuses on multiple applications such as expression profiling, genomic copy number profiling (array CGH) and high-density SNP profiling.

Molecule-2-Man (www.molecule2man.eu)

The NCMLS is an active participant in Molecule-2-Man (M2M), an innovative multidisciplinary imaging platform located at the University and the Radboud University Nijmegen Medical Centre. Strategically located in Europe, these partners have a strong track record in interdisciplinary research, education and healthcare. M2M is built on the strengths of leading Nijmegen institutes in molecules and materials, molecular life-sciences, cognitive neuroscience and medical sciences. It aims to reinforce existing local and national infrastructure in order to create a top European health technology campus in Nijmegen by concentrating in one location expertise and facilities to (a) implement and advance imaging technologies from the molecular level to entire organs and the human body itself (i.e. from molecule to man); and (b) take translational research from the laboratory into the clinic (from bench to bed). M2M provides the perfect platform for knowledge exchange, access to state-of-the-art instrumentation and facilitates collaborations with research institutes, Small and Medium-sized Enterprises and large industrial companies.

Proteomics

The growing availability of genomic sequence information, together with improvements in protein characterization by mass spectrometry, facilitates protein research enormously. To exploit these opportunities the Nijmegen Proteomics Facility (NPF) was established in 2004. This state-of-the-art proteomics facility offers fundamental technological tools in proteomics research and makes them available for academic and industrial researchers, both within and outside the Radboud University Medical Centre. Equipment available includes 2D-electrophoresis, SELDI-TOF and mass spectrometry (MALDI-TOF, MALDI-LTQ and nano-LC LTQ-FT MS).

Bioinformatics

The Centre for Molecular and Biomolecular Informatics (CMBI), which is the Dutch National Centre for Computational Molecular Sciences, is housed on the ground floor of the NCMLS research tower. The institute pursues a rigorous research programme, with topics ranging from computational small-molecule chemistry to bioinformatics. The Centre's facilities, databases and software packages are available to external scientists and there is a help desk 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.

Nijmegen Centre for Molecular Life Sciences

Key publications

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Dissertations:	56
Scientific publications:	634
Patents:	3

Collaborations

NCMLS researchers continue to collaborate at the local, national and international level. The research school is allied with the Institute for Molecules and Materials (IMM), providing a solid platform for integrating the neurosciences and/or nanoscience with molecular life sciences. Furthermore, incorporating the CMBI within the NCMLS has strengthened the multidisciplinary 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 and has several academic and industrial partners in this context. In addition, the NCMLS contributes to the Center for Translational and Molecular Medicine (www.ctmm.nl).

The 'Molecule to Man' platform (see inset) promises great potential to advance early detection of disease and monitor treatment of disease states. Besides the NCMLS, the platform represents research groups from a number of other institutes and research groups, *i.e.* the Donders Institute for Brain, Cognition and Behaviour, the IMM, and clinical departments of the Radboud University Medical Centre.

Research results

- Prof. Joost Schalkwijk (Department of Dermatology) has recently been awarded the Wyeth Award within the programme 'Advances in psoriasis Research'. This prize will be spent on studying the role of innate immunity genes in psoriasis.
- Dr. Frank Wagener (Department of Pharmacology and Toxicology) was awarded a grant from the Dutch Burn Foundation for a four-year project to perform research entitled: 'Induction of cell protective proteins as novel strategy against oxidative stress- and inflammation-induced hypertrophic scar formation'.
- Dr Frank van Kuppeveld (Department of Medical Microbiology) and Prof. Gosse Adema (Department of Tumour Immunology) have been awarded by the Juvenile Diabetes Research Foundation (JDRF) for investigating the interplay between enterovirus, pancreatic beta cells, and dendritic cells in the development of Type 1 diabetes.
- On the 17 January 2008, TI Pharma announced a new project in the fight against malaria. This project will be carried out by a large consortium that includes Prof. Robert Sauerwein, Department of Medical Microbiology, NCMLS. The project is designed to develop a highly protective malaria vaccine that would save the lives of millions of people in developing countries, especially infants and children.
- Dr Joost Hoenderop (Department Physiology) was awarded a ZonMw TOP grant to study the molecular regulation of the magnesium transporters in the kidney.
- Dr J. de Vries (Department of Tumour Immunology) was awarded a two-year subsidy within the ZonMw 'Translational Research' pilot program. The project is entitled: 'Boosting the immune response to prevent cancer.'

Societal impact

NCMLS plays an important role in the understanding of the molecular mechanisms of disease. Various members and affiliated 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, several NCMLS members have advisory functions or are board members within these organizations. Clinical groups (Berden, Netea, Punt, de Witte, Knoers, Kullberg, Smeitink), are in daily interaction with patients and their relatives at the Radboud University Medical Centre, have close ties with patient organizations and are involved in public and strategic policy.

Recently NCMLS held its second annual symposium, which was entitled *New Frontiers in Ubiquitination*, at the Radboud Auditorium, Nijmegen. Both fundamental aspects of ubiquitination (a specific type of modification of proteins) as well as altered ubiquitination states in human disease were covered. Invited speakers from around the globe including the 2004 Nobel prize winner for Chemistry, Professor Aaron Ciechanover, attracted over 350 scientists and clinicians from all over Europe to Nijmegen for fruitful discussions on the latest research in this area.

The importance of Molecular Life Sciences related research in society is emphasized in the NCMLS graduate education programmes (both MMD and PhD) and throughout the research school. Researchers at the NCMLS study molecular mechanisms that control essential functions of the cell and explore ways in which malfunctioning can lead to life-threatening disorders. Training researchers in this particular field is of great importance for society, since they will form the new generation of scientists and biotechnology entrepreneurs that will continue the search for new drugs and further develop novel treatments. In addition, when NCMLS researchers follow their careers in public, political or governmental positions, they will be equipped to inform the general public and have the communication skills to explain complicated scientific matters in layman's terms.

NovioGendix®, an NCMLS spin-off company, was founded in 2006. NovioGendix® specializes in research and the discovery of molecular diagnostics in cancer. Improved healthcare in cancer patients requires not only improved treatments but also early diagnosis and accurate monitoring of disease progression. By performing research for the discovery of new cancer markers and the development of new diagnostic tests based upon these markers, NovioGendix® contributes to this goal of improved medical healthcare. The first molecular diagnostic test for prostate cancer, PROGENSA™ PCA3, is now widely available (www.noviogendix.nl).

Future research

The following Vidi grants, which were awarded to members of NCMLS, form a basis of important future research.

- Dr Annette Schenck (Department of Human Genetics) received a Vidi award to study mental retardation, one of the main unsolved medical problems in our time.
- Dr Anneke den Hollander (Department of Human Genetics) received a Vidi award for the study of macular (central part of retina) degeneration, the main cause of poor vision in the elderly.
- Dr Ronald van Rij (Department of Medical Microbiology) received a Vidi award for research immune defense mechanisms in the fruit fly (*Drosophila*).
- Dr Jan Koenderink (Department of Pharmacology & Toxicology) received a Vidi award to conduct research into the applications of digitalis-like compounds as future drugs.

Theme 1: Infection, Immunity and Tissue Repair

Fundamental research within this theme relates to the elucidation of regulatory circuits and their deregulation in diseases. Many diseases with a high societal burden are studied, such as chronic inflammatory disorders, infectious diseases, transplantation and cancer. Future fundamental research will focus on the role of dendritic cells, regulatory T-cells and other haematopoietic cells in adaptive immunity, as well as the contribution of resident tissue-specific cells (e.g. epithelial cells, synovial cells, chondrocytes) in innate immune processes. The current knowledge on these cell types and developments in the field of stem cells will help us redefine and expand our knowledge of cellular regulatory circuits and differentiation routes. In addition to the development and application of novel tools for diagnosis and tissue pathology, the knowledge gathered will lead to new experimental treatment modalities.

Theme 2: Metabolism, transport and motion

Research within this theme covers both fundamental and translational aspects. New opportunities will allow (i) further integration of novel microscopy-imaging platforms and MR tools into experimental *in vitro* and *in vivo* studies, (ii) the development of biosensors or cell lines for screening and diagnostic purposes, (iii) the development of new methodology for the modulation of cell processes by chemical rather than biological means, and (iv) new high-content diagnostic methods for characterisation of cellular metabolic-physiological states. Patients with metabolic or genetic diseases, including muscle, neurological disorders and kidney problems, will ultimately profit from the availability of new procedures for the prevention of disease manifestation or novel agents that can help in stabilising or enhancing their health conditions.

Director: Prof. Carl Figdor

Carl Figdor has been Full Professor of Cell Biophysics at the University of Twente since 1992, and a Full Professor 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 NWO - the most prestigious science prize in the Netherlands. In 2008 he was elected as member of the Royal Netherlands Academy of Arts and Sciences (KNAW).



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Theme 3: Cell growth and differentiation

The research carried out within theme 3 focuses on the molecular basis of cell behaviour in the context of health and disease. Basic and clinical research is combined to decipher the molecular pathways that underlie the functioning of the central nervous system under normal and pathological conditions together with elucidation of pathways that control the processes of proliferation and differentiation in physiology and pathology, especially cancer. The range of research activities in theme 3a, Functional Genomics, has resulted in the development of novel diagnostic tools such as the DNA micro-arrays and software development and improved recognition of hereditary cancer syndromes. Other new tools of great general interest such as ChIP-seq will be generally implemented to explore disease aetiology and functional consequences of key nuclear factors. Research in sub-theme 3b will continue to exploit the potential of organic chemistry to modify, design and mimic proteins and their building blocks with the purpose to modulate and analyze their activities and properties in the cellular environment.

Institute for Water and Wetland Research

The Institute for Water and Wetland Research (IWWR) encourages 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 micro-organisms, their interactions with the environment, and to find solutions to a variety of problems arising from these interactions. The research is carried out in three key research programmes: Integrative Physiology, Gene-Environment Interactions, and Water and Wetland Research.



Water will be the main global environmental problem in the 21st century. Water shortage is likely to increase in many parts of the world, while many flood plains will experience increased chances of flooding in particular seasons. In addition, poor water quality is challenging human populations and natural ecosystems alike. Organisms and ecosystems are adapted to specific water regimes, but changes in water quantity and quality result in stress responses. The research at the IWWR focuses on water, wetland and associated terrestrial systems in which there is considerable variation in environmental conditions, both in space and time, and from the gene to the 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 both natural and experimental conditions.

Water and wetland: Nutrient and toxicant cycles

The questions addressed in this programme are: 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 within 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?

Integrative physiology: Stress and adaptation

The central question in this programme 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 in this programme 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 cell differentiation? How can metagenomic approaches help us understand the way the complete ecosystems functions?

Research facilities

The IWWR has eight departments, all with state-of-the-art modern laboratory facilities in the new Huygens Building, and a central analytical service. Some examples of equipment used are:



Flooded plant showing roots growing into the water.

Staff

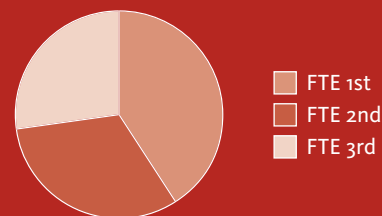
Prof. G.C. Angenent (e)
 Prof. A.M. Breure (e)
 Prof. E. van Donk (e)
 Prof. G. Flik (o)
 Prof. A.G.M. Gerats (o)
 Prof. J.M. van Groenendael (o)
 Prof. A.P. Grootjans (e)
 Prof. A.J. Hendriks (o)
 Prof. P.M.J. Herman (e)
 Prof. M.S.M. Jetten (o)
 Prof. J.C.J.M. de Kroon (o)
 Prof. N.H. Lubsen (p)
 Prof. C. Mariani (o)
 Prof. D. van de Meent (e)
 Prof. W. Olijve (o)
 Prof. J.G.M. Roelofs (p)
 Prof. E.W. Roubos (o)
 Prof. J.H.J. Schaminée (e)
 Prof. H. Siepel (e)
 Prof. M. Strous (e)
 Prof. S.E. Wendelaar Bonga (p)
 Prof. E.J.J. van Zoelen (o)
 Prof. G.J. van der Zwaan (e)

Tenured

Full Professors	5.7 FTE
Associate Professors	3.3 FTE
Assistant Professors	7.5 FTE
Researchers	1.3 FTE

Non-tenured

Researchers	13.1 FTE
Postdocs	10.0 FTE
Doctoral candidates	48.4 FTE



■ FTE 1st
 ■ FTE 2nd
 ■ FTE 3rd

- State-of-the-art light microscopy and electron microscopy facilities for detailed analysis of the ultrastructure of microorganisms, animals and plants
- Extensive molecular biological facilities such as quantitative RT PCR, RNA interference and in-situ hybridisation techniques for analysis of single cells till complex ecosystems
- Extensive culture facilities for microbes, plants, fish and amphibians
- PHYTOTRON – a unique national research facility for detailed ecological research on sub-surface processes such as root formation under varying oxygen conditions.
- The Solanaceae collection and green houses are part of the IWWR large scale facilities.

Collaboration

Research is conducted in close collaboration with over hundred national and international research groups, research institutes, companies and governmental organizations. These include the Institute for Society and Information systems (ISIS), Center for Wetland Ecology (CWE), the Darwin Center for Biogeology, the Netherlands Center for River Studies (NCR), the Graduate School Experimental Plant Sciences (EPS), the Graduate School Functional Ecology (FE), the Research School for Socio-Economic and Natural Sciences of the Environment (SENSE), various environmental

biotechnology companies, various water boards, the Joint Genome Institute (Walnut creek, USA) and Genoscope - the French National Sequencing Center (Evry, France).

Research results

The past year was a very successful one for the IWWR, with an ERC Advanced Grant, two Veni and two Mozaiek Grants. The Institute welcomed two new Extra-ordinary professors, who will strengthen research on wetland ecology, and further enhance the high quality and focus of research at IWWR. In order to reinforce our internal links and strengthen the Biology curriculum, two procedures designed to recruit full professors in Ecogenomics and Animal ecology were started.

Plant geneticists at the IWWR finalized The Petunia Monograph, in which all of the research carried out by Petunia groups worldwide is summarized. In Petunia, 4- and 5-fold mutants of the six sepallata genes were created and used to elucidate their function.

A patent application related to modulating homologous meiotic recombination frequencies was filed together with the research company KeyGene. Such a patent may make it possible to identify a male-meiosis-specific promoter. Furthermore, a 3,000-plant transposon library was created, together with a Dutch seed company

Institute for Water and Wetland Research



Thikra Dawood MSc – winner of an NWO Mozaiek grant – studies adventitious root formation using water-stressed plants from the Solanaceae family.



and the transposon-sequence-tag technique was refined. Together with plant ecologists at the IWWR, materials were created for identifying and isolating genes involved in stoloniferous growth.

Marine anammox bacteria were enriched from anoxic Fjord sediment by the microbiologists at the IWWR. The genome and proteome of the microbes were elucidated using pyrosequencing and advanced mass spectrometry. The activity, gene expression and ladderane lipids of the marine anammox bacteria were investigated together with NIOZ and MPI Bremen, showing that these bacteria may contribute significantly to the dinitrogen gas production of our atmosphere.

Plant ecologists, together with the IWWR research group Molecular Ecology, developed a method for quantitatively determining the proportions of plant species present in mixed root samples, based on their DNA signature. This method opens new avenues for research into mechanisms of biodiversity as – for the very first time – it is now possible to determine where the roots of different species of a plant community are in the soil.

Plant cell biologists at IWWR have been able to continue their participation in the prestigious CBSG centre of the National Genomics Initiative.

Environmental Biologists, in collaboration with environmental scientists at the IWWR, demonstrated the fact that the toxicity of reduced nitrogen in eelgrass (*Zostera marina*) to a large extent depends on shoot density and pH.

Environmental scientists at the Institute showed that ecological footprints can serve as a reliable scientific screening indicator for the environmental impact of products. A novel risk assessment tool for evaluating invasive species in freshwater systems based on

life traits was developed. In marine seagrass ecosystems positive feedback mechanisms that are based on physical as well as chemical factors were discovered.

Plant Scientists at IWWR have contributed to a better understanding of how fruit set is established in tomato. The role of an Auxin Response Factor was demonstrated to be a negative regulator of fruit growth, and inhibition of its expression resulted in the production of seedless fruits. Research on biotic plant stress factors led to the successful mapping of an R gene of *S. dulcamara* that provides resistance to the oomycete *P. infestans* (in late blight conditions).

Animal ecologists at the Institute demonstrated that seagrass beds function as nursery for coral reef fish by stable isotopes and the chemistry of otoliths and muscle tissue. Invasions of macro-invertebrates in rivers and mechanisms and the conditions required for species displacements were studied in controlled experiments.

Together with an electron microscopist at Utrecht University, the microbiologists at IWWR elucidated the ultrastructure of anammox bacteria using state-of-the-art electron tomography. The research showed that anammox bacteria harbour a unique organelle that may play a role in energy generation.

Aquatic ecologists at IWWR discovered two previously unknown genes that are likely to be involved in the onset of flowering in the clonal plant species *Trifolium repens*.

Microbiologists at the Institute showed that nitrite dependent anaerobic methane oxidation is mediated by bacteria of the NC10 phylum without the involvement of archaea, using new enrichment techniques and advanced mass spectrometry in combination with stable isotope labelling.

The Department of Organismal Animal Physiology expanded its research on stress physiology to include leptin endocrinology, thyroid physiology and fish welfare-related topics.

Awards

Prof. Mike Jetten won an ERC Advanced grant. Drs Philippe Vergeer and Liesje Mommer won a NWO Veni grant. Thikra Dawood and Ahmad Khadem MSc won an NWO Mozaiek grant. Anneke Rijpkema MSc won an NWO Rubicon grant.

Societal impact

The IWWR departments of Environmental Science and Animal Ecophysiology organized a large conference in Nijmegen in 2008 which received a great deal of public attention. Highlights of the meeting included the hypothesis that flooding and higher temperatures may limit the ecological rehabilitation of riverine communities. Further, massive invasions of exotic animal species have a huge environmental impact and can cause considerable economic damage.

In 2008 collaboration with KeyGene using novel 454 sequencing technology was further intensified by both plant scientists and microbiologists at the IWWR.

The IWWR and Faculty of Science 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, in terms of water quality, sediment quality, hydrological regimes, and ecological and socio-economic development.

The IWWR has extended its collaboration with Chinese scientists in research on the efficiency of water use in crops in the arid provinces of China, river management and nitrogen removal from water, respectively.

The Ministry of Agriculture, Nature and Food Quality of the Netherlands has notified the FAO International Treaty on Plant Genetic Resources for Food and Agriculture, of the Radboud University collection of Solanaceae, consisting of non-tuber bearing wild species.

A transparent, cost-effective tool called USEtox, which was designed to assess human health and ecosystem damage due to chemical emissions in life cycle assessment (LCA) was developed. Making use of a referenced database, it has now been applied in assessing several thousands of substances and forms the basis of recommendations by UNEP-SETAC's Life Cycle Initiative to LCA practitioners involving characterizing toxic impacts. The results of invasive species research were used to underpin European and national policy making and nature conservation plans such as the Natuurbalans (Nature balance produced by the Netherlands

Environmental Assessment Agency). Knowledge of sea grass has been used in dike reinforcement projects in Zeeland following the requirements of EU regulations, developed at the Institute.

Studies by IWWR Animal ecologists, who are involved in nature development at Rotterdam port, provided tools for restoration and nature development projects. Studies on biological invasions are carried out in cooperation with English, Irish, Polish and Chinese researchers. Biofouling research, together with KEMA Power Generation and Sustainables in Arnhem, has been intensified.

Plants within the Solanaceae family are both important agricultural products and weeds throughout Europe. This was reason enough for presenting the IWWR's Solanaceae collection to the public at a symposium in June.

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

The MADS-box work carried out by the plant geneticists at the Institute contributes to a better understanding of the evolution of the floral sexual organs and to an understanding of the evolution of reproduction systems. Moreover, control of recombination processes would allow breeders to more easily develop elites: reducing recombination would make it easier to maintain advantageous combinations, while enhancing recombination would make it possible to break linkages between bad and good traits.

The discovery and distribution of anammox bacteria in the oceans had great impact on current models of the global nitrogen and carbon cycles used by oceanographers and was the basis for further expeditions to study various marine ecosystems. Furthermore, two new wastewater treatment plants based on the anammox concept were built to remove ammonia from industrial waste streams more cost effectively.

Future research

In 2009 the Institute will further strengthen its focus on the study of gene-environment interactions and ecogenomics. The elucidation of several new genomes and the use of novel 454 pyrosequencing and illumina sequencing technology has stimulated new initiatives in this programme in collaboration with other universities and industries. A Veni project entitled 'Transcriptional profiling of inbreeding depression and genetic erosion in *Scabiosa columbaria*' will focus on the variation of genes (and their expression) in inbreeding depression in plants. The ERC Advanced grant will make it possible to establish two new cooperative ventures within

Institute for Water and Wetland Research

Key publications

Jong, M. de, Wolters-Arts, M., Feron, R., Mariani, C. & Vriezen, W. (2008). The *Solanum lycopersicum* auxin response factor 7 (SIARF7) regulates auxin signaling during tomato fruit set and development. *The Plant Journal*, 57, 160-170.

Ettwig, K.F., Shima, S., Pas-Schoonen, K.T. van de, Kahnt, J., Medema, M.H., Op den Camp, H.J., Jetten, M.S.M. & Strous, M. (2008). Denitrifying bacteria anaerobically oxidize methane in the absence of Archaea. *Environmental Microbiology*, 10, 3164-3173.

Huising, M.O., Vaughan, J.M., Shah, S.H., Grillot, K.L., Donaldson, C.J., Rivier, J., Flik, G. & Vale, W.W. (2008). Residues of corticotropin releasing factor-binding protein (CRF-BP) that selectively abrogate binding to CRF but not to urocortin 1. *J. Biol. Chem.*, 283(14), 8902-8912.

Mommer, L., Wagemaker, C.A.M., Kroon, H. de & Ouborg, N.J. (2008). Unravelling below-ground plant distributions: a real-time polymerase chain reaction method for quantifying species proportions in mixed root samples. *Molecular Ecology Resources*, 8, 947-953.

Vossenbergh, J. van de, Rattray, J.E., Geerts, W., Kartal, B., Niftrik, L. van, Donselaar, E.G. van, Sinnighe Damsté, J.S., Strous, M. & Jetten, M.S.M. (2008). Enrichment and characterization of marine anammox bacteria associated with global nitrogen gas production. *Environmental Microbiology*, 10, 3120-3129.

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Vandenbussche, M., Janssen, A., Zethof, J., Orsouw, N. van, Peters, J., Eijk, M.J.T. van, Rijpkema, A.S., Schneiders, H., Anthanam, P., Been, M. de, Tunen, A. van & Gerats, T. (2008). Generation of a 3D indexed *Petunia* insertion database for reverse genetics. *Plant Journal*, 1105-1114.

Veltman, K., Huijbregts, M.A.J., Kolck, M. van, Wang, W.X. & Hendriks, A.J. (2008). Metal bioaccumulation in aquatic species: Quantification of uptake and elimination rate constants using physicochemical properties of metals and physiological characteristics of species. *Environmental Science and Technology*, 42, 852-858.

Verweij, M.C., Nagelkerken, I., Hans, I., Ruseler, R.M. & Mason, R.D. (2008). Seagrass nurseries contribute to coral reef fish populations. *Limnol. & Oceanogr.*, 53, 1540-1547.

Visser, E.J.W., Bögemann, G.M., Smeets, M., Bruin, S. de, Kroon, H. de & Bouma, T.J. (2008). Evidence that ethylene signalling is not involved in selective root placement by tobacco plants in response to nutrient-rich soil patches. *New Phytologist*, 177, 457-465.

Dissertations: 19
Scientific publications: 273

the IWWR. The diversity of N-cycle bacteria will be investigated in simulated N-loaded wetland ecosystems, using the large-scale phytotron facility, and the diversity of the N-cycle bacteria in piscine ecosystems will be studied.

The Joint Genome Institute (JGI) will sequence three more genomes of fresh water and marine anammox bacteria. Genoscope, the French genome sequencing institute, will elucidate the metagenome of the microbial community involved in nitrite-dependent anaerobic methane oxidation. The results of this study will be used by microbiologists at IWWR and bioinformaticists at Radboud University Medical Centre in an NGI-horizon programme.

Within the DARWIN Center and CWE consortium, IWWR research groups will continue to assess 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. The microbial production of the greenhouse gas nitrous oxide in heavily nitrogen-loaded wetlands is one of the topics of this research, which is carried out together with Utrecht University. The effects of climate change on soft water ecosystems, a project that is financed by the Danish Science Foundation, will be studied by IWWR's aquatic ecologists. 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 also be studied in 2009.

Plant biologists at the Institute will shift the research effort more towards the adaptation of plants in the environment, in particular studying the molecular and physiological responses of plants exposed to a-biotic and biotic stresses, and the genetic and bio-genetic diversity of Solanaceae in Europe.

Director: Prof. Mike Jetten

Mike Jetten has been a Full Professor of Microbial Ecology at Radboud University Nijmegen since 2000. Since 2002 he has also been Extraordinary Professor of Environmental Biotechnology at Delft University of Technology. He is an expert in the ecology, physiology and application of anaerobic micro-organisms. Prof. Jetten is editor of the leading journals in the field of Environmental Microbiology. His work has been awarded with many prizes. Most notably he received the prestigious Advanced Investigator Grant from the European Research Council in 2008.



Institute for Water and Wetland Research

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Physiologists at the IWWR will participate in a SMARTMIX consortium to study zebra fish and their genome as a model for stress and bone (osteoporosis) physiology and related drug development.

The plant scientists at the Institute will continue to analyse the genes involved in flower development. In a newly launched NWO-financed project. They will investigate the evolution and mode of action of miRNAs involved in floral development. For the EU-funded proposal Meiosys the intention is to elucidate the effect of deletions on recombination frequency in the remaining part of the chromosome in *Petunia* and *Arabidopsis*.

Several EU-funded projects that will take effect in 2009 will make it possible to continue with developing and implementing a consistent framework for assessing impacts on human health and ecosystems in a life-cycle assessment context. Likewise, the fate, exposure and effects of nano-materials will be investigated in various externally financed projects, starting in 2009.

The molecular method for distinguishing roots is used in ongoing phytotron experiments. As part of the Veni project that was recently awarded to Liesje Mommer, she will explore idiosyncratic root behaviour in which the roots of some species in communities seem to grow as if competitor roots are not present. It thus appears that roots can distinguish the roots of a neighbour plant from those of their own, and thus grow faster in an alien neighbourhood. The mechanisms behind these novel responses are currently being investigated.

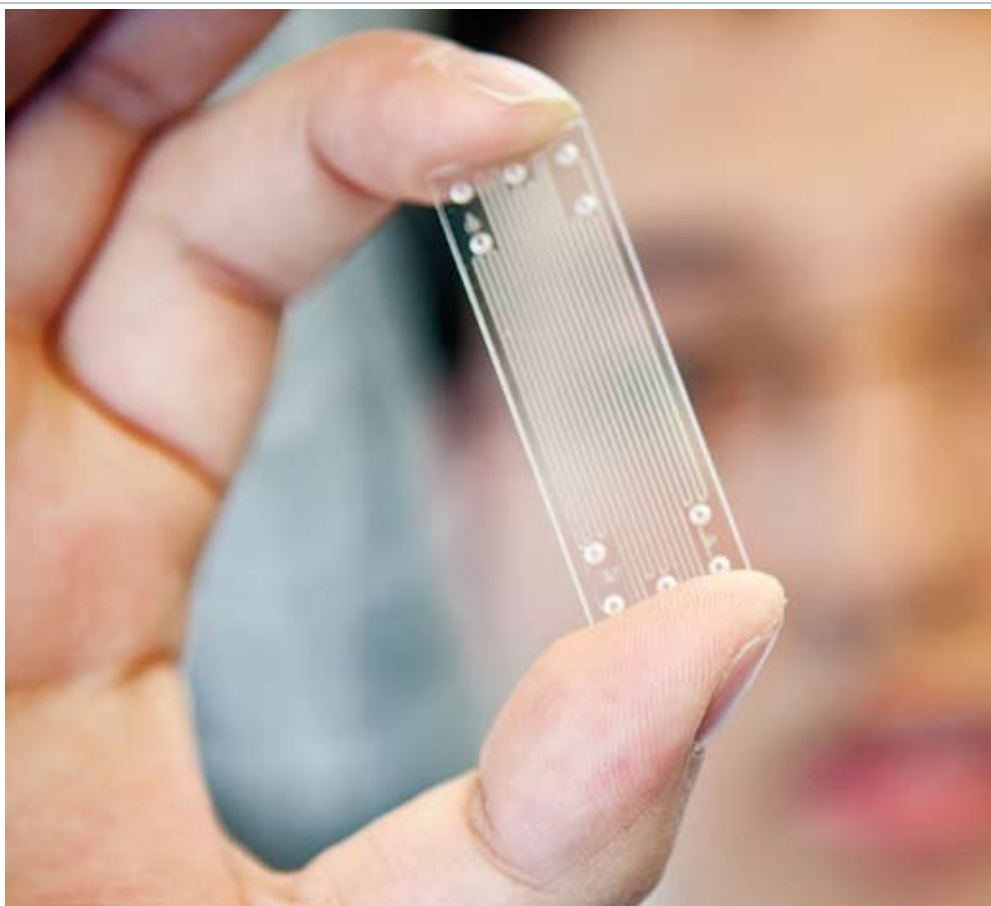
In 2009, experimental plant ecologists and environmental biologists at the IWWR will extend their use of the new Nijmegen phytotron for advanced studies of underground processes under outdoor conditions. This will combine observations of the detailed responses of the roots with whole plant responses in realistic settings. Environmental scientist 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 as well as in soils. Together with the NIOZ and Utrecht University, the role of aerobic and anaerobic ammonium-oxidizing micro-organisms in past and present oceanic nitrogen cycle will be studied, using unique ladderane lipids as biomarkers and proxies. Furthermore, the fate of methane in various wetland and volcanic ecosystems will be assessed, using both stable isotopes, molecular and environmental genomic methods.

In 2009, research by the 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 the large rivers and mangrove estuaries. In several international projects the influence of the river on sea-grass beds will be evaluated using a four-scale indication: plant, community, landscape and human interest. Restoration of seagrass beds will also be part of a study of the Dutch Wadden Sea, in which interaction with mussel beds will be included.

Institute for Molecules and Materials

The Institute for Molecules and Materials (IMM) conducts research and trains undergraduate and post-doctoral students in the field of functional molecular structures and materials. There is a strong emphasis on understanding and controlling complexity in order to design new functionality in these systems.



In physics, chemistry and biochemistry the desire to understand complexity in systems is driven by the wish to manipulate their functionality. In recent decades scientists have approached the problem of complexity from two perspectives.

On the one hand an advanced understanding of complexity is sought by studying the smallest building blocks and using them incrementally to build up larger and larger systems. In this way the structure and functionality of atomic nuclei, atoms, and (small) molecules have been investigated and analyzed. A combination of experimental and theoretical efforts has helped generate deeper insight into the behaviour of these systems.

On the other hand continuous efforts are made to study macroscopic systems with well-known properties and to analyze the constituents of large systems that have been investigated extensively. Examples include many-body problems in physics and experiments in the life sciences designed to understand systems on the cellular and subcellular scale.

One of the major challenges is to understand complexity and functionality in the area where these two trends meet, namely in the field of Nanoscience. This research area is very extensive, encompassing traditional topics in physics, such as liquid crystals, nanotubes, thin films, as well as chemical and biochemical research on , for example, proteins and protein complexes and the self-assembly of supra-molecular systems.

It is precisely in this area that the IMM aims to be a key player. With its infrastructure and expertise, the institute is ideally suited to answering some of the most pressing questions in Nanoscience.

The IMM actively promotes scientific interplay between researchers with different backgrounds and expertise in physics, chemistry and biological chemistry and coordinates a multidisciplinary research programme with close interaction and feedback among the research groups.



Microreactor for the synthesis of new drugs.

Staff

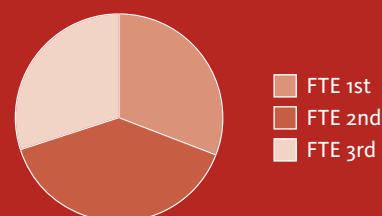
Prof. A. van der Avoird (o)
 Prof. J.G.J. van den Brink (e)
 Prof. L.M.C. Buydens (o)
 Prof. A. Fasolino (p)
 Prof. R.A. de Groot (e)
 Prof. J.C.M. van Hest (o)
 Prof. M.I. Katsnelson (o)
 Prof. A.P.M. Kentgens (o)
 Prof. J.C. Maan (o)
 Prof. G.J.M. Meijer (e)
 Prof. J.J. ter Meulen (o)
 Prof. R.J.M. Nolte (o)
 Prof. D.H. Parker (o)
 Prof. G.J.M. Pruijn (o)
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 Prof. E. Vlieg (o)
 Prof. M.J.J. Vrakking (e)
 Prof. W. van de Water (e)
 Prof. S.S. Wijmenga (o)
 Prof. W.J. van der Zande (o)

Tenured

Full Professors	8.9 FTE
Associate Professors	4.6 FTE
Assistant Professors	9.5 FTE
Researchers	2.2 FTE

Non-tenured

Researchers	22.3 FTE
Postdocs	21.5 FTE
Doctoral candidates	82.8 FTE



The IMM has the following key qualities and facilities:

- Excellent, unique spectroscopy facilities (NMR – both solid state and high field liquid, a Scanning Probe laboratory, Molecular and Laser spectroscopy, and a High Field Magnet Laboratory)
- Strong organic, bio-organic and supra-molecular chemistry
- Strong interaction between physicists and chemists and between theoretical and experimental groups. Large degree of collaboration, both internal and external

The 20 groups within the IMM possess all the expertise needed to explore the three main research areas: Electron-correlated systems, self-organizing systems, and biomolecular systems. 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 has the ambition to be one of the top institutes in Europe in this field of science.


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

Research facilities

The IMM houses a number of national and international research centers. 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, as well as solid state NMR.
- A Scanning Probe laboratory, where molecules and materials can be investigated and manipulated at nanometer and sub-nanometer scales utilizing 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.
- Velocity map imaging laboratory for the study of unimolecular and bimolecular dynamical processes with complete quantum state characterization.

Institute for Molecules and Materials



Floris Rutjes, Full Professor of Synthetic Organic Chemistry, won the national award for most enterprising scientist for his initiative 'Future Chemistry BV', involving the use of microreactor systems to produce new drugs.



- 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 design and understanding of materials.
- NanoLab Nijmegen, a facility dedicated to innovation, i.e. to making new developments in Nanoscience accessible to small and medium-sized enterprises.
- Spin-off companies such as Spinnovation, Noviomatrix and VICIM that were specifically established to give industrial partners access to scientific research facilities.

In addition, the IMM has state-of-the-art facilities for carrying out advanced synthesis and analyses: instruments for synthesis under extremely high pressure, equipment for combinatorial synthesis, a peptide synthesis laboratory, mass spectrometers and mass-spectrometer combinations MALDI-TOF, and high-pressure liquid chromatography facilities as well as X-ray diffractometers.

Finally, the IMM was recently granted €6 million to develop a brand new spectroscopy facility, which will serve as an international user facility. The IMM plans to make this facility, which includes the construction of a brand-new terahertz free electron laser and an upgrade of the magnetic field facility, operational in 2012.

Collaboration

There are a large number of collaborative initiatives between IMM research groups and research groups at universities and institutions worldwide. At the university level, external collaboration is maintained – among other ways – in a network called IRUN, the ‘International Research Universities Network’.

The aim of IRUN is to further improve the quality of research and teaching at the universities involved. Within the network, the exchange of researchers, lectures, and students will be encouraged and facilitated. This may lead to a joint curriculum development and joint degree programs for Masters students and PhD candidates. Within the context of IRUN, the IMM currently collaborates with groups from Münster, Duisburg/Essen, and Barcelona.

Collaboration with other universities includes the Catholic University of Leuven, Belgium in the field of single molecule spectroscopy (group of Profs. J. Hofkens and F.C. de Schryver). This collaboration involves the exchange of PhD students and postdocs and the use of the special laser equipment at the two locations, leading to successful joint publications.

There is collaboration between the Molecular and Biophysics section and the Institut für Physikalische Chemie of the Heinrich Heine University in Düsseldorf, which has led to as many as 6 joint publications in highly ranked journals. Strong links also exist between the IMM and the Fritz Haber Institute of the Max Planck Society in Berlin Germany (Director Prof. Gerard Meijer), and the

Fraunhofer Institut für Mikroelektronische Schaltungen, Duisburg, which has led to two filed patents on the joint project 'Processes on a chip'. Currently, collaboration between the IMM and the Duisburg/ Essen Center for Nanointegration CENIDE is formalized.

Further collaboration takes place between the IMM and the Ioffe Institute in St. Petersburg, Russia. This includes joint projects and shared PhD students that have already led to a number of high-ranked publications including two *Nature* articles. Likewise, the collaboration with the Jozef Stefan Institute in Ljubljana, Slovenia, deserves to be mentioned. Joint undertakings with this institute have proved to be successful and the filed patent on Liquid Crystal Displays is an example of this.

Many of the groups in the IMM participate in EU projects with other European partners, which is very rewarding both with respect to the strengthening of the research contacts and the training of PhD students and postdocs. Three IMM members (Prof. R. de Groot, R. Nolte, and L. Meerts) hold part-time professorships at other universities in the Netherlands.

Research results

The decision in 2005 among physicists and chemists at the Radboud University to form one institute has resulted in the desired synergy. Scientists have started venturing in uncharted water with often unexpected, at times even surprising, results. Below is a summary of the results within the three main research themes of the IMM.

Electron-correlated systems

Prof. Katsnelson and co-workers demonstrated in their work on graphene that in order to make real graphene devices, magnetism in graphene can and should be protected by chemical functionalization (*JACS*). The group led by Prof. Rasing further elucidated the role of spins and succeeded in controlling the spin beatings at the ultra-short attosecond time scale in quantum wells (*PRL*). Prof. Vlieg's research yields new insight into how to manipulate the electronic properties of semiconducting indium phosphide nanowires, thus achieving controlled growth of twinning superlattices (*Nature*). Prof. Speller's group obtained results on the response of quantum dots on local electric fields, which is useful when designing nano-electronic, electro-optical, or photovoltaic devices. In the group led by Prof. Kentgens hydrogen mobility is studied in solid-state samples to shed light on hydrogen storage possibilities in materials. Prof. de Groot and his colleagues developed an advanced understanding of the structure and function of anionogenic half-metallic ferromagnets. And Prof. Maan's research in the High Field Magnet Laboratory unveils the first metrological characterization of quantum Hall resistance in graphene (*Science, PRL*). Finally, the applied research group led by Prof. Hageman, lastly, established the existence of certain nanowire alloy systems, opening up a whole class of new nanoscale semiconducting materials.

IMM External Evaluation

The IMM was evaluated in January 2008 by an external evaluation committee comprising eight leading scientists, who visited the institute for a week and wrote a detailed report of their findings. Below are some excerpts from this report:

"The ambitions of the IMM are high, as indeed they should be. One envisions the creation of a techno-campus, where Orsay, Grenoble and Garching are mentioned as inspiring examples. It seems that the ingredients of a techno-campus are already in place, and the Committee congratulates IMM, the faculty and the university board on what has been achieved so far.

The IMM is generally regarded to perform research and education at an internationally competitive level. The institute has been able to attract an impressive amount of external funding both from industry as well as from national and international funding agencies.

The highly professional administrative structure and the quality of the top leadership are excellent. The management of the institute has done a great job promoting the idea of this institute around an organizational structure optimized for interdisciplinary research. Judging from the large number of links between groups, producing exciting science, the Committee concludes that this strategy is effective.

The institute is housed in excellent conditions in the new Huygens building and has excellent and unique spectroscopy facilities (NMR - both solid state and high-field liquid, a Scanning Probe laboratory, Molecular and Laser spectroscopy, High Field Magnet Laboratory). The commission wants to congratulate the technical staff for its very high level of quality.

The scientific output of the IMM is very good to excellent in many areas in both numbers and even more importantly in quality and impact of the papers. Scientific highlights are visible in many areas of the interest in the institute. The national and international visibility of the institute or some of its members can be seen in the substantial number of grants.

The institute has set up an interesting and well working scheme helping young researchers starting a spin-off company.

Institute for Molecules and Materials

Key publications

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Dissertations:	33
Scientific publications:	271
Patents:	2

Self-organizing systems

Profs. Feiters and Nolte addressed the unresolved question of the chemical state of iodine in oarweed, leading to a publication in PNAS. Prof. Rowan's group unveiled the mechanism of threading a polymer through a macrocyclic ring (*Science*), and Prof. Buydens' team focused on models predicting the mutagenicity of a particular drug, thus providing valuable information for a drug discovery process. In the group led by Prof. van der Avoird and Groenenboom cold molecules are investigated including their infrared characteristics, which are then to be used to determine the solar nitrogen abundance (*PRL*). And researchers in the group led by Prof. Parker found that the previous values for bond energies of diatomic sulphur were incorrect and determined new significantly higher bond energies. Finally, by analyzing the formation of NO, Prof. ter Meulen and his colleagues characterized the combustion process in heavy-duty diesel engines.

Biomolecular systems

In the search for attractive drug candidates, the group led by Prof. Rutjes develops a total synthesis sequence of platencin, a new antibiotic, starting from commercially available chemicals (*Angew. Chem.*). Prof. Van Hest and co-workers extend the ability to create complex biomimetic systems and monitor three-enzyme reactions in a polymersome nanoreactor.

Prof. Pruijn *et al.* investigate the molecular basis for an inherited form of dwarfism, providing insight into the molecular mechanisms of mutation in the P3 domain of RNase MRP. Prof. Vuister's group produced an open-source program to help validate thousands of biomolecular NMR structures, and Profs. Heus and Wijmenga explored the mechanical stability of RNA systems by combining their biomolecular expertise with the scanning probe infrastructure present in the IMM. To conclude, Profs. Meerts and Van der Zande gathered structural information of azaindole clustered with water molecules, providing information on the possible conformers of these biomolecules.

Awards

The most exciting Award received was the Spinoza Award for Prof. Theo Rasing. This honorable award, unofficially dubbed the Dutch Nobel Prize, will enable the IMM to strengthen its programme involving optical manipulation of electron spins for the years ahead.

Further prestigious grants awarded in 2008 include two Netherlands Organisation for Scientific Research (NWO) Veni grants (Dr Vedran Vonk and Dr Richard Hoogenboom) and two NWO Vidi grants (Dr Kerstin Blank and Dr Hans Elemans) as well as four NWO ECHO grants (the groups led by Profs. Speller/Nolte, Rutjes, Vlieg and Van der Zande), one NWO TOP grant for Prof. van Hest, and several prestigious FOM Project grants in the groups led by Profs. Rasing and Maan.

Institute for Molecules and Materials

Societal impact

One of the aims of the IMM is to valorize research results. The formation of spin-off companies and filing patents is encouraged 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 many major companies in the Netherlands, including DSM, Philips, Organon, Solvay, Unilever and AkzoNobel.

Besides these well-maintained ties with large industrial partners, the work of IMM has had a clear impact on the Nijmegen region. Maintaining large infrastructure in the IMM has resulted in long-standing business relationships with technology-oriented medium-sized enterprises in the direct vicinity of Nijmegen. Spin-off companies of the IMM have directly resulted in hundreds of jobs in and around Nijmegen, and technical expertise is shared between IMM groups and NXP Nijmegen. Finally, a partnership with Nanoscience center CENIDE in Duisburg/Essen has led to an increased influx of knowledge workers in the region and a burgeoning student population at the Nijmegen Faculty of Science.

An important initiative that helps start-ups to flourish is the 'Innovation Lab', where enterprising researchers can commercialize innovative research results. They have access to technical and scientific support as well as business training and coaching. In the new science building completely furnished lab space is available for this purpose. Financial support for the Innovation Lab comes from the university and from NWO. The entrepreneurs are also expected to attract their own start-up financing.

IMM's outreach to small and medium-sized enterprises is further embodied in the NanoLab, which was established to facilitate knowledge transfer between the university and industry. Companies will be able to 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. The wide range of application areas is facilitated through the availability of different Scanning Tunneling (STM) and Atomic Force (AFM) microscopes as well as the presence of other techniques, but most significantly through the embedding of the NanoLab within the IMM, with its High Field Magnet Laboratory, its NMR facility, and its other cutting-edge experimental and spectroscopic expertise.

Furthermore, the IMM maintains close collaboration with the NCMLS 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 techniques of identified species, targeted drug-delivery systems, and diagnostics on a nanometer-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 drives progress in sustainable

chemistry. Non-invasive diagnostic tools such as 'the breath test', which allows researchers to analyze the trace gas constituents of human breath for diagnostic purposes, are also being developed. These are all successful examples, which reflect a larger trend in nanotechnology 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 ultrafast light or extremely high magnetic fields, thus directly addressing the issue of data storage on hard drives, is but one example. The development of thin film solar cells with maximum efficiency is another.

IMM scientists sit on various national and international advisory boards, committees and journal editorial boards (including such prestigious journals as Science). Apart from these activities in the scientific domain, many leading IMM researchers are actively involved in public debates on a variety of scientific topics.

Future research

Future research within the IMM will take place within three broadly defined research themes, merging physics and chemistry. These can be summed up by the following questions: 1) How to understand the exciting, yet unresolved, issues in correlated-electron systems and nano-sized materials? 2) What is the science behind self-assembly of complex molecules? And 3) What are the unique properties of biomolecules which explain their function in cellular systems?

This philosophy is further supported and carried out with substantial external funding, which contributed almost 60% of the institute's annual budget in 2008.

The most important opportunity in the next ten years has been created by a grant from the national investment in large infrastructures NWO-BIG. This grant will enable the IMM to set up an Advanced Spectroscopy Center. By combining the HFML, Nano-lab facilities, the NMR Lab and laser facilities into one coordinated infrastructure creating a research infrastructure of international standing. A free-electron laser/based TeraHertz facility will be built next to the HFML to create unique opportunities for studying magnetic excitations in inorganic and organic molecules, as well as low-energy spectroscopy (far-infrared) on molecular clusters and large (bio)molecules. HFML will build a new hybrid 45 T magnet, which will provide new unique research opportunities with cutting edge technology. Grouping a combination of these facilities on the same campus and making them available to external users will

Director: Prof. Roeland Nolte

Roeland 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.



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boost scientific applications in Nijmegen and increase their international visibility.

A new solid-state 850 MHz NMR machine has been secured as part of a separate NWO-BIG programme. This represents an important injection of finance into the institute's advanced materials science programme, which will help attract even more scientific talent to the University. The combination of state-of-the-art NMR equipment with the new free electron laser facility and the 45 T high magnetic fields will lead to a wealth of new possibilities and ideas that will become feasible in the next ten years.

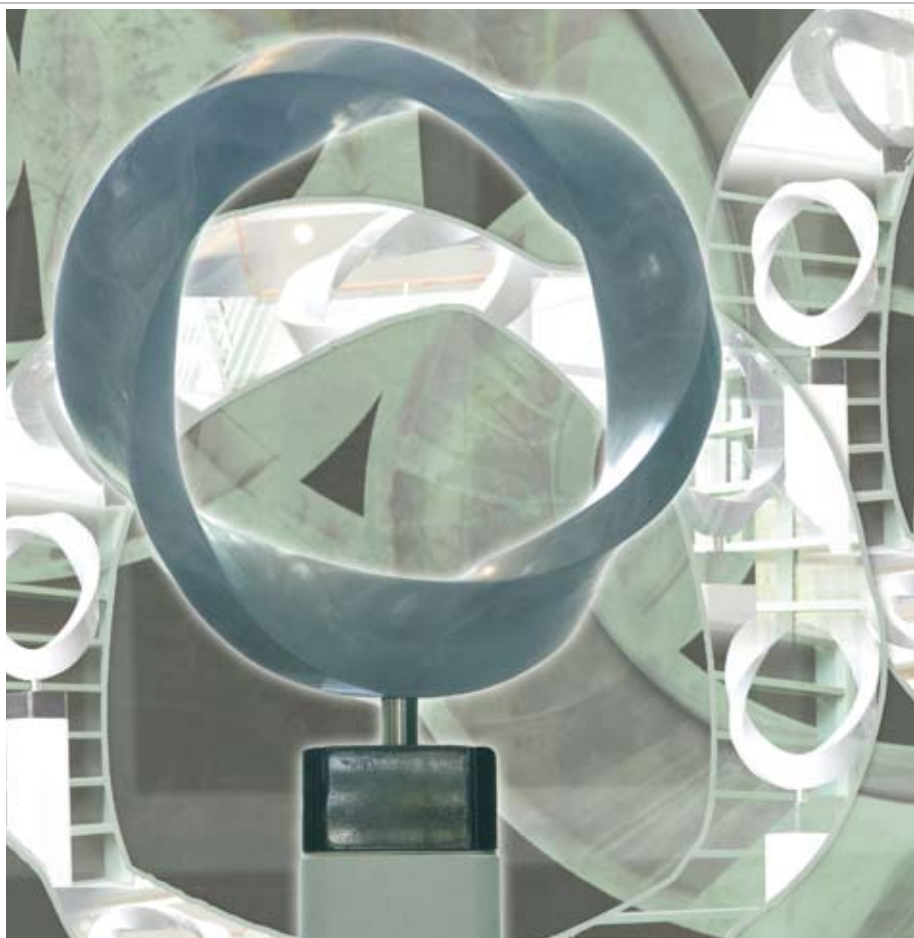
The future direction of the theoretical work at the IMM will involve the study of more complex molecular systems with closer ties to the organic chemistry groups in the institute. An open theory chair will be established with this in mind.

In close collaboration with the NCMLS the IMM has formed a Chemical Biology cluster to further exploit our knowledge in organic chemistry and apply it to solve biochemical, biological, and medical problems. Together with NCMLS research groups and industrial pharmaceutical partners, this promising and burgeoning research line will enhance our understanding of complex molecules and enable us to synthesize molecules with the desired 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 make 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 Mathematics, Astrophysics and Particle Physics

The Institute for Mathematics, Astrophysics and Particle Physics (IMAPP) carries out fundamental research in mathematics, high-energy physics and high-energy astrophysics, with an emphasis on interdisciplinary topics. The overarching research theme is the origin and evolution of the universe and underlying mathematical structures. The institute is also actively engaged in outreach.



Mathematics

This subject centres on three interdisciplinary themes: mathematical physics, algebra and logic, and stochastics. There are well-established links between these themes and computer science and physics. The traditional areas algebra, logic, analysis, geometry and stochastics are embedded in these themes.

Astrophysics

This 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 analyzes 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. There is a particular focus on electro-weak symmetry breaking and the Higgs boson, which makes it possible to gain more insight into the structure of vacuum.

Awards and acknowledgements

- Prof. Falcke received an ERC Advanced grant.
- Prof. Aerts received an ERC Advanced grant.
- Prof. Groot was elected to the Young Academy of the Royal Netherlands Academy of Arts and Sciences.
- Drs. Hu received a Frye Stipend from Radboud University Nijmegen.
- Prof. Gehrke, together with Jean-Eric Pin (LIAFA and Paris7) and Serge Grigorieff (Paris7), won the Best Paper Award in Track B at the ICALP 2008 conference.
- Dr Nelemans received a Netherlands Organisation for Scientific Research (NWO) Vidi grant.
- Dr Van Suijlekom received an NWO Veni grant.



A sculpture of a Möbius strip (named after the 19th century German mathematician and astronomer) graces the main hall of the building where the Faculty of Science is accommodated.

Staff

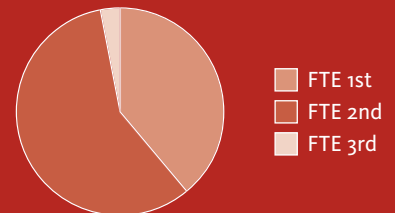
Prof. C.C. Aerts (e)
 Prof. C. Dominik (e)
 Prof. H.D.E. Falcke (p)
 Prof. D. Froidevaux (e)
 Prof. M. Gehrke (o)
 Prof. N. de Groot (o)
 Prof. P.J. Groot (o)
 Prof. G.J. Heckman (p)
 Prof. S.J. de Jong (o)
 Prof. F.J. Keune (o)
 Prof. R.H.P. Kleiss (o)
 Prof. H.T. Koelink (o)
 Prof. J.M.E. Kuijpers (o)
 Prof. N.P. Landsman (o)
 Prof. A.N.J.J. Schellekens (e)
 Prof. J.H.M. Steenbrink (o)
 Prof. M.C.A. van Zuijlen (o)

Tenured

Full Professors	4.9 FTE
Associate Professors	2.4 FTE
Assistant Professors	3.0 FTE

Non-tenured

Researchers	5.9 FTE
Postdocs	2.2 FTE
Doctoral candidates	17.6 FTE



Research facilities

Experimental groups make use of leading national and international astronomical observatories (ESO, La Palma, LOFAR, LOPES, HST and Cascade-Grande) and high-energy particle accelerators (LEP, LHC and Tevatron). The LHC circulated its first beams in 2008. 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 based in Nijmegen are involved in the NWO mathematics clusters DIAMANT (Discrete, interactive & algorithmic mathematics, algebra & number theory) and GQT (Geometry and Quantum Theory). Mathematical physicists at the IMAPP make a leading contribution to GQT.

The elementary particle physics group – a partner in the Nikhef – is associated with the European Laboratory for Particle Physics (CERN in Switzerland) and the Fermi National Accelerator Laboratory (FNAL in the USA). Intensive collaboration involving the particle physics theory group takes place with KEK, RIKEN, Tokyo Hosei and Osaka EC University in Japan and Demokritos in Greece.

Astronomical research is carried out within the framework of the top research school NOVA and in association with ASTRON and ESA. The Nijmegen group co-leads the EGAPS survey. Nijmegen is also 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 Cascade-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

Institute for Mathematics, Astrophysics and Particle Physics



Mai Gehrke, Full Professor of Algebra, is a specialist in algebraic geometry and logic. In 2008 she won a Best Paper Award (see text).

(theoretical physics) and NOVA (astronomy). All researchers at the institute are a member of one of these research schools, which are accredited by the Royal Netherlands Academy of Arts and Sciences.

Research results

Research in mathematical physics on the mathematical foundations of quantum theory and its relationship with classical physics has focused on the interface between quantum theory and topos theory. The aim is to relate the generalized concept of space in non-commutative geometry to that used in topos theory, both as a purely mathematical problem and with an eye to quantum information theory and perhaps even quantum gravity. Another more realistic goal of this line of research is to improve our understanding of quantum information theory.

Work on geometric structure related to root systems has continued. Now that additive and multiplicative complex numbers are reasonably well understood, the focus has shifted to elliptic curves. A long-term goal is to understand the underlying geometry behind the largest sporadic simple group, via a hypergeometric type period map, whose existence is conjectured by Daniel Allcock in his 'Monstrous Proposal'.

A fundamental duality has been discovered between profinite structures in algebra and geometry and extended Stone duality for Boolean algebras with additional operations as being studied in logic and theoretical computer science. In fundamental duality theory, connections with mathematical physics via topos theory are being explored. In affine algebraic geometry, the focus continues

to be the Jacobi Conjecture and advances include new conceptual tools (e.g. shifted linearizability) and further development of examples and partial results, especially focusing on the all-important dimension three setting. In computer algebra, a construction of a series of finite simple groups known as the Ree groups of the first kind was made. New research was performed on applying modular forms and analytic number theory to combinatorial and algebraic areas. This work involves both theoretical results and computational questions. In particular a method was designed for determining the average growth or decay of aliquot sequences. Progress was made in a project established to compute the endomorphism rings of group representations of characteristic zero using fields of finite characteristic and computer algebra. This yielded a standard tool that can now be used for representations up to degree 1000. Research on intuitionistic mathematics has, among other results, produced a lengthy report on intuitionistic descriptive set theory and a paper on the Borel hierarchy from this constructive perspective.

The work on the use of topo-algebraic invariants in automata theoretic complexity theory was honoured in 2008 with the Best Paper Award in Track B at ICALP, the annual conference of the European Association of Theoretical Computer Science, and a Master's student pointed the way towards using these methods in a more general setting. Applications of duality for finite distributive lattice-ordered algebras, which have led to a novel notion of minimal solution, have been used to provide a search and query tool for databases. Multifaceted work on symmetries with applications in crystallography continued. In this setting, partial symmetries

play a role in the description of layered materials and one active direction of work focuses on developing methods for working with partial symmetries in a way that is accessible for crystallographers.

In a book project the aim is to make the approach to symmetries in two and three dimensions via Clifford algebras available to crystallographers. Modelling the proof trees involved in the elliptic curve primality proving algorithm is an attempt to find heuristics for practical applications.

There was collaboration with the Computer Science institute ICIS on dualities that are relevant both to mathematics and Computer Science, and a pilot Research Master's programme in the Mathematical Foundations of Theoretical Computer Science was developed.

While the process of reorientation of stochastics research to include a new area, e.g. the stochastics of the brain, still has to begin, research on financial mathematics continued. A technical report was released entitled 'Increased Market Stability as a result of Consensus and Transparency with respect to Price Ranges for Illiquid Derivatives'. This report on determining price-ranges for illiquid derivatives in a proper way and using these results may lead to an important tool, which can be used to solve one of the main problems in the present financial crisis. It shows why the stability, liquidity and transparency of the financial system would greatly benefit from so-called Scientific Market Makers.

Consensus among independent parties and transparency (via the public domain), concerning a reliable risk measure and the corresponding price range is very important to ensure that Scientific Market Makers will become active in the market for liquid and illiquid derivatives. The aim of this report is to start the search for consensus, which could lead to increased market stability. In particular, in order to incorporate Grey Swans and to avoid hidden uncertainty, necessary conditions for a good price range for derivatives are introduced. We advocate a price range based on Stable Integrated ϵ Arbitrage Bounds as a suitable candidate for consensus. Examples were presented concerning the current credit crisis and valuation of embedded options, in particular the contingent indexation promise in certain pension contracts.

The Department of Astrophysics has as one of its two themes compact binaries. A compact binary consists of at least a stellar remnant (white dwarf, neutron star or black hole) that is orbited by a companion at close range, which itself is either another stellar remnant or a low-mass normal star. Often mass is transferred from the companion, through a gaseous accretion disk, to the primary stellar remnant. Our research focuses on understanding the evolution of these systems and their population in the Milky Way Galaxy.

A possible X-ray progenitor system to the Type Ia Supernova 2007on was found and published in *Nature*. The major part of the X-Shooter spectrograph was moved first from Nijmegen to Dwingeloo and then to the headquarters of the European Southern Observatory in Munich and in the autumn also to the VLT Paranal observatory in Chile. Initial commissioning was successfully concluded in November 2008. The first asteroseismological study into the formation channels of subdwarf-B stars took place, including the first data release of the IPHAS survey, which is part of the Galactic Plane surveys, and the subsequent detection of a very rare type of progenitor of a nova explosion.

The astroparticle physics research at the institute is a joint effort involving the astrophysics and experimental high-energy physics departments. It focuses on the origin, composition and physics of ultra-high energy cosmic rays. These elementary particles (protons, neutrons and heavy atomic nuclei) have kinetic energies up to 10^{20} eV. Their astrophysical origin is unknown, but suspected to be associated with the active centres of galaxies. In Auger, an upper limit on the diffuse flux of Ultra High Energy tau neutrinos was published. Flux limits for tau neutrinos were set in the GZK energy range (0.1-100 EeV), which are only an order of magnitude above the theoretically expected flux.

An upper limit on the cosmic ray photon flux above 10 EeV has been measured, using shower shape variables. This limit puts severe constraints on the exotic top-down models of highly energetic cosmic rays. IMAPP focuses on the detection and characterisation of these cosmic rays using, in particular, radio techniques in the LOPES, LOFAR and Auger experiments. Hardware, data acquisition, data reconstruction and data analysis of radio detection of cosmic rays in Auger are being developed. The data set obtained by the Dutch operated setup is used by the whole collaboration for analysis. Measurements of the galactic background have been used to calculate the expected field strength and simulations have provided a qualitative understanding of these measurements and explained a number of details. The lateral distribution of the radio signal was also determined, hinting at a larger density of radio antennas needed for good coverage than was originally anticipated.

The operation of the DØ experiment at the Tevatron collider at Fermilab, as well as the operation of the collider itself, has further improved, leading to a total Run II integrated luminosity of almost 5 fb^{-1} collected (compared to 3 fb^{-1} at the end of 2007). As a testament to the maturity of the experiment, 2008 was the most productive year ever, in terms of physics output, with 46 papers submitted for publication. Jointly with the CDF experiment on the same accelerator, a Standard Model Higgs boson with a mass of approximately 170 GeV is now excluded and the top quark mass was measured with unprecedented precision of 1.2 GeV . DØ established a significant lifetime difference in the B_s system and the first observation of the Ω_b baryon.

Institute for Mathematics, Astrophysics and Particle Physics

Key publications

Gehrke, M., Grigorieff, S. & Pin, J.-E. (2008). Duality and equational theory of regular languages, ICALP 2008. *Lecture Notes in Computer Science*, 5125 (2), 246-257.

Heunen, C., Landsman, N.P. & Spitters, B. (2008). A topos for algebraic quantum theory. *arXiv*, 0709.4364 (v2, April 6, 2008).

Suijlekom, W.D. van (2008). Representing Feynman graphs on BV-algebras. *arXiv*, 0807.0999.

The DØ Collaboration, Anastasoae, M., Ancu, L.C., Jong, S.J. de, Filthaut, F., Galea, Naumann, N.A., *et al.* (2008). Measurement of B_s^0 mixing parameters from the flavor-tagged decay $B_s^0 \rightarrow J/\psi \phi$. *Phys. Rev. Lett.* 101, 241801.

The Pierre Auger Collaboration, Coppens, J., Falcke, H., Jong, S.J. de, Hörandel, J., Horneffer, A., Timmermans, C., *et al.* (2008). Upper limit on the diffuse flux of ultrahigh energy tau neutrinos from the Pierre Auger Observatory. *Phys. Rev. Lett.*, 100, 21101.

Veldman, W. (2008). The Borel hierarchy theorem from Brouwer's intuitionistic perspective. *The Journal of Symbolic Logic*, 73, 1-64.

Voss, R. & Nelemans, G. (2008). Discovery of the progenitor of the type Ia supernova 2007on, *Nature* 451, 802-804.

Dissertations: 9

Scientific publications: 251

The year 2008 was an eventful one for the Atlas experiment.

It started off with race against the clock in order to complete the full detector before the start of data taking. Then there was the excitement of the LHC start-up and the first beams through Atlas. This was followed by the deception of the incident in the accelerator that damaged the machine to such an extent that collisions were delayed by at least eight months. From cosmic ray data that were collected, the Atlas detector was shown to function well, while further improvements are being made. The electronics of the monitored drift tubes for the muon detection system, which is the responsibility of the IMAPP, were shown to function with only few dead channels and good measurement resolution en efficiency.

IMAPP is involved in two areas of Atlas physics analysis: supersymmetry (Susy) and Higgs searches. IMAPP expertise in the muon system is used to look for Susy in events with one or two muons and missing transverse energy. In the Susy group, IMAPP researchers were among the pioneers of data-driven background estimation. In the Higgs analysis, a 10% improvement was made in the golden channel, where the Higgs decays into four leptons, by adding calorimeter information in an attempt to identify muons. Contributions were made to the vector boson fusion channel with data-driven background estimates and to the channel where the Higgs decays into two muons and two b quarks.

Research on the concavity properties of theories with non-concave potentials continued, with results showing that the effective potential depends crucially on the quantization scheme that is used, canonical or path-integral approach. The use of multi-cutting techniques for the numerical one-loop corrections to nontrivial (5-particle) QCD processes was initiated. A C++ program for the automated computation of multi-particle tree-level cross sections was finished. Such codes can easily be implemented in current LHC experimental analyses. Resummation techniques for loop effects in SUSY QCD were constructed, opening up the possibility of in-depth studies of the low-energy spectrum of supergravity-motivated standard models.

The study of the baryon and meson-baryon Nijmegen Extended-Soft-Core (ESC) potentials continued, in particular for channels with strangeness. A new, fully relativistic, basis for the description of hadronic reactions developed, using the Kadyshevsky formalism.

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.

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

Director: Prof. Sijbrand de Jong

Sijbrand de Jong has been a Full Professor 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.



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mathematics) and Natuur, Leven en Technologie (Nature, Life and Technology, as well as influencing the mathematics syllabus in secondary education at the highest political level. Four staff members teach in the prestigious honours programme at the University. The yearly Mathematics Tournament at Nijmegen and the national Kangeroe math competition, both organized from IMAPP, have significantly improved the popularity and visibility of mathematics among schoolkids. The Institute initiated the HiSPARC project building air-shower array telescopes on high-school roofs in Nijmegen and other places (<http://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.

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 new window on the universe in a multi-messenger approach. For the study of cosmic rays, techniques from radio astronomy and elementary particle physics are used and there is full cooperation between astrophysicists and particle physicists in IMAPP. The appointment of two new faculty members in this area in the astronomy department in 2007 has provided a huge boost to research in astroparticle physics.

In elementary particle physics, much of the focus is on the structure of the vacuum and the associated Higgs mechanism. Knowledge of the vacuum has great implications for our understanding of cosmology. The mathematical physics department concentrates on methods originating in the mathematical foundations and analysis of quantum theory, applying these both in physics, notably in quantum information theory, and in pure mathematics, especially in representation theory. This has deep implications for the interpretation of quantum physics theories and measurements as well as practical implications for formulating theories. The theoretical particle physics department uses existing theories to develop and implement methods for calculating measurable observables.

A new research line has started, which will combine algebra and logic, with extensions to both mathematical physics as well as computer science. Work on intuitionistic mathematics has been strengthened by the new algebra and logic research. The search for a proof of the Jacobian conjecture – a worthy cause in itself – continues to generate valuable spin-off. The search for a new professor of stochastics is nearly completed allowing that department to revitalise and start research in connection with neuroscience. Also a visiting professor of applied mathematics will be appointed. These are essential ingredients in consolidating the mathematics departments by balancing pure research in mathematical physics, algebra and logic with applied mathematics.

Institute for Computing and Information Sciences

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 enhancing reliability, security, systems 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. In 2008 research was concentrated within three research themes, each with its own specific focus and aims.



Computer systems now influence virtually every aspect of our lives. Sometimes these systems appear in an easily recognizable form, as in eCommerce sites such as Amazon, and pocket calculators, but they are also increasingly hidden inside public transport cards (OV chip), television sets, multimedia devices, mobile phones, cars and washing machines, for example. This trend is known as ambient computing. However, while computing is becoming increasingly pervasive, there are growing problems with 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 artifacts – together with the slow pace of software development, high costs and strong competitive pressures – further complicates the search for solutions.

Model-Based System Development (MBSD)

Exploring various formal methods for model construction, implementation, testing and validation with the explicit aim of bridging

the gap between theory and practice through collaboration with stakeholders from industry and other application areas.

Digital Security (DS)

Developing theories and formal methods for analyzing and improving security in the digital world. This involves on the one hand investigating the security and correctness of software (and other systems), and on the other, issues related to identity-centric security and privacy, i.e. developing approaches and protocols for managing and protecting digital identity.

Intelligent Systems (IS)

Developing and applying intelligent systems that are capable of learning and reasoning. The long-term research goal is to align computer-based intelligent systems with the needs of their users, answering questions such as how best to combine knowledge from human experts with measurement data, how to enable users to guide computerized proof ‘assistants’ and how people can profit most from a large repository of structured knowledge.



Prof. Bart Jacobs' group studies the security of digital systems, such as the chip cards used in public transport.

Staff

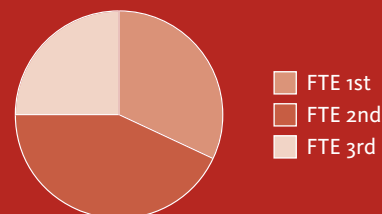
Prof. H.P. Barendregt (p)
 Prof. E. Barendsen (p)
 Prof. J.H. Geuvers (p)
 Prof. T.M. Heskes (p)
 Prof. B.P.F. Jacobs (o)
 Prof. J.W. Klop (e)
 Prof. C.H.A. Koster (o)
 Prof. W. Kraaij (e)
 Prof. M.J. Plasmeijer (o)
 Prof. H.A. Proper (e)
 Prof. F.W. Vaandrager (o)
 Prof. E.R. Verheul (e)
 Prof. M. van Vliet (e)
 Prof. Th.P. van der Weide (o)
 Prof. H. Zantema (e)

Tenured

Full Professors	4.1 FTE
Associate Professors	2.9 FTE
Assistant Professors	3.8 FTE

Non-tenured

Researchers	7.3 FTE
Postdocs	11.7 FTE
Doctoral candidates	22.6 FTE



Awards

- Bernard van Gastel, Leonard Lensink, Sjaak Smetsers, and Marko van Eekelen together received the Best Paper Award at the 'Formal Methods for Industrial Critical Systems' conference.
- Rinus Plasmeijer received an honorary doctorate and professorship from ELTE University (Budapest, Hungary).
- The NAF Architecture Award was awarded to the ArchiMate team, which includes Erik Proper, Stijn Hoppenbrouwers, Nivea Ferreira and Arjen Hommersom.
- Peter Lucas received the Best Paper Award at BNAIC'08.
- Research at ICIS on the Mifare Classic chip cards was awarded the I/O Media Award 2008. This is a national award by the Netherlands Organisation for Scientific Research (NWO) for bringing ICT research-related issues to the attention of the general public. The professional journal *InformationWeek* also featured it as one of the Top 10 Security Stories of 2008.
- The media interest surrounding the OV (Dutch public transport) chip card also helped Prof. Jacobs win the annual Frans Duynstee Award, which is awarded to the member of staff at the University who received the most media attention in the previous year.

- Roel Verdult, a student who did his Masters thesis in the Digital Security group and became a member of the group after finishing his MSc degree, won the national 'Student of the Year' award issued by the student unions LSVb, ISO and ScienceGuide.

Collaboration

International cooperation is essential in the work done at ICIS, because developments in computing take place around the globe. Partners include MIT Computer Science & Artificial Intelligence Laboratory (USA), Ministry of Internal Affairs, ST Microelectronics (France and Belgium), University of Grenoble (Fr), RWTHA, Aachen (D), Cap Gemini, Makerere University Kampala (Uganda), INRIA Microsoft Research Lab Paris, ETH Zurich, ASML and Océ Technologies.

Research results

The most prominent result achieved in 2008 by the Digital Security section was undoubtedly the work on Mifare Classic RFID tags. This is a type of contactless chip card used as public transport and building access card in many places around the world, including

Institute for Computing and Information Sciences

Key publications

Andrés, M.E. & Rossum, P.J.B. van (2008). Conditional Probabilities over Probabilistic and Nondeterministic Systems. Tools and Algorithms for the Construction and Analysis of Systems: 14th International Conference (TACAS '08). *Theoretical Computer Science and General Issues*, 4963, 157-172.

Garcia, F.D., Koning-Gans, G.T. de, Muijrs, R., Rossum, P.J.B. van, Verdult, R., Wichers-Schreur, R.J.M. & Jacobs, B.P.F. (2008). Dismantling MIFARE Classic. In: Jajodia, S. & Lopez, J. (Eds.), *13th European Symposium on Research in Computer Security (ESORICS 2008). Lecture Notes in Computer Science: Security and Cryptology*, 5283, 97-114.

Hommersom, A.J., Lucas, P.J.F. & Bommel, P. van (2008). Checking the quality of clinical guidelines using automated reasoning tools. *Theory and Practice of Logic Programming*, 8(5-6), 611-641.

Hooman, J.J.M., Kugler, H., Ober, I., Votintseva, A. & Yushtein, Y. (2008). Supporting UML-based Development of Embedded Systems by Formal Techniques. *Software and Systems Modeling*, 7, 131-155.

Jurgelenaite, R. & Heskes, T.M. (2008). Learning symmetric causal independence models. *Machine Learning*, 71, 133-153.

Marchiori, E. (2008). Hit Miss Networks with Applications to Instance Selection. *Journal of Machine Learning Research*, 9, 997-1017.

Mostowski, W.I. & Poll, E. (2008). Malicious Code on Java Card Smartcards: Attacks and Countermeasures. Smart Card Research and Advanced Application Conference CARDIS 2008, Proceedings, Egham, U.K. *Lecture Notes in Computing Science*, 5189, 1-16.

Overbeek, S.J., Bommel, P. van & Proper, H.A. (2008). Matching Cognitive Characteristics of Actors and Tasks in Information Systems Engineering. *Knowledge-Based Systems, Elsevier* 21, 764-85.

Plasmeijer, M.J., Jansen, J. M., Koopman, P.W.M. & Achten, P.M. (2008). Declarative Ajax and Client Side Evaluation of Workflows using iTasks. In: Albert, E. & Antoy, S. (Eds.), *Proceedings 10th International ACM SIGPLAN International Conference on Principles and Practice of Declarative Programming, PPDP, New York, ACM*. p. 56-66.

Wiedijk, F. (2008). Formal proof-getting started. *Notices of the American Mathematical Society*, 55(11), 1408-1414.

Dissertations:	7
Scientific publications:	140
Professional publications:	3

the Dutch OV (public transport) chip card and the Radboud University personnel card. This work, which started of as two Master's thesis projects, has so far resulted in two scientific publications, at ESORICS and CARDIS. In research on software security and correctness, the paper 'Reentrant Readers-Writers' describes the combined use of theorem proving and model checking to verify a concurrent C program, an approach known as software surgery.

In the context of our research on brain-computer interfaces the Intelligent Systems section developed and tested new methods for extracting relevant features. In collaboration with GnResound, new methods for personalizing hearing aids were developed and tested. The overview book (600+ pages) on Type Theory by Prof. Henk Barendregt and Dr Wil Dekkers has been completed and published in 2009. The Surf project 'Web Deduction' with the VU Amsterdam has led to a successful tool (www.prover.cs.ru.nl), which students can use to learn logic through a web-based system. The Web Deduction systems have also been extended with a 'certified calculator', which permits the certified computation of real values with arbitrary precision using the Coq system.

The Model-Based System Development section continued its work on model checking, a technique for automatic exploration of large state spaces. A framework for compositional abstraction of timed automata models makes it possible to check a complex Internet protocol for a random number of hosts, whereas previous methods could only handle three hosts. MBSD researchers succeeded in applying the Uppaal model checker to analyse models of the data path in copier machines. To develop embedded control systems in a multidisciplinary way, a 'lightweight' approach was developed that allows co-simulation of VDM++ and bond-graph models. In the BSIK/BRICKS project B-Screen, researchers at MBSD were able to develop and validate a Bayesian network model that combines information from different mammograms of the same patient. This resulted in improved cancer detection.

Societal impact

The Institute's impact is evident in various industrial projects designed to improve the quality of software, for instance in the medical domain (decision-support systems in the context of breast cancer screening – testing 'mindfulness') and with Océ® and ASML

Director: Prof. Tom Heskes

Tom Heskes has been a Full Professor since 2008, specializing in Artificial Intelligence, in particular Bayesian machine learning. Since 2007 he has been a Principal Investigator at the Institute for Computing and Information Sciences and an Affiliated Principal Investigator at the Donders Centre for Neuroscience. He won a prestigious Vici grant from the Netherlands Organization for Scientific Research in 2006 and is Editor-in-Chief of the journal *Neuro-computing*.



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(model checking). Computer security and privacy are hot topics in today's information society and the Institute has continued to play a prominent role in the public debate about such issues. In doing so, the group has contributed to the broader awareness that security issues can make or break large ICT projects. In 2008, the section Digital Security was prominently involved in public debate about the new Dutch OV (public transport) chip card. Research carried out by the group even sparked off a vote of no confidence in the Secretary of State. On several occasions members of the group were invited to be expert witnesses by the Secretary of State for transport and by the Parliamentary sub-committees for transport. The research on the Mifare Classic RFID tags was listed by the professional journal *InformationWeek* as one of the Top 10 Security Stories of 2008. Investigations related to the Dutch electronic passport carried out by the group also led to questions in Parliament.

Bayesian techniques developed at ICIS are being used to combine data with background knowledge, for instance to localize sources in the brain and to improve the performance of brain-computer interfacing. The Digital Security section is regularly asked to examine security issues, including commercial contract research through LaQuSo, the Laboratory for the Quality of Software. In the past year the group investigated the Dutch e-passport, the new government personnel pass, the RIES internet voting system used for Waterschapsverkiezingen (Water Board elections) in a joint project with TU Eindhoven, access control for the Electronisch Patienten Dossier (Electronic Patient Dossier, EDP), and smart electricity meters for Nuon. The group also investigated road pricing (kilometerheffing) and was contracted to develop a proof-of-concept test of the new electronic driving license. The ICIS

continued to run CodeYard, an innovative project set up to interest and involve high school students in the Netherlands and Belgium in computer science.

Future research

Within the Model-Based System Development section research will continue on the European FP7 project Quasimodo the NWO project ARTS and the ESI project Octopus (with Océ as the leading industrial partner) Within the Digital Security section research will focus on identity-centric security, which includes identity management and software security. Identity management involves investigating the policies and protocols used for identity management, mechanisms such as smart cards, RFID tags (e.g. in public transport), and the biometrics that can be incorporated, as well as the impact of this new technology on privacy and anonymity. Research on software security involves examining the role that software plays on the one hand in providing security and on the other as a source of security vulnerabilities. In collaboration with the Center for Neurogenomics and Cognitive Research at the VU in Amsterdam, the Intelligent Systems section will start a new project called GeNeUSS (Gene Networks Underlying Synaptic Signaling). The aim of this project is to develop dynamic models of neurotransmitter vesicle release. The MathWiki system project, which will start in 2009, is geared to making formalized mathematics available through a web interface that provides both high-level (standard mathematical style) and low-level (proof code) access – for reading and for joint cooperative developments.

Institute for Science, Innovation & Society



Scientific, technological and societal developments are closely interrelated. We are in the middle of a techno-scientific revolution that affects all aspects of society, resulting in a dramatic increase in the scale and pace of knowledge production and in the emergence of new converging technologies in ICT, genomics and nanotechnology. These developments change the way we see ourselves in relation to the world. 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 philosophy, the social and natural sciences in order to better understand, assess and improve the interactions between science, technology and society.



The Institute consists of three departments: the Department of Philosophy and Science Studies, the Department for Sustainable Management of Resources (DSMR) and the Department for Innovation Studies. In 2008 ISIS organized a mid-term review and was visited by an external assessment team, which was very impressed by what has been achieved in just three years by highly committed staff. All three departments have attracted a considerable amount of research funding and have produced a corresponding level of academic output. A steady stream of contract income demonstrates that all three departments have succeeded in building a strong network, including ties with industrial, governmental and civic partners. ISIS as a whole has become firmly entrenched in the Faculty of Science. The concept of 'pervasive science', which is the central research theme at ISIS, plays a pivotal role in the Strategic Plan of the Faculty of Science.

Theme 1: Society & Genomics

(Department of Philosophy & Science Studies)

In 2004 the Centre for Society & Genomics (CSG), which is funded by the Netherlands Genomics Initiative (NGI), was established at the Department of Philosophy & Science Studies. CSG is an interactive research centre that combines scholarly activities with

innovative societal interaction and collaboration among genomics researchers, policy makers and societal stakeholders. In 2008 the successor of CSG, CSG Next has started. This programme for societal research and interaction in the field of genomics will run for a period of five years (2008- 2012). Its main objective is to improve the societal embedding of genomics, as well as the quality of the debate in this field. Research is structured within three areas: 1) governance of genomics applications, 2) agenda setting for knowledge production and 3) communication and education. Collaboration with all of the 14 Genomics Centres that are funded by NGI is a core element of the programme. Related areas of interest are science communication and public perceptions of science, animal philosophy and environmental philosophy.

Theme 2: Sustainable water management

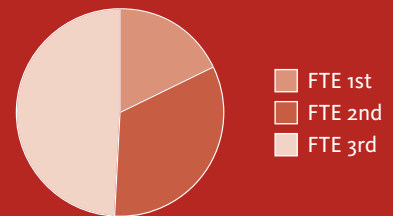
(Department for Sustainable Management of Resources; DSMR)

Sustainable water management, which is an important focus for DSMR, addresses a wide range of issues, combining scientific and societal perspectives and building on the ways in which researchers, policy makers, politicians and citizens view these issues. For centuries, the emphasis has been on the technological mastery of water and river systems. Now, a more ecocentric approach is emerging.



Staff

Prof. B. Dankbaar (o)
 Prof. J.T.P. Derksen (e)
 Prof. W.T. de Groot (p)
 Prof. F.W.J. Keulartz (e)
 Prof. C.H. Lüthy (p)
 Prof. A.J.M. Smits (o)
 Prof. J. de Wit (e)
 Prof. H.A.E. Zwart (o)



Tenured

Full Professors	1.7 FTE
Assistant Professors	0.5 FTE
Researchers	0.5 FTE

Non-tenured

Researchers	4.1 FTE
Postdocs	2.6 FTE
Doctoral candidates	15.2 FTE

< Prof. Merel Ritskes-Hoitinga – director of the University's Animal Laboratory – participated in a public debate on animal welfare organized by ISIS.

This ecological approach, which is based on river ecosystems, focuses on the strategies needed for more sustainable planning and design of river basins. Economic, ecological, societal and spatial planning aspects are all taken into account. Research takes place on a regional, national and international scale (for example, focusing on the river Waal, the tributaries of the Rhine, the Meuse, Loire, Yangtze and estuarine lakes).

Theme 3: Managing Innovation (Department of Innovation Studies)

In close connection with the Master's track Management and Technology, The Department of Innovation Studies has developed the MICORD research programme, funding for which was secured from various companies, research institutes and ministries. Researchers in MICORD (Managing Innovation, Collaboration and Outsourcing in Research and Development) tackle problems related to innovation and collaboration in three sectors that are of economic importance: food, chemicals and equipment manufacturing. Research in the programme is coordinated with the Centre for Innovation Studies (CIS) of the Nijmegen School of Management.

ISIS has defined three overarching research themes, which strengthen collaboration, namely: (1) Visions of Nature; (2) Sustainability and (3) Interactive approach. All three research groups are involved in at least two of these themes.

Collaboration

ISIS collaborates with a large number of academic and societal organizations, both nationally and internationally.

Nationally

- Locally: Institute for Water and Wetland Research (IWWR), Nijmegen Centre for Molecular Life Sciences (NCMLS) and Centre for Innovation Studies (CIS)
- Regionally: Waalweelde (Wealthy Waal) and Freude am Fluss (The joy of rivers) – projects in which various regional societal partners participate
- Nationally: CSG is a national research centre, located at the institute but collaborating with groups and experts at various other universities

Key publications

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Groot, W.T. de & Tadepally, H. (2008). Community Action for Environmental Restoration: A Case Study on Collective Social Capital in India." *Environment, Development and Sustainability*, 10, 4, 519-36.

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Keulartz, J. & Leistra, G. (Eds.). (2008). *Legitimacy in European Nature Conservation Policy. Case Studies in Multilevel Governance*. Series: The International Library of Environmental, Agricultural and Food Ethics Vol. 14. Dordrecht, Springer.

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Warner, J. (2008). Emergency River Storage in the Ooij Polder - a Bridge Too Far? Forms of Participation in Flood Preparedness Policy. *International Journal of Water Resources Development*, 24, 4, 567-82.

Zwart, H. (2008). Understanding the Human Genome Project: a biographical approach. *New Genetics & Society*, 27, 4, 353-376.

Zwart, H. (2008). Challenges of Macro-ethics: Bioethics and the Transformation of Knowledge Production. *Journal of Bioethical Inquiry*, 5, 4, 283-293.

Zwart, H. (2008). *Understanding Nature. Case Studies in Comparative Epistemology*. Series: The International Library of Environmental, Agricultural and Food Ethics, Vol. 13. Dordrecht, Springer.

Dissertations:	2
Scientific publications:	114
Professional publications:	3

Internationally

- CSG collaborates with a number of international partners, notably the ESRC Centre for Economic and Social Aspects of Genomics (CESAGen) at Lancaster/Cardiff in the UK. Each year, international academic conferences on the societal aspects of genomics are jointly organized. CESAGen and CSG together host the online journal *Genomics, Society & Policy* and collaborate with the EU-funded INES programme (Institutionalization of Ethics in Science Policy), in which CSG was responsible for the work package on medical genetics.
- DSMR cooperates with the University of Duisburg-Essen and in collaboration with IWWR, ISIS offers a two-year international Master's programme on Transnational Ecosystem-based Water Management (www.twm-master.com). Together with Chinese, Netherlands and German governmental and nongovernmental organisations (GOs and NGOs) as well as universities, a knowledge exchange platform was launched to explore sustainable river basin management (the Healthy Yangtze project). This project has established an arena in which scientists, consultants, civil servants and entrepreneurs involved in water management innovations can exchange knowledge and experiences and identify cooperative ventures in research, education and business. DSMR is either lead applicant or otherwise involved in four research/educational projects funded by one of the three European Interreg programmes (Interreg A, B and C), in which various GOs, NGOs and universities are involved:
 - Transnational Water Management (Interreg IIIA); Germany, the Netherlands
 - IRE (Interreg IIIA); Germany, the Netherlands.
 - Freude am Fluss (Interreg IIIB); Germany, France and the Netherlands
 - River Cross (Interreg IIIC); Germany, Greece, Poland and the Netherlands.
- MICORD receives funding for its research programme from several international companies, including AkzoNobel, Philips and Shell as well as the Dutch Polymer Institute.

Research results

Department of Philosophy & Science Studies

In 2008 the department significantly strengthened its position as an Expert Centre of international prominence and high societal visibility for Social Science and Humanities research in the contemporary life sciences, notably genomics. This was the year in which CSG Next started with ten externally funded research projects and numerous activities related to education and communication.

Director: Prof. Hub Zwart

Hub Zwart has been a Full Professor 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), genomics (2003-now). He was also European leader of the EU-Canada exchange program 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*.



Institute for Science, Innovation and Society

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DSMR

The DSMR organized a successful three-day international conference in Nijmegen from 22-26 October. This conference, which marked the end of the EU project *Freude am Fluss*, was also the starting point for preparing two new EU-funded projects. Work on the project 'Wealthy Waal' has also finished. Dr Gertjan Geerling defended his thesis, which was entitled 'Riverine nature and flood risks' in September 2008.

Department of Innovation Studies

In 2008 research in the MICORD programme continued. This programme, which covers innovation processes in all major industrial sectors, involves senior researchers, who coordinate six externally funded PhD projects. Members of the programme organized two meetings to inform sponsors, which include several large companies as well as ministries, TNO and NWO, about the progress of research. In May 2008, an international conference was held in Nijmegen, which highlighted critical perspectives on the knowledge society.

Societal impact

A high degree of public visibility and relevance to society and policy is inherent in the innovative, interactive research programmes at ISIS. The Centre for Society & Genomics, which hosts the public website watisgenomics.nl (~ 10,000 hits each month), organizes a number of interactive workshops, public debates and on-line discussions (DNA dialogues) in collaboration with established podia such as the LUX cultural centre and various popular magazines. Developing new tools for interactive research and continuous and systematic interaction with a variety of stakeholders are key features of CSG's methodological profile. Evidence of the societal

outreach of the DSMR's research can be seen in 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 Rhine-Waal region. Educational programmes and materials have been developed that are used to train international professionals and academics and research has resolved specific issues raised by the partners. Regional development plans are structured according to a Joint Planning Approach, a stepwise decision-making method that includes all those involved. The Department of Innovation Studies also involves key societal stakeholders in developing its research programme, in particular those from industry.

Future research

Research in the CSG Next programme will continue. Genomics is now in the process of moving out of laboratory environments and into the realm of concrete applications, thus raising new questions concerning governance, agenda setting and communication. The departments of Innovation Studies and Sustainable Management of Resources are developing new ideas for research programmes that will be submitted early in 2009. The focal points of these proposals are the way in which nature is valued (nature and economy) and sustainable land use in river deltas. In line with the mission of ISIS these (research) proposals will involve co-operation with various societal partners. In total, twelve theses will be delivered over the next five years. ISIS also has a new challenge: to mature into an Institute with a strong national and international reputation among all of its stakeholders (academics and students, as well as public and private partners).

Glossary

(e)	Extraordinary chair	NHS	Nederlandse Hartstichting – Netherlands Heart Foundation
(o)	Ordinary chair	NISCO	Nijmegen Institute for Social & Cultural Research
(p)	Personal chair	NROG	Nationaal Regie-Organ Genomics – Netherlands Genomics Initiative
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	NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek – Netherlands Organisation for Scientific Research
BSI	Behavioural Science Institute	N4i	Nijmegen Institute for Infection, Inflammation and Immunity
CLS	Centre for Language Studies	OO&R	Onderzoekscentrum voor Onderneming & Recht – Business and Law Research Centre
CMBI	Centre for Molecular and Biomolecular Informatics	RST	Research Institute for Religious Studies and Theology
CMR	Centrum voor Migratierecht – Centre for Migration Law	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
CNR	Centrum voor Notarieel Recht – Centre for Notarial Law	Spinoza	The most prestigious prize for scientists in the Netherlands who are at the very top of their research profession, awarded by NWO
DCC	Donders Centre for Cognition	SteR	Onderzoekscentrum voor Staat en Recht – Centre for State and Law
DCCN	Donders Centre for Cognitive Neuroimaging	STW	Technologiestichting STW – Technology Foundation STW (Netherlands)
DCN	Donders Centre for Neuroscience	UMC	Radboud University Nijmegen Medical Centre
DFG	Deutsche Forschungsgemeinschaft – German Research Foundation	Veni grant	Personal grant from NWO awarded over a period of three years to researchers who have recently obtained their PhD, to allow them to continue to develop their ideas
DFN	Diabetes Fonds Nederland – Dutch Diabetes Research Foundation	Vidi grant	Personal grant from NWO 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
ERC	European Research Council	Vici grant	Personal grant from NWO awarded over a period of five years to senior researchers who wish to establish their own research group
ESF	European Science Foundation	ZonMw	ZorgOnderzoek Nederland NWO Medische Wetenschappen – Netherlands Organisation for Health Research and Development
FOM	Stichting voor Fundamenteel Onderzoek der Materie – Foundation for Fundamental Research on Matter (Netherlands)		
FP6 ; FP7	EU Framework Programme 6, respectively 7		
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 public and/or private organizations		
HLCS	Institute for Historical, Literary and Cultural Studies		
ICIS	Institute for Computing and Information Sciences		
IGMD	Institute for Genetic and Metabolic Diseases		
IMAPP	Institute for Mathematics, Astrophysics and Particle Physics		
IMM	Institute for Molecules and Materials		
IMR	Institute for Management Research		
IRUN	International Research Universities Network		
ISIS	Institute for Science, Innovation & Society		
IST	Information Society Technologies		
ITEA	Information Technology for European Advancement		
IWWR	Institute for Water and Wetland Research		
KNAW	Koninklijke Nederlandse Academie van Wetenschappen – Royal Netherlands Academy of Arts and Sciences		
KWF	Koningin Wilhelmina Fonds – Dutch Cancer Foundation		
MPI	Max Planck Institute for Psycholinguistics, Nijmegen		
NCEBP	Nijmegen Centre for Evidence-Based Practice		
NCMLS	Nijmegen Centre for Molecular Life Sciences		