Preface

By grouping all of our academic investigations in 21 institutes, we have succeeded in creating an inspiring research environment. This can be seen from the internationally-recognised results that our researchers achieved on many fronts in 2007. In research, the University is at the top of European academic institutions.

Twelve of the University’s research institutes have been evaluated by international commissions since 2004. These have been graded “very good” to “excellent”. The quality of our research can also be seen from the rising number of academic publications and PhDs. One very welcome development is that our researchers have become more successful in publishing in top journals such as Nature and Science.

It is a hopeful sign for the future that our young researchers, in particular, are producing good results and are among the very best nationally and internationally. In 2007, our University provided the greatest number of members for the Young Academy of the Royal Netherlands Academy of Arts and Sciences. What’s more, over 40 national and international prestigious grants were awarded to the younger generation of scientists at Radboud University Nijmegen.

An important aspect is transmitting research results to a broad public, a practice that is known as social and economic valorisation. This report presents the results of valorisation in all research institutes. The University facilitates this in many ways. In 2007, for example, we formalized our patents policy.

Research takes place in an international academic environment. Researchers at the University work together with colleagues world-wide and participate in international research projects. We strongly encourage their contributions. To further strengthen our international position, we have initiated the International Research Universities Network, IRUN, in which nine universities currently participate. The participants seek to further improve the quality of their research and the training of their young researchers through exchange and cooperation. These activities help guarantee our future research success.

This is now the fifth edition of the Research Report. We describe the most recent developments within our research institutes and their plans for future research. We also account for our use of the resources we receive from government, various institutions and companies. From their reactions, it appears that many people appreciate the fact that, through these reports, we provide an accurate description of the state of our research. In view of our achievements in 2007, we can again do that with considerable pride.

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

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

Research staff

Tenured

Full Professors 126.8 FTE
Associate Professors 96.8 FTE
Assistant Professors 144.7 FTE
Researchers 98.4 FTE

Non-tenured

Researchers 249.4 FTE
Post-docs 172.8 FTE
Doctoral candidates 780.9 FTE

Research input

Research output

Dissertations 262
Scientific publications 5288
Professional publications 1081
Annotations 235
Patents 11
Academic reputation

In 2007, Radboud University Nijmegen has made progress towards its ambition to be one of Europe’s top academic institutions. The numbers of academic publications, of publications in top-ranking journals, of PhD dissertations, scientific infrastructures and competitively awarded research projects all increased substantially. Frequent contributions to public debate and memberships in advisory councils have again improved our societal impact and visibility. International scientific networks have been established and reinforced, while our partnerships with private and public institutions have been consolidated. A particular characteristic of our University is its stimulating environment and attractiveness to talented young researchers. In 2007, more than 40 prestigious grants were awarded to the most promising young researchers across the University. This report highlights the most significant achievements of the institutes in which all the research at the University is organized.

![Increase in the total number of scientific publications](image)

**Figure 1:** Increase in the total number of scientific publications

**International position**

On 7 September 2007 the International Research Universities Network (IRUN) was launched in Nijmegen. IRUN is an international network of broad-based research universities that was initiated by Radboud University Nijmegen. The universities participating in the Network are well known for the international quality of their research and education and are strongly motivated to further improve that quality.

The aim of IRUN is to strengthen the quality of research and teaching at the universities involved. Within it, the exchange of researchers, lectures and students will be encouraged and facilitated. This may lead to joint curriculum development and joint degree programmes for Master’s students and PhD candidates. Furthermore, the network will serve as a platform for joint conferences, symposiums and seminars.

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).
The programmes described below demonstrate our leading role and responsibilities as a coordinator.

The framework of the International Working Group on Protected Funds in the EU and the International Working Group on Security Rights in Europe were both established and are chaired by the Institute for Law. The Institute for Law is also responsible for coordinating the European Network on the Free Movement of Workers within the European Union (funded by the European Commission).

The aim of the IMPACT programme – an EU-funded consortium in which the Medical Centre of Radboud University Nijmegen is the European coordinator – is to control the HIV/AIDS epidemic in Bandung, Indonesia by targeting the main risk group (intravenous drug users).

Figure 2: Increase in the number of publications in *Nature*, *Science*, *Proceedings of the National Academy of Sciences* and the *New England Journal of Medicine*

The Centre for Society & Genomics (CSG) is an interactive research centre that combines scholarly activities with innovative societal interaction and collaboration with genomics researchers, policy makers and societal stakeholders. This Centre, which is funded by the National Genomics Initiative, is managed by the Institute for Science Innovation and Society (ISIS). Its basic objective is to improve the societal embedding of genomics and the quality of the societal debate on related issues. The new programme (2008-2012), was accepted for funding in December 2007.

An international conference on ‘Salafism as a transnational movement’ was organized by Dr R. Meijer and Drs M. de Koning at the Institute for Historical Literary and Cultural Studies (HLCS) as a starting point for research on Salafism. Experts from 22 universities in 10 countries discussed its emergence worldwide, its use of the Internet and recent research on this movement designed to get a better understanding of how Salafism – as a transnational movement – has been so successful in retaining its universal features while adapting to local circumstances.

The Netherlands Organization for Scientific Research (NWO) awarded a grant to Profs. Grimes, Venbrux and Wiegers from the Research Institute for Religious Studies and Theology (RST) to establish a structural cooperation with researchers in the field of ritual studies (SFB Ritualdynamik) at the University of Heidelberg, Germany. This collaboration is entitled ‘Ritual, Conflict and Media.’
To strengthen collaboration and increase our visibility, both nationally and internationally, the research activities of the F.C. Donders Centre for Cognitive Neuroimaging, the Nijmegen Institute for Cognition and Information (NICI) and the recently reorganized Institute for Neuroscience will be combined in a new institute: the Donders Institute for Brain, Cognition and Behaviour (from September 2008).

The Donders Institute’s Centre for Cognition is leading a consortium of universities, industries and patient associations in the SmartMix programme BrainGain. This programme has been granted new joint funding from the Dutch Ministry of Economic Affairs and the Netherlands Organization for Scientific Research (NWO). The grant was won against strong competition. BrainGain focuses on the application of results from brain research in patient therapies.

**External evaluations**

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

In 2007 three research institutes at the University – Heyendaal Institute, Research Institute for Religious Studies and Theology and the Donders Institute’s Centre for Cognition – were evaluated by independent international review committees.

The Research Institute for Religious Studies and Theology (RST) and its research programmes were given high marks by the Committee, both for their scientific quality and for their societal relevance. On average the five programmes were rated “very good” on all four criteria (quality, productivity, relevance and vitality & feasibility). Measures have been taken to improve fundraising at the national and international level and to enhance the quality and impact of the Institute’s academic output.

The Heyendaal Institute (HIN) was assessed during the same evaluation as the RST and was rated “good” on all aspects. The Committee commented on the small size of the Institute and the uncertain funding of its research programme. Based on this evaluation and the proposed new HIN research programme, the Executive Board of the University decided to guarantee structural financial support. Regarding the size of the Institute, it was decided to discontinue HIN as an independent institute and to make the new HIN research programme part of the RST research programme on the Transformation of Religions in the Framework of Modernity. This will contribute to an enriched academic environment for the RST and broaden the scope of the former HIN’s research.

The Donders Institute’s Centre for Cognition was rated “very good”. Of the five programmes, two were uniformly “excellent” or “close to excellent” on all scales and the other three programmes, on average, were “very good”. The conclusions in the assessment report have prompted action to strengthen the Centre, for example by combining two divisions.

**Acknowledged excellence**

Many researchers at the University received prizes and awards for their excellent performance in academic research. A selection is presented here.

**International**

Prof. Peter Hagoort was awarded an honorary doctorate by the University of Glasgow. The Nijmegen neuroscientist received the distinction because of his involvement in the
establishment of a neuro-imaging facility in Glasgow. Hagoort is Professor of Cognitive Neuroscience at Radboud University Nijmegen, Director of the Donders Institute’s Centre for Cognitive Neuro-imaging and Director of the Max Planck Institute for Psycholinguistics in Nijmegen. His research focuses on the neuro-biological foundations of human linguistic abilities. He studies language disorders in people with brain damage as well as brain activity while people are speaking.

Prof. Ad van der Avoird – Professor of Theoretical Chemistry – received the prestigious Humboldt Research award from the Max Planck Society in Germany for his work in the field. Van der Avoird is engaged in modelling and understanding the quantum mechanical processes in molecules and materials and the course of chemical reactions. In 2007 he published a complete theoretical description of water in the journal *Science*.

![Figure 3: Growth in the number of dissertations](image)

Dr Frans Cremers, Professor of Molecular Biology, specializing in genetic eye disorders, has been honoured by the European Vision Institute with the European Vision Award 2007. This award recognises his work and that of his group over the past twenty years. Prof. Cremers is Head of the Molecular Genetics section in the Department of Anthropogenetics and curriculum coordinator for the Research Master’s programme in the Molecular Mechanisms of Disease. The European Vision Institute integrates, advises and supports scientific research that contributes to the prevention and treatment of eye diseases. Prof. Cremers is the first recipient of the Vision Award.

As a long-term adviser to the EBIA (European Bedding Industry Association), Prof. Ton Coenen received an award for his work on sleep. Prof. Coenen is especially interested in the phenomenon of sleep in all its facets, including sleep disorders and therapies to treat them as part of his neuro-physiological research into the relationship between brain activity and behaviour.

Dr Pascal Fries, who works at the Donders Institute’s Centre for Cognitive Neuro-imaging, was awarded the 2007 Bernard Katz Prize for his research on human observation. He studies the role of rhythmic synchronization in interactions between brain cells and how the brain initiates behaviour. Each year, one young scientist is chosen to receive the Bernard Katz Prize. In 2007 Fries also won the Boehringer Ingelheim FENS Research Award.

Prof. Sible de Blaauw, Professor of Early Christian Art and Architecture, received the prestigious Premio Daria Borghese in 2007 – an annual prize for non-Italian scholarship on the cultural history of Rome. De Blaauw is the first Dutch academic to receive this prize for his studies of the city of Rome.

Prof. Harald Motzki of the Department of Arabic and Islam at Radboud University is one of the winners of the fourteenth World Prize for the Book of the Year, awarded by the Ministry of Culture and Islamic Guidance of the Islamic Republic of Iran. Prof. Motzki was awarded this prize for his book ‘The Biography of Muhammad’ (2000) and his studies of the traditions concerning the Prophet. The Iranian government awards six prizes to foreign authors working in the field of Islamic Studies each year.

Prof. Jan Kremer received the Telemedicine award as well as the FREYA award for his innovative work at the outpatient clinic for fertility.

The Nijmegen Parkinson Centre (ParC) was evaluated as “excellent” by the American National Parkinson Foundation.

Prof. Luciano Fasotti received the ‘2007 Award for Outstanding Contribution’ from the Society for Cognitive Rehabilitation.

Dr Chris Buskes won the Socrates award for his book *Evolutionair denken. De Invloed van Darwin op ons Wereldbeeld*. This book discusses the impact of Darwinism on the way we see ourselves.

**National**

Prof. Pieter Muysken was awarded a prestigious academy chair by the Royal Netherlands Academy of Arts and Sciences (KNAW), which will allow him to devote five years to his research on the indigenous languages of South America and to consolidate his work with talented young researchers.

Prof. Theo Rasing was the recipient of the PHYSICA prize, which is awarded once a year by the Dutch Physical Society to a physicist for an outstanding contribution to the field. Prof. Rasing, who is Professor of Solid-state Physics at the Institute for Molecules and Materials, studies how light can affect magnets.

Prof. Rob Oostendorp became an Honorary Member of the Royal Association of Physical Therapists (KNGF). An annual ‘Prof. R.A.B. Oostendorp lecture’ was announced by the board of the Netherlands’ Association for Manual Therapy – with the first lecture being presented by Prof. Oostendorp himself.

Dr Mirjam Ernestus was elected as one of the ten new members of the ‘Young Academy’, a branch of the Royal Netherlands Academy of Arts and Sciences. This brings the number of Nijmegen Young Academicians to eleven (out of a total of seventy).

The Department of Plant Genetics received the RijkZwaan Plant Sciences award and the award for the best internship report for a genetic study of flower development from the Dutch Genetics Society.
Young scientists and Research Master’s students at the University have produced outstanding results. More than 40 excellent young researchers at the University won prestigious national and international grants against strong competition in 2007.

Sixteen talented young researchers received a NWO Veni grant, which will enable them to do research for three years. The winners are: Ellen de Bruijn, Erno Hermans, Anna-Karina Hermkens, Alexandra Jesse, Eelke Jongejans, Sander Leeuwenburgh, Kristin Lemhöfer, Alessandra Palmigiano, Lisinka Vissers, Manon Zweers, Celina Cohen-Bendahan, Benda Hofmeyr, Nikolaos Lazaridis, Renske Spijkerman, Thilo Womelsdorf and Astrid de Wijn.

Ten researchers have received a NWO Rubicon Scholarship to enable them to go to another country to conduct research immediately after gaining their doctorates, or to come to our university with such a scholarship. The scholarships were awarded to: Floris de Lange, Bart Pollux, Niels Riksen, Bart Smeets, Carinne Piekema, Ali Mazaheri, Iman Schultz, Dick Thijssen, Juan Vidal Miranda and Amanda Brown.

Seven post-doctoral students received NWO Vidi grants, which will enable them to develop their line of research for five years. These grants were awarded to Onno Crasborn, Betty de Hart, Gabrial Janzen, Yiya Chen, Timothy Radstake, Ronald Roepman and Bert de Vries.

Four Research Master’s students (Wieteke Hoeijmakers, Marleen van Gelder, Kirsten Weber and Karlien Coene) received an NWO Top Talent grant for four-year long PhD research programmes which they have designed themselves.

Two researchers (Hans Naus and Paul Hageman) received an STW ‘Valorisation Grant’ which will enable them to develop the results of their scientific research results for commercial use over the next two years.

An NWO Casimir Grant, which enables researchers in centres of expertise to work for short periods in companies, or vice versa, was awarded to Paul Geutjes.

One of the three prestigious European Young Investigators (EURYI) Awards given to Dutch scientists this year was won by Jeroen Cornelissen. EURYI is an initiative of the European Science Foundation (ESF). The winners of this prize are seen as potential world leaders in their fields.
A European Research Council (ERC) Starting Grant was awarded to Gabriele Janzen and to Onno Crasborn. Only 3% of a total of 9,167 applications, from all over Europe, were honoured.

**Valorization**

In 2007 Radboud University Nijmegen formulated a patents policy. At the same time, further regulations on ownership and remuneration were made to cover cases in which a patent is transferred or licensed to a third party, resulting in revenues that exceed costs.

If the University is either owner or co-owner of the patent, researchers – as employees of the University – will get reasonable compensation whenever they transfer or license the patent. Some of this income will go into a revolving fund to finance other patent applications.

The University and the Radboud University Medical Centre have jointly chosen to adopt a three-way distribution of income for the university, for the faculty where the researchers work, and for the researchers themselves.

**Societal impact**

A large number of researchers of the University have positions in the public and private domain as advisors, council members or board members. They are also engaged in public debates, giving lecture for the general public or specific patient associations and interviews on radio and television. An example from the Arts: by contributing to artistic or historic exhibitions they publicise the latest insights into cultural heritage. In Medical Science the development of tools for early diagnosis of severe illnesses such as cancer is of major importance for society. The following examples illustrate the impact of our research in 2007.

The Centre for State and Law participated in the public debate on the administration of justice. In cooperation with the Review Committee on the Intelligence and Security Services, it held an international symposium on Accountability for Human Rights in the World of Intelligence. Keynote speakers were Prime Minister J.P. Balkenende, vice-president of the European Commission Franco Frattini and the vice-president of the Raad van Staat Herman Tjeenk Willink. Prof. Ybo Buruma chaired the round table and delivered the concluding speech.

Dr Gerben Westerhof from the Behavioural Science Institute (BSI) published a manual on the residential care of older adults. This received widespread media attention and is already being used in institutions.

The semi-public international conference ‘Salafism as a transnational movement’ attracted government representatives, members of socio-political institutions and journalists from the Netherlands and other European countries. It was widely reported in the media. The conference was preceded by a public debate on Salafism with M. de Koning (Radboud University), S. Lacroix (Sciences Po, Paris) and S. Hamid (Chester University, UK).

Prof. Jos van der Meer was appointed Fellow of the Royal College of Physicians (Edinburgh) and Vice-chairman of the European Academies’ Scientific Advisory Council.

Prof. Harold Bekkering chaired the Royal Netherlands Academy of Arts and Sciences (KNAW) committee on ‘How to organize Cognitive Science in the Netherlands’ and the Netherlands Organisation for Scientific Research (NWO) committee ‘Contours of the National Initiative on Brain and Cognition’.
Prof. Frans Russel, Professor in Molecular Pharmacology & Toxicology, was elected President of the Netherlands Society of Toxicology (NST). The NST is one of the largest toxicological societies in Europe, representing more than 600 members from different branches of science.

Dr Joost Hoenderop, Dept of Physiology, was elected member of the Young Nephrologists Committee (YNC) in the International Society of Nephrology (ISN). ISN, which has over 8,000 members, selected just ten young members world-wide in 2007.

Top academic achievements

Profs. Katsnelson and Fasolino demonstrated in their work on graphene that thermal fluctuations in the two-dimensional carbon layer cause it to form ripples (Nature).

Equally exciting results on graphene have come from Prof. Maan’s group, where recent experiments at the HFML reveal the room temperature quantum Hall effect (Science).

The group led by Prof. Nolte have produced a virus-based single-enzyme nano-reactor, making it possible to monitor enzyme processes at the single-molecule level (Nature Nanotechnology).

A birth-to-maturity study showed that negative parent-child bonds are indirectly related to low-quality partner relationships and dissatisfaction with life in adulthood due to conflictual parent-adolescent communication and low-quality partner relationships in young adulthood (Prof. Overbeek et al., 2007).

Research in the programme on cognitive processes in psychological dysfunctions suggests that avoidance behaviour is a central mechanism in maintaining anxiety (Profs. Rinck & Becker, 2007; Prof. Heuer et al., 2007).

An interdisciplinary study commissioned by the Dutch Ministry of Justice reviewed the relevance of the prohibition on profanity in criminal law. The main conclusion was that the criminal law article on profanity, although seldom used, still mirrors important moral considerations.

The Institute for Law publishes the leading case law review of Business and Law (Jurisprudentie Onderneming en Recht). Research on 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 the authors of volumes in the prominent Asser Series.


In 2007 the ‘Lexicon voor de ethiek’ (Dictionary of Ethics) was completed. This contains extended descriptions (between 500 and 2,000 words) of 145 key concepts in the moral vocabulary. The dictionary – an initiative of the Centre for Ethics – is edited by four of its members. Sixty-two scholars from twenty-two research institutes in the Netherlands, Belgium and Germany contributed. As the first Dictionary of Ethics to be published in Dutch, it is expected to play an influential role in ethical debates in the Netherlands and Flanders.

In 2007, Prof. Helen de Hoop’s PIONIER project ‘Case cross-linguistically’ was completed. This project linked three areas of linguistics: theoretical linguistics, language typology and psycholinguistics. This combination of various linguistic traditions has proved very productive, leading to fresh insights and to a new theory of the functions of case in language and its processing.
Onno Crasborn’s sign language research shows that there is no globally dominant language comparable to English, although American Sign Language is slowly gaining importance.

In 2007, Dr Norris’ group at the Donders Institute’s Centre for Cognitive Neuro-imaging demonstrated that it’s possible to perform high spatial resolution fMRI in humans with sub-millimetre resolution and sufficient temporal resolution to be compatible with a block design. They also published a solution to one of the longest-standing problems in fast MRI. This will facilitate the development of highly sensitive imaging experiments for both functional and diffusion-weighted imaging that does not suffer from image distortion.

Research on School-University partnerships is contributing to the development of ‘local theory’ on teachers’ professional development in schools. Teachers are gradually coming to understand the theory and it is increasingly being applied in daily classroom practice.

The Biophysics group at the Institute for Computing and Information Science (ICIS) has gained a better understanding of the way we disaggregate complex sounds from various sources – each with different spectral content and at different positions in 3D space. This is of major importance for virtual reality applications and for the development of hearing aids. The group has also developed new algorithms for optimal decision-making in machine learning, with new applications in gene-linkage analysis and medical diagnostics. Moreover, it has taken a further step towards solving the problem of stochastic optimal control, which is of major importance for optimal control in uncertain real-world applications and for understanding the stochastic mechanisms involved in neuronal processes.

The Software Technology group at ICIS focuses on the applicability of generic programming techniques to writing generally-applicable type-driven algorithms, i.e. those which work for any type. Such a generic algorithm only needs to be defined once and can then be re-used for any new case. This high degree of re-usability considerably increases the reliability of software and can cope with changes in software systems over time.

Treating children with ADHD with atomoxetine was found to be associated with superior outcomes compared with placebos. The considerable variability among individuals in terms of the recurrence of symptoms after drug discontinuation suggests that some subjects treated with atomoxetine consolidate gains made during drug treatment and would benefit from a medication-free trial to assess the need for ongoing drug treatment.

The association of a specific haplotype of the alleles of two variable-number tandem repeat polymorphisms within the 3’ untranslated region and intron 8 of the dopamine transporter gene with attention deficit hyperactivity disorder (ADHD) has been confirmed.

A study identified genetic factors predisposing for schizophrenia by screening 600 non-synonymous single-nucleotide polymorphisms (SNPs) in three independent Caucasian schizophrenia case-control cohorts. A meta-analysis revealed eight SNPs significantly (p<0.05) associated with schizophrenia: six risk factors and two SNPs that protect against the disorder.

The Pierre Auger Observatory had an extremely successful year. It has been shown that the highest energy cosmic rays originate from the vicinity of Active Galactic Nuclei. This establishes the new field of Charged Particle Astronomy. The Nijmegen group, which has, for the first time, observed cosmic rays with a radio detection technique at the Pierre Auger Observatory, has taken the lead in developing this technique, which promises better duty cycle and angular resolution than the techniques currently employed. Large-scale
applications, e.g. in LOFAR have also come a step closer. Exploitation of LOFAR measurements was an important focus for the group. The work in astroparticle physics has been put on a firm footing with an approved FOM programme.

Plant scientists at the IWW elucidated the role of microRNA R169 in controlling the formation of male and female gametes in petunia flowers. In cooperation with Keygene NV (Wageningen), they successfully developed a technology for the large-scale identification of transposon insertion flanking sequences using novel pyrosequencing technology.

Plant ecologists published an alternative hypothesis to explain the ecological significance of idiosyncratic root behaviour in *Science*. In this and other work they re-analyzed current research on interactions between roots in plants. It is becoming increasingly clear that roots can distinguish the roots of a neighbouring plant from their own roots and grow faster in alien surroundings.

In 2007, the first results became available from the EU 6th Framework project POLYGENE. In close collaboration with deCODE Genetics, whole genome association studies were conducted on breast cancer and prostate cancer. New genes and additional candidate genomic regions were identified and published in four papers in *Nature Genetics* in 2007.

The Nijmegen Institute for Social Cultural Research (NISCO) have shown the consequences of rationalization processes, by investigating changes in public opinion in the Netherlands about two controversial issues: homosexuals and euthanasia. They found that a rapid reduction in opposition to both issues in the 1970s and early 80s was followed by a period of stable minority opposition. They identified period and cohort indicators to test which characteristics are associated with these changes in attitude. For both attitudes, transitions in the religious composition of Dutch society account for the largest changes in public opinion. They also found that the influence of religion on both attitudes has become stronger in recent years, whereas the influence of educational attainment has weakened.

New volcano microbes responsible for methane oxidation below pH 1 were discovered by the microbiologists at the IWW in mud pots near Naples in Italy. The genome and proteome of the microbes were elucidated using pyrosequencing and advanced mass spectrometry. The activity of these microbes could lead to a completely new methane sink, with global implications for counteracting climate change.

In spring 2007 the NSM Decision Lab – supervised by Prof. Ad van Deemen – was opened. This laboratory undertakes experimental research based on game theory and social choice theory to study cooperative decision making in various empirical domains.

The wide variety of successful results referred to here show the vitality of research at our University.
Radboud University Nijmegen has nine faculties:
- Faculty of Theology
- Faculty of Religious Studies
- Faculty of Philosophy
- Faculty of Arts
- Faculty of Law
- Faculty of Social Sciences
- Nijmegen School of Management
- Faculty of Science
- Medical Centre (Faculty of Medicine and University Hospital)

**Fundamental and applied research is carried out within twenty-one 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
- Research Centre of the Graduate School of Education
- Centre for Language Studies
- Behavioural Science Institute
- Donders Institute for Brain, Cognition and Behaviour
  - Centre for Cognition
  - Centre for Cognitive Neuroimaging
  - Centre for Neuroscience
- Nijmegen Centre for Clinical and Translational Research
- Nijmegen Centre for Evidence-Based Practice
- Nijmegen Centre for Molecular Life Sciences
- Institute for Water and Wetland Research
- Institute for Molecules and Materials
- Institute for Mathematics, Astrophysics and Particle Physics
- Institute for Computing and Information Sciences
- Institute for Science, Innovation and Society

**Preparing for a career in research with ten Research Master’s 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

Director: Prof. G.A. Wiegers

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. Researchers working on this theme study transformations of religious traditions in their social, cultural and political contexts.

RST encourages interdisciplinary research. While transformations within Christianity is the principal field of study, other religions – especially Judaism, Islam, Indian religions and new and local religions – are increasingly important research topics.

In April 2007 RST and its research programmes received a very positive evaluation of its scientific quality and societal relevance from an international peer review committee. The Institute sees this positive evaluation as an affirmation of the current research programme Religions and Transformations in Context.

In order to more efficiently integrate a number of small interfaculty research institutes, it was decided to place them all in one of the faculties. These institutes include the Heyendaal Institute Nijmegen for interdisciplinary research into the relationship between theology and other fields. As of 1 January 2008, the Heyendaal research programme is integrated within RST and part of the programme led by Prof. G. Essen.

The central research theme ‘Religions and Transformation in Context’ (running from 2007-2012) is carried out by the following five groups:
Traditions and transformations in intercultural and inter-religious contexts  (Prof. G. Wiegers, Prof. E. Venbrux)
This programme in comparative religious studies focuses on processes relating to transformation in the traditions of Islam, Asian religions, and new religious movements (including indigenous and local religions) in the Western world. There is a special focus on ritual changes, in particular within the NWO-funded research programme Refiguring Death Rites (RDR).

Reframing Spirituality and Mysticism in Past and Present  (Prof. F. Maas, Prof. P. Nissen, Prof. C. Waaijman)
This programme starts from the observation that in present-day Western societies there is a growing interest in spirituality and mysticism, not only within the historical religions, but also outside these traditional settings, in the so-called ‘secular quest’ in new religious movements, alternative circuits, and even in secular contexts. These developments have deeply transformed both the socio-cultural manifestation of spirituality and mysticism, and the scholarly awareness of the inner structure of spirituality and mysticism and their relationship to texts, material objects, images, social and economic culture, histories, practices and theoretical presuppositions. These transformations have not yet been subjected to inter-disciplinary study. In order to describe and understand these phenomena adequately, the programme aims to revise the scholarly approach to research into spirituality and mysticism. There is close cooperation with the Titus Brandsma Institute and the Institute of Eastern Christian Studies.

Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism  (Prof. T. Nicklas, Prof. E. Eynikel)
This programme focuses on biblical and extra-biblical texts that mirror religious transformations in changing social, political, or religious contexts. The research concentrates on the interpretation of a number of key texts on religious transformations (e.g. the Books of Judges, the Books of Samuel and early Christian apocryphal Gospels), different levels of interpretation and re-working of early Christian and Jewish texts (textual history of canonical and extra-canonical texts, apocryphal and patristic interpretations), as well as their historical, religious and hermeneutical backgrounds.
Transformation of Religions in the Frameworks of Modernity: Research into the normative quality of religious belief-systems in processes of change
(Prof. G. Essen)
This programme investigates the effects of social and cultural transformation on the normative quality of religious interpretive systems. The way such systems position themselves in the pluralistic society of modern Europe requires ‘cognitive dissonances’, which in many respects demand a reflexive leap on the part of religious institutions and communities. Religions have to come to terms with the experience that in a religiously pluralistic situation they are confronted with alternative types of religious interpretation that cannot simply be integrated with their own religious contexts.

Religions have to come to terms with the experience that they are no longer able to control the reception of the contents of their beliefs. Although these criteria continue to determine the self-interpretation of modern culture, it often happens in a secularized form and outside institutionalized religious frameworks. Hence, religions have to engage with the premises of modernity (specifically their crystallization in civil society) and in this respect develop explicitly modern forms of religious awareness. In the first place, civil society is grounded in a profane legal and moral order; secondly, reaching consensus is based on principles of tolerance and mutual recognition.

Religious Identity Transformation in Context
(Prof. C. Hermans)
This research programme is designed to develop theories about the transformation of religious identity within a pluralizing and individualizing context that is characterized by different types of interactions between religions. Religious identity refers to believing, belonging and acting from the perspective of the polarity of transcendence and immanence, as cultivated by formal and informal processes of learning, appraisal
and ritual participation. Transformation of religious identity is studied as a continuity/discontinuity of religious identity in time, through adaptation with its contexts and within an explanatory framework of its antecedents and consequents. The context of religious identity transformation is characterized by intended and non-intended interactions between individuals and groups of different religions in terms of their functions (dialogue) and dysfunctions (violence) with regard to the social cohesion of society.

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

Research results
In the research group Traditions and Transformations (Profs. Wiegers and Venbrux), a special theme issue of the peer-reviewed journal Nederlands Tijdschrift voor Theologie (NTT) appeared on religious studies in secondary education. This includes expanded versions of papers presented to the international conference of the Dutch Association for the Study of Religion, with contributions by Profs. Wiegers and Komers and Van der Velde. Prof. Wiegers gave invited papers at the European Association for the Study of Religions, EASR in Bremen and the ‘Networks of Interaction in the Early Modern Mediterranean’ Workshop, University of Toronto, 11-13 October 2007 and published new historical and theoretical insights into the shifting religious identities of Moorish Jews in Early Modern Europe (with Dr M.Garcia-Arenal). Hitherto unpublished documents were dealt with, which shed an interesting light on the life of the Moroccan Jewish Pallache family in Leiden and Amsterdam. Prof. van der Velde published three monographs on New Buddhism. Prof. Venbrux was invited to present research on ritual innovations at the University of Heidelberg, Germany, at the University of Edinburgh, UK, as well as to an expert meeting at the University of Groningen.

The NWO-funded research group ‘Refiguring Death Rites’ commenced in April and presented five research papers to the international conference on ‘The Social Context of Death, Dying and Disposal’ at the University of Bath in the UK, and another six to the annual conference of the Netherlands Anthropological Association (ABV) in Arnhem. Papers were also presented at several conferences and during lectures at the universities of Heidelberg, Leiden, and Utrecht. Field research was conducted all over the Netherlands. In part it focused on ritual dealings with material objects in relation to spirituality in order to test a hypothesis based on Robert Hertz’s seminal work. This interrelationship was also examined from a comparative perspective in various societies in the South Pacific, resulting in the publication of a special journal issue.

The Netherlands Organization for Scientific Research (NWO) awarded a grant to Profs. Grimes, Venbrux and Wiegers to establish a structural cooperation with researchers in the field of ritual studies (SFB Ritualdynamik) at the University of Heidelberg, Germany. The joint project, entitled ‘Ritual, Conflict, and Media’, started on 1 November 2007 and will run until November 2009. Furthermore, some smaller research projects explored new forms of religiosity.

The research group led by Prof. Nicklas and Prof. Eynikel organized an interdisciplinary international conference in which the conception of the ‘Other world’ in antiquity and the Middle Ages was studied from biblical, literary, historical, philosophical and anthropological perspectives. The proceedings will be published in 2008.

Within the context of the research group ‘Reframing Spirituality and Mysticism Past and Present, Dr Hense studied the conversion of a 16th-century mystical text into a modern musical stage play. She described and analyzed this production by paying special attention to the text, the actors and the spectators. Furthermore, she explored the transformation of the genuine thinking of Master Eckhart into a 14th-century anonymous Pseudo-Eckhart treatise in Middle-Flemish. An accurate comparison between the two texts offers insights into the diverse situations of the Rhinish and Flemish mystics.

Prof. Waaijman continued his studies on the theoretical backgrounds of the digital encyclopaedic project on spirituality, prepared by the research group within the SPIRIN project (Spirituality International). Dr Ackermans introduced necrologies as a source for the historical analysis of the transformation of the professional and religious identity (collective and individual) of Roman Catholic priests in the Netherlands in the 20th century. Prof. Maas started a research project on religious images.

The research programme ‘Transformation of Religions in the Frameworks of Modernity’ (led by Prof. Essen) concentrated on research about ‘Grace and Evil’ in the context of globalisation and post-colonialism in Sri Lanka and Latin America (Prof. Troch). Prof. Essen delivered a lecture at the City University of Hong Kong entitled ‘Faith, Reason and the Idea of Humanism in an Era of Terrorism’. Prof. Wils published a monograph on blasphemy and delivered a lecture at the University of Passau about this topic. Members of the programme cooperated with the University of Fribourg, Switzerland and the Kulturwissenschaftliche Institut in Essen (Germany).

The Heyendaal research project ‘Reconstructions of cultural memory: the meaning of (late) modern texts and arts for the future of religious culture’ was concluded with
a publication entitled ‘Bricoler la mémoire’ (in French), edited by Dr R. van den Brandt. The Heyendaal project on ‘The persistence of religion in Western society’ was concluded with a publication about fundamentalism and psychoanalysis and fundamentalism and music, both edited by Dr M. de Kesel. Dr S. van Erp gave invited lectures at the Universities of Cambridge, Oxford and at King’s College London about a research project on theology and medical sciences.

In Transformation of Religious Identity in Context, a research programme on Christian rites of passage was concluded. The ideas and feelings of participants of funeral rites and marriage rites within the Catholic Church in the Netherlands were studied. According to an anthropological theory developed by Van Gennep and Turner, rites of passage induce a status transition. Between the old and new status, there is an uncertain phase of liminality. Within the research of funeral rites, five types of liminality could be found, namely two types of relational liminality (with regard to the deceased and the liturgical community) and three types of differential liminality (influential, generational and ecclesial) (Quartier 2007). The participants agree with all types of differential liminality, but strongly disagree with the validity of both types of relational liminality. Religious characteristics such as belief in God and religious salience predict agreement with differential liminality.

An important piece of research was published on the influence of emotions on the acquisition of religious ideas (Van der Zee 2007). This influence is rather low, suggesting that the two mental systems cognition and emotion are less strongly connected to religious learning than may have been thought. Religious characteristics of students are predictors of learning of religious ideas, but this influence runs indirectly through meta-cognitive beliefs about religious education. Seven types of meta-cognitive beliefs were found in this research project, such as beliefs about the usefulness of religious ideas in daily life. Finally a study by Dr F. Wijsen was published, in which he argues for a transition from religious studies to inter-religious studies with regard to the study of religions in Africa.

Societal impact
Researchers from the Institute have been actively engaged in public debates (in radio interviews and in the printed media) and have given lectures and Masterclasses. A large number of presentations on the Religious Death Rites Project were held at various locations, contributing to the dissemination of research findings to academics, professionals and to the wider public. The group also launched its own website (Refiguring Death Rites; www.ru.nl/rdr) and attracted a degree of media attention.

Dr P. van der Velde took part in political discussions on Asian spirituality and

Prof. G.A. Wiegert
Gerard Wiegert specializes in the history of Islam and Muslim minorities in Europe and the Islamic World. He publishes regularly 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), and chairs the Dutch Association for the Study of Religions (NGG) and a board member of the Dutch School for Advanced Studies in Theology and Religion (NOSTER).
sustainability and, as the chairperson of the Dutch Association for psychotherapy and Buddhism, gave various presentations on modern Buddhism and connections with psychotherapy. He gave various radio interviews on this subject and also on the Buddhist background of the recent events in Myanmar.

Prof. Jespers chaired the Working group on Interreligious Dialogue and organized a successful Symposium in Nijmegen about ‘Makeable man’, in which Prof. Wiegens was also involved. Prof. E. Hense advised the directors of several theatre performances which could be seen as religious. On that subject, she gave a lecture for a group of over 80 leaders of Institutes of Formation in the Archdiocese of Köln.

Prof. T. van den Hoogen employed activities in his discipline in various fields of Socially Responsible Enterprise. Dr F. Maas gave several lectures in Utrecht for groups of bankers and businessmen on the theme: Spirituality, Management and Business. In Haarlem he also counselled groups of pastors and teachers in religion and philosophy by reading spiritual and mystical texts with them. Dr K.Waaijman gave the keynote lecture at a meeting attended by over 1200 people at the Vereniging in Nijmegen, entitled ‘Silence, Desire, Spirituality’.

Insights from the research project on funeral rites have been communicated to professionals within the Christian Churches in the Netherlands. In connection with the research project of Dr van der Zee (2007), a training programme and a text book have been developed for teacher training centres for primary education together with teachers, school directors and school advisors. The title of this training programme is ‘Biblical stories in meaningful learning situations’. The quick scan that has been made by Dr J. Castillo and Dr M. Steggerda (in cooperation with NIM & KASKI) in relation to religion in a multicultural society was applied by the Municipality of Rotterdam.

Dr Chr. Hübenthal is a member of the Dutch section of Justitia and Pax and Prof. G. Troch is European Advisor to the Asian Women’s Research Center in Kuala Lumpur, Malaysia.

**Future research**

Within the framework of the research programme Traditions and Transformations, Wiegens will be involved in the 400-year commemoration of the expulsion of the Moriscos from the Iberian Peninsula (1609-2009) and the preparation of a conference on that topic as well as an exhibition in Madrid. He is also continuing research on ethical issues among Muslims as minorities in present-day Europe, together with Prof. H.L. Beck (Tilburg). Various members of the research group led by Prof. Wiegens and Venbrux will contribute to the project Ritual, Media and Conflict, which will organise three more workshops and a book to be published with Oxford University Press. A joint international research programme will be developed and submitted to a European agency for funding. For the exchange of researchers between the two institutions, Marsilius van Inghen Research Fellowships have been made available, named after the first vice-chancellor of the University of Heidelberg who was born and raised in Nijmegen.

In December 2007 NWO granted a Veni postdoc position to Dr A. Hermkens, who will conduct research on religion as a source of conflict and reconciliation in Bougainville, Papua New Guinea in the period 2008-2011. This research is closely related to the Ritual, Conflict, and Media project, in which Dr Hermkens is a participant. Sage’s Encyclopaedia of Death and Human Experience invited the researchers of the RDR group to write significant entries, and Mortality (the leading journal in death studies) decided to devote a special issue to the research on contemporary mortuary rituals in the Netherlands. The group is also involved in the organization of a number of sessions at international conferences to be held next year.

With the framework of Biblical studies a conference is scheduled from 9-11 April 2008 entitled ‘Samson: Hero or Fool?’ in the context of Themes in Biblical Narratives. Also for 2008 the proceedings of the Samuel conference and the Conference on ‘Other worlds’ are both scheduled for publication. Erik Eynikel will publish his introduction to the Old Testament in Dutch and English.

Prof. Essen is involved in preparing an international conference on the ‘Crisis of Theism? ‘Pantheismusstreit’, ‘Atheismusstreit’ and ‘Theismusstreit’ in the Making of Modernity’ (Vienna, April 2008) and establishing an international research group on ‘God Talk in Philosophical and Theological Modernity’. The Heyendaal research group will be conducting research within the framework of the themes: ‘Evil, Modernity and the Making of Tradition: Reflecting on the Shoah’ and ‘The Problem of Divine and Human Agency in a Scientific Worldview’.

Within the programme Reframing Spirituality, Prof. E. Hense will conduct research into the discernment of the spirits in the first three centuries CE and prepare applications for funding this research. Prof. F. Maas will continue his research into building theological theories related to religious images.

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There are two main research categories:

**Fundamental ethics**
The philosophical and theoretical orientation of the Centre is characterized by a predominantly hermeneutical approach. That means that historical and systematic methodologies are integrated in the interpretation of moral dilemmas and problems. The normative orientation of the research is predominantly virtue-ethical.

**Applied ethics**
Research in this category deals with main authors from the history of ethical thinking, with the relationship between historical and systematic research, the so-called rehabilitation of virtue ethics, the meaning of literature for ethics, the role of emotions in moral life, using hermeneutics as a methodology for ethical research.

Dr Marcel Becker's research focuses on the boundaries for acceptable behaviour in relation to issues such as reorganizations, integrity scandals, money laundering and whistle blowers.
starting point, the Centre’s research deals with issues such as religion, morality and democratic citizenship; religion, society and human rights; justice and poverty, restorative justice and ethics; and religion, citizenship and the **sensus communis**.

This focus is applied to various branches of professional ethics, in particular political ethics, the ethics of public administration, police ethics, ethics of education, the ethics of sports and medical ethics.

Cooperation between philosophers, theologians and social scientists within the core research group and with colleagues from the Departments of History and Political Sciences, as well as from the Faculties of Medicine, Law and Natural Sciences ensures an interdisciplinary framework. The unique position of the Centre arises from a combination of fundamental and applied ethics and an interdisciplinary approach to issues in both categories.

**Collaboration**

Within Radboud University Nijmegen the Centre collaborates with other faculties on interdisciplinary research projects.

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

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

Apart from these cooperative ventures between research groups, individual members of the Centre for Ethics are involved in joint projects with colleagues from a wide variety of academic institutions, including the Institute for Philosophy of the University Hildesheim (Germany), the Institute for Philosophy of the Humboldt University, Berlin (Germany), the Faculty of Philosophy, Université de


Dissertations: 1
Scientific publications: 72
Professional publications: 59

Fribourg (Switzerland), The Università degli Studi di Macerata (Italy), Universitatea Babes-Bolyai in Cluj-Napoca (Romania), St. Augustine College of South Africa in Johannesburg and Loyola University Chicago (USA).

Research results
An interdisciplinary study commissioned by the Dutch Ministry of Justice reviewed the relevance of the prohibition on profanity in criminal law. The main conclusion was that the criminal law article on profanity, although seldom used, still mirrors important moral considerations. This conclusion was further explored in a symposium.

In 2007 the ‘Lexicon voor de ethiek’ (Ethics Dictionary) was completed. This contains elaborate descriptions (in between 500 and 2,000 words) of 145 key concepts of moral vocabulary. In an initiative taken by the Centre for Ethics and edited by four of its members, 62 scholars from twenty-two research institutes in Netherlands, Belgium and Germany contributed to this project. As the first Ethics Dictionary to be published in Dutch, it is expected to play an influential role in all ethical debates in the country.

Another ‘first’ in the Dutch language is the appearance of an introduction to the ethics of public administration, which was written by a member of the Centre. Integrity, responsibility and loyalty are shown to be the most important virtues of the civil servant.

During 2007 contacts were intensified with a number of Eastern European countries. Three members of the Centre gave guest lectures at Eastern European universities, and published in Eastern European journals or volumes.

Conferences and expert seminars were held on ‘Rituals of Democratic Deliberation’, ‘Profanity and Religious Feelings’, and on the ‘Relationship between Phenomenology and Ethics’.
Members of the Centre started to cooperate with researchers from the Humanities and the Social Sciences in writing a project on ‘Repertoires of Democracy’. This was submitted to the Netherlands Organisation for Scientific Research (NWO) and awarded with 3 PhD positions, one of which will be within the Centre for Ethics. 

A research project in the field of Police Ethics received an award from the Ministry of Internal Affairs.

Societal impact
The Centre takes its involvement in the development of moral debates in the public domain very seriously. Its hermeneutical, interdisciplinary and virtue-ethical approach ensures a fruitful contribution to these debates. The results include the following:

• The Centre contributes directly to the moral education of a wide range of professional bodies, such as the police, army, health-care professionals and sports coaches.
• Members of the Centre are directly involved in moral education programmes in schools.
• Members of the Centre gave dozens of lectures to professional groups as well as more general audiences.
• Some of the Centre’s publications, which were intended to contribute to the spread of knowledge of ethics and to improve the moral quality of society, are being sold in large numbers, attracting considerable attention in national newspapers and periodicals.
• Members of the Centre often contribute to public discussions on radio and television, as well as in the opinion pages of newspapers.
• Members of the Centre are on the board of several (national and international) journals and book series.

Future research
Future lines of research will include:

• Research on the role of religion in a pluralistic and democratic society, with special attention to the irenic (peace-making) and polemic power of religions.
• Research on modern and postmodern varieties of virtue ethics.
• Conferences and expert seminars will be prepared on ‘Unity and Plurality in Ethics’, ‘Christian Social Thinking’, ‘Environmental Ethics’ and ‘Forgiveness in public discourse’.

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

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

These headline questions are explored in each of the three programmes. In the first researchers study the conceptions of belief, cognition, and language, analysing 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. In particular hermeneutical and related criticisms of the modern idea of rationality are discussed. The third programme focuses on the emergence of science as the key paradigm of rational thinking in Western Europe, tracing the history of long-term developments and transformations in scientific thinking from its philosophical beginnings.

In tackling these problems, the programmes employ a variety of methodological approaches: analytical, hermeneutical, critical, and historical-philological. The overall aim is to clarify the complex notion of rationality.

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

**Research facilities**

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

**Cooperative arrangements**

There are formal cooperative arrangements with the Universities of Leuven (Belgium), Parma (Italy), Pretoria, Stellenbosch, University of Kwazulu Natal (South Africa), De Paul University (Chicago, USA) and the University of Sao Paolo (Brazil).

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

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

**Research results**

A new cooperative agreement between the Institute of Philosophy and the department of Philosophy of De Paul University (Chicago) was inaugurated by a workshop on contemporary Philosophy in which
large delegations from De Paul University and the Research Institute of Philosophy participated.

From 31 May to 2 June 2007 the faculty hosted an international conference on ‘Psychology and the Other Disciplines. A Case of Cross-Disciplinary Interaction (1250-1750)’. This conference was organized by the programme ‘From Natural Philosophy to Science’ and sponsored by the European Science Foundation.

In the programme ‘Cognition, Interpretation and Context’ two PhD dissertations were successfully defended during 2007. Dr Chris Buskes won the Socrates award for his book on ‘Evolutionair denken. De Invloed van Darwin op ons Wereldbeeld’. In this book the author discusses the effects of Darwinism on our understanding of the self.

Several other members of the Institute also published monographs in the course of 2007. Prof. Ben Vedder published a book on ‘Heidegger’s Philosophy of Religion, From God to the Gods’ (Duquesne University Press). This book gives a systematic account of the place of religion in Heideggerian thought. Prof. Philippe van Haute co-authored the book ‘From Death Instinct to Attachment Theory. The Primacy of the Child in Freud, Klein and Hermann’, which was published by Other Press. In this book the authors contest the Freudian primacy of sexuality and defend a pathoanalytical approach to attachment.

Members of the Institute edit several book series. Those working within the programme ‘From natural philosophy to science’ edit the series ‘Medieval and Early Modern Science’, which is dedicated to investigating scientific thought from 1200 to 1700. So far, eight volumes have been published, including two in 2007. In addition, they edit the international journal *Early Science and Medicine*.
Researchers at the Centre for Psychoanalysis and Philosophical Anthropology (Radboud University/University of Leuven), which is part of the Institute’s programme ‘The project of a hermeneutic philosophy’, edit an English series on ‘Figures of the Unconscious’ (Louvain University Press). Six volumes have been published since its launch at the end of 2000, including one volume in 2007.

Societal impact
Members of the Institute regularly participate in forum discussions and contribute to public debate on philosophical issues by publishing articles in newspapers, talking on the radio and in other media, thus reaching a wider audience than the scientific community alone. One such example is the lectures series known as Publick-lezingen, which were organized by the faculty. The series introduces the ideas of well-known contemporary philosophers to a wider audience. Some of the Institute’s members contribute to national and international encyclopaedias and general works of reference.

Future research
The research programmes at the Institute will continue. Their future content will be partially determined by NWO grants awarded to members and research programmes at the Research Institute.

In the programme ‘From natural philosophy to science’ Dr P. Bakker is half way through the Vidi project ‘Form of the Body or Ghost in the Machine? The Study of Soul, Mind, and Body (1250-1700)’. Prof. J. Thijssen directs the NWO project ‘Visualizing the Invisible. Representations of Matter and motions since the Renaissance’. This project studies the relationship between theory (text) and visual representations of invisible entities (minute configurations of matter, and motion) from the seventeenth to the nineteenth century.

In the context of the research programme ‘Cognition, Interpretation and context’ Dr B. Geurts is responsible for the programme ‘Cognition and consciousness’, which is part of a larger NWO project ‘Reasoning and the brain’.

In 2007, Dr B. Hofmeyr received a Veni grant from NWO. This brings the number of current Veni grants for the programme ‘The project of a hermeneutic philosophy’ to three.

As part of a reorganization, the Centre for Ethics has been relocated to the Faculty of Philosophy. As from 2008, it will be the faculty’s second research institute.

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Prof. P.I.M.M. 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 psychopathological variants. Van Haute is President of the Belgian School for Psychoanalysis.
Institute for Historical, Literary and Cultural Studies

Director: Prof. E.M. Moormann

The Institute for Historical, Literary and Cultural Studies (HLCS) is part of the Faculty of Arts. Its main objective is to create a stimulating environment for high-quality, innovative research on literature and literary theory, cultural studies, history, art history and archaeology. HLCS researchers have organized themselves 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. Achieving this aim is facilitated by recent developments in university education and research which are becoming more and more interdisciplinary. By sharpening its profile through combining expertise, HLCS ensures that the research conducted in Nijmegen remains prominent in the national and international arena.

Following the results of a quality assessment in 2006, five key research themes were defined in 2007, bringing together researchers working on issues that strengthen the research profile of HLCS and provide an umbrella for specific research proposals. These are:

The Roman Empire
The aim of this group is to integrate historical, archaeological and related literary studies, focusing on Rome and its Empire from Augustus onwards. Of great importance in this respect is an interdisciplinary approach, incorporating the different types of available sources. This has so far led to an emphasis on Roman imperial art and ideology, Roman private life in the Italian peninsula, the relationship between the centre and the periphery of the Empire,

There are five research programmes:
• The Ancient World
• Christian Cultural Heritage
• The Dynamics of Islamic Culture
• History after the Middle Ages
• Literature, Culture, Media

One of the fifty drawings found in tunnels under the Sint Pietersberg hill in Limburg in the Netherlands. Researchers led by Prof. Jos Koldeweij have dated them to the late Middle Ages.
and perceptions of the Roman Empire in later times. These subjects, which are explicitly interdisciplinary, have formed the basis for successful projects, generating interest both inside and outside of the academic world (with exhibitions, media interest, etc.).

**Dealing with the religious past**
The central issue of this research focus is the construction of Christian religious heritage as a continuous process of selection and re-interpretation of the past for the purpose of individual or collective identification in different stages of history. Projects concentrate both on analysing what has been identified as Christian heritage in specific historical and geographical contexts and on the actual processes of heritage building and its promoters.

The research has two main themes:

- the city of Rome as a material and mental construct of heritage.
- the impact and function of religious (confessional) heritage in the development of local, regional, national (e.g. Dutch) and supranational (e.g. European) identities.

**Political culture**
Most political history is chiefly interested in political institutions, processes, and results. Important as this may be, this research team takes a somewhat different perspective. It considers ‘politics’ to be an ‘essentially contested concept’. Thus the subject matter of political history comes to encompass the whole of controversial claims as to the definition, valuation, and range of the political sphere, and participation in this sphere. Political history turns into the history of ‘the political’, or the culture and business of politics.

**Studying Criticism And Reception Across Borders (SCARAB)**
This research theme combines expertise in General Literary Studies with Dutch, English, and Spanish Literary Studies of the University. The aim is to study literary reception and criticism, primarily within a transnational context. The research focus is on both contemporary criticism and historical developments, with a particular emphasis on the role played by periodicals in processes of cultural transfer.


Performances of memory

The focus of this research theme is on art and artistic practices as performances of memory. By linking the present to the past – and to the future – art is embedded in affective practices. The theoretical notion of performance refers specifically to this pragmatic level of experience and affect. The arts that are researched cover a wide range of disciplines from literature, music, cinema and theatre, to digital media and fashion.

Awards

Prof. S. de Blaauw was invited to the American Academy in Rome as a James S. Ackerman resident in the History of Art from February-March 2007.

Prof. de Blaauw also was awarded the Premio Daria Borghese, an annual prize for non-Italian scholarship on the cultural history of the city of Rome.

Prof. J. Koldeweij was decorated with the insignia of Knight of the Order of Orange-Nassau for the societal impact of his scholarly activities.

At the European science festival WISER (Women In Science, Education & Research), Dr F. Kemmers, won the X-Ray, a NWO award, for a presentation of her research on Roman Coins and mass communication.

Dr. I.B.M. Frye grant of Radboud University Nijmegen for promising female PhD students.

Collaboration

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

Prof. A. Lardinois (The Ancient World) has recently set up a network for the study of archaic Greek lyric, iambic and elegiac poetry and 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 often work in isolation, by holding regular meetings, keeping in touch through a network website and a newsletter, and defining common topics within archaic Greek poetry that groups of scholars in different countries can work on together.

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

Members of The Dynamics of Islamic Culture programme cooperate with:

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

Prof. Th. 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 Literature, Culture, Media programme 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 at the Faculty of Arts of the University of Utrecht and the Huygens Institute of the Royal Netherlands Academy of Arts and Sciences (KNAW).

Research results

In 2007 eleven dissertations were defended, two of which were awarded cum laude: Bé Breij’s ’The Eighteenth and Nineteenth Major Declamations Ascribed to Quintilian: A Commentary’, and Marijt Derks’ ’Heilig moeten. Radicaal-katholiek en retro-modern in de jaren twintig en dertig’.

The Ancient World

The Provincial-Roman archaeologists, organized in the affiliated research group Auxilia, have surveyed and published the archaeological excavations of the Roman fort at Bunnik-Vechten, which will also form the basis for the recreational development of the site in the near future. Several of the ancient historians, including PhD students, associated with the international programme 'Impact of Empire' administered by the Faculty of Arts in Nijmegen, have participated in a conference on 'The impact of the Roman Empire on the

Research facilities

- Humaniora library (155,000 volumes, 15,500 serial volumes, 750 serial subscriptions and 600 manuscripts)
- Catholic Documentation Centre: archives and publications of Dutch Catholic institutions, 1800-2000 (www.ru.nl/kdc)
- Centre for the Documentation of Art History: collections of pictures, photographs, and slides (www.ru.nl/ckd)
itself to local circumstances.

Christian Cultural Heritage
In 2007 a range of studies were published on themes within the Christian Cultural Heritage programme. Among them is the digital publication of a series of writings of the 16th century author Anna Bijns, by Prof. J. Oosterman and Drs J. Keßler.

Two international art-historical meetings were initiated and organized by Prof. J. Koldeweij. Concluding a successful exhibition in Bruges, a three-day conference entitled ‘Faith & Fortune – Beauty and Madness’ explored visual communication and exchanges between high and low culture in the Middle Ages, supported by funding from VNC (NWO, FWO).

At the Hieronymus Bosch Art Centre in ’s-Hertogenbosch, the three-day conference ‘Hieronymus Bosch, the sources’ was organized as part of a preparatory programme for an ambitious manifestation in 2016 (500th anniversary of Bosch’s death).

PhD students M. Ilsink and A. Wattel organized an international workshop: ‘Looking Backwards, Moving Forwards: Imitation and Canon-making in the Renaissance in Italy and the Netherlands’.

The Dynamics of Islamic Culture
An international conference on ‘Salafism as a transnational movement’ (28-30 September 2007) was organized by Dr R. Meijer and Drs M. de Koning as a starting point for research on Salafism. Experts from 22 universities in 10 countries discussed its emergence worldwide, its use of the Internet and recent research on this movement designed to get a better understanding of the way in which Salafism as a transnational movement has been so successful in retaining its universal features and at the same time adapting itself to local circumstances.

Literature, Culture, Media
A research project on ‘The Reception of Foreign Literature in the Netherlands in the 20th century’ is being carried out in collaboration with the University of Utrecht and the Huygens Institute of the KNAW. In August 2007 three members of the project group (Prof. S. Levie, Dr M. Sanders and Prof. M. Steenmeijer) participated in the international conference on reception issues: ‘Transfer and Integration. Foreign Literatures in National Contexts’, co-organized by Prof. Levie. Proceedings of this conference will be published in the international journal Arcadia in 2009.

Societal impact

The Ancient World
Under the auspices of the classical archaeologists, Prof. E. Moormann and Dr S. Mols, the local Valkhof museum organized – between December 2006 and March 2007 – an exhibition around the Roman town of Herculaneum, which, like its more famous neighbour Pompeii, was buried in an outburst of the volcano Vesuvius in 79 AD. It turned out to be the most successful exhibition ever organized in the museum, attracting 120,000 visitors. Small wonder the museum asked the archaeologists to help them set up a similar exhibition in 2008 about life in the bay of Naples in Roman times. Researchers in the programme ‘The Ancient World’ organized a day in November with lectures on the Roman emperor Nero, who figures in the Dutch 2007-2008 high-school Latin curriculum. This attracted more than 50 high school teachers from around the country.

Christian Cultural Heritage
A comprehensive website on the history of Catholicism in the Netherlands (On-line museum, Digitaal Katholiek Erfgoedhuis) was launched under the direction of Prof. M. Monteiro and in collaboration with the Catholic Documentation Centre (www.ru.nl/nederlandskatholicisme).

Literature, Culture, Media
Prof. V. Manuth and Prof. J. Koldeweij organized a public conference in Leeuwarden on applied arts in museum collections, in collaboration with the Ottema-Kingma Stichting: ‘Schilderij, commode en drinkhoorn. Kunstnijverheid in het museum: didactiek of esthetiek?’

The semi-public international conference ‘Salafism as a transnational movement’ (28-30 September 2007) attracted government representatives, members of socio-political institutions and journalists from the Netherlands and other European countries. It was reported widely in the media. The conference was preceded by a public debate on Salafism (27 September 2007, at the World Trade Centre in Arnhem) with M. de Koning (RUN/ISIM), S. Lacroix (Science Po, Paris) and S. Hamid (Chester University, UK).

A workshop on ‘Islam and cultural citizenship’ (21 September 2007) was organized by Dr K. van Nieuwkerk within the framework of the newly designed research project ‘Islam and the performing arts in the Middle East and Europe: from cultural heritage to cultural citizenship’. The aim of the workshop was to present the research project to important academic and cultural players in Dutch society and to obtain their advice.

At the Annual Conference of the research programme ‘The Dynamics of Islamic Culture’ (11 May 2007), organized by PhD students N. Boekhoff-van der Voort, M. Gazzah and J. Wagemakers, research conducted by the members of the programme was presented to a wider public. The societal impact of the research was emphasized by a keynote speech on ‘Europe and the Islamic World: Egypt, Turkey and Morocco’ held by J.M. Wiersma, a Dutch member of the European Parliament.

Literature, Culture, Media
Professor A. Smelik organized a full day workshop, entitled ‘Dutch Fashion Identity in a Globalized World’. This attracted twenty-five participants from the fashion
industry, fashion departments in art academies, and costume curators from museums.

**Future research**
The programme ‘The Ancient World’ has attracted Dr N. Lazaridis, a native Greek with a PhD from Oxford University, as a Veni postdoc. He will study the relationship between the cultures of Ancient Egypt and Ancient Greece. Prof. A. Lardinois has received an NWO Internationalization in the Humanities grant for setting up an international network for the study of archaic and classical Greek poetry, centred on Radboud University Nijmegen. A website has been established (www.let.ru.nl/greeksong) and three international conferences have been planned for 2008-2010.

**The Dynamics of Islamic Culture**
In 2007 external funding was attracted for two international and one national conference: an international conference on ‘Salafism as a transnational movement’, an ESF workshop on ‘Islam and the performing arts in the Middle East and Europe: from cultural heritage to cultural citizenship’, and a national expert meeting on Islam and cultural citizenship.

**History after the Middle Ages**
Within the NWO programme ‘Disputed Democracy’ a grant for four interdisciplinary PhD projects was obtained by political historians Dr W. van Meurs, Prof. R. Aerts and Prof. C. van Baalen, together with philosophers and political scientists from Radboud University Nijmegen, for their project ‘Repertoires of Democracy. The Transfer of Democratic Practices and Institutions in 20th Century Europe’. In 2008 two of these PhD projects will start within HLCS. The overall project is coordinated by Dr W. van Meurs.

Prof. Th. Engelen and Dr O. Boonstra received a Medium NWO Investment Subsidy for their project ‘Hub for Aggregated Social History (HASH). Toward an integrated infrastructure for Dutch municipal data, 1812-2000’. The HASH project involves creating a hub (a web portal for distributed datasets) for accessing relevant demographic, social, economic and political data on all Dutch municipalities between 1812 and 2000.

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

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

**Business and Law Research Centre**

(Prof. S.C.J.J. Kortmann and 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 the Radboud University of Nijmegen and a dozen prominent, mostly international, law firms and Dutch multinationals. The following leading law firms, companies and financial institutions are partners: ABN AMRO Bank, ABP Pension Funds, Akzo Nobel, Allen & Overy, De Brauw Blackstone Westbroek, Clifford Chance, Houthoff Buruma, Loyens & Loeff, Nauta Dutilh, Pels Rijcken & Droogleever Fortuijn, Rabobank Netherlands and Stibbe. Various partners are deeply involved in its research. Furthermore, the partners may provide recommendations on the governance policy and focus of the OO&R through participation in its Advisory Board.

The Centre conducts fundamental research in the field of business and law, and critically analyzes national and international developments in legislation and case law pertinent to this field. It also provides a comprehensive 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 ongoing 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 within the OO&R are: Company Law and Capital Markets, Banking, Finance and Insolvency Law, General Business Law (including European private law, Dutch general private law and private international law) and Employment Law.

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

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

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

The Centre also contributes to drafting new European migration laws. Apart from conducting fundamental and applied research, it organizes international conferences, it edits the European Journal of Migration and Law, a book series (Immigration Law and Policy in Europe), and a yearbook on Dutch and international migration law (Rechtspraak Vreemdelingenrecht). The latter has been
The Centre for State and Law – known in the Netherlands by its Dutch abbreviation ‘SteR’ (Staat en Recht) – focuses mainly on the central issues and basic principles in public law. Its researchers critically analyze national, European and international developments in constitutional law, administrative law and criminal law. The Centre has committed itself to creating a stimulating environment in which high-quality, national and international multidisciplinary law research can flourish. It publicizes its results in authoritative publications (including its own book series), and also disseminates these results through lectures, conferences and symposia.

The Research Unit ‘Administration of Justice’ was established within SteR to enhance a multidisciplinary approach, providing excellent opportunities for its members to benefit from each other’s know-how. This unit focuses on law in action – the workings of the courts, public prosecutors and the legal profession. In the near future special attention will be paid to the phenomenon of convergence of civil, criminal and administrative procedural law. Exploring common principles and the initial concepts of legal proceedings is an important research topic.

Further research is conducted in a number of programmes: Sociology of Law, Administrative Law, Constitutional and Comparative Constitutional Law, European and International Law, Criminal Law, Legal History and Philosophy of Law.

This research has led to studies on international arbitration, European integration, the background and future of the European and national constitutions, the general provisions of administrative law and the law relating to local and regional governments. ‘Administration of Justice’ encompasses four main themes:

**Prof. G. van Solinge**

Gerard van Solinge has been a Full Professor of Business Law at Radboud University Nijmegen since 1997. He is an expert in corporate governance and corporate litigation. Prof. van Solinge is director of the Van de Heijden Institute, the oldest and largest study centre on business law. He is also a lawyer at Allen & Overy in Amsterdam, and editor of Ondernemingsrecht. Prof. van Solinge is a member of various authoritative committees e.g. at the Dutch Ministry of Justice.
1) Legislation and case law concerning procedural law
2) Organizational design and practice of the Administration of Justice
3) The quality of Administration of Justice from the point of view of legality, effectiveness and efficiency and
4) The legitimacy of the Administration of Justice, from the perspective of the ethics of legal professionals (magistrates, lawyers and others).

Centre for Notarial Law
(Prof. M.J.A. van Mourik)
Researchers at the Centre for Notarial Law study the principles, 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 pertaining 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 paid to the bearing of these fields on the general law of property. The approach to all such work is a practical one and several of the researchers are also engaged 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. SteR has at its disposal the so-called Cerutti Room, where old and rare legal books can be consulted. The Business & Law Research Centre (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 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 broad spectrum 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 – Bocca (Italy), Montpellier (France), Ohio (United States of America), Oxford (England), Paderborn (Germany), Paris II (France), Prague (Czech Republic), Rome – Luigi Guido Carli (Italy) and Thessaloniki (Greece).

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

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

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

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


Centre for State and Law


Grondon, J. W. van de (2007). Bestaat er een coherente visie op de verhouding tussen diensten van algemeen economisch belang, de Dienstenrichtlijn en andere communautaire regelingen? SEW, 55 (10), 399-421. (Preadvies voor de Nederlandse Vereniging voor Europees recht)


Centre for Migration Law


Centre for Notarial Law


科学出版物: 230
专业出版物: 187
注释: 235
Practice (EPN), and with Tilburg University for training in Notarial and Fiscal law.

Research results
A number of books produced by members of the OO&R were published in the following series:

- Series on Business and Law (Onderneming en Recht) (currently 43 volumes)
- Series on the Law of Business and Finance (currently 9 volumes)
- Series on Corporate Law (Van der Heijden Instituut) (currently 95 volumes)

The OO&R also publishes the leading case law review of Business and Law (Jurisprudentie Onderneming en Recht).

Research on 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 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 and seminars were organized by the OO&R in 2007:

- Conference on ‘Onderneming en Integriteit’, 4 April 2007, World Trade Centre, Amsterdam
- Conference on ‘Onderneming en Financieel Toezicht’, 13 September 2007, Rosarium, Amsterdam

Research on 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 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 Centre has also participated in a large comparative research programme funded by the European Commission on implementing ten new EC Directives in the field of asylum and migration, including reception conditions, long term residency, qualification and temporary protection, which was coordinated by the Odysseus network. In 2007 studies were completed on implementing the Family reunification directive in 25 EU Member States, on the legislative and administrative rules on issuing visas for a stay of more than three months and residence permits, on multiple nationality in Germany and the Netherlands, and on the rights of domicile of women with a migrant partner.

The Centre for State and Law participated in the public debate on administration of justice. In cooperation with the Review Committee on the Intelligence and Security Services on June 7-8, an international symposium was held on Accountability for Human Rights in the World of Intelligence. Keynote speakers were Prime Minister J.P. Balkenende, vice-president of the European Commission Franco Frattini, and the vice-president of the Raad van State Herman Tjeenk Willink. Prof. Y. Buruma chaired the round table and delivered the concluding speech.

In 2007, the European Network on Free Movement of Workers – coordinated by the Centre for Migration Law - produced 25 national reports on developments affecting the freedom of movement of workers in the Member States, and also published a European comparative report written by staff members at the Centre. Members of the Centre published a number of 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 Centre has also participated in a large comparative research programme funded by the European Commission on implementing ten new EC Directives in the field of asylum and migration, including reception conditions, long term residency, qualification and temporary protection, which was coordinated by the Odysseus network. In 2007 studies were completed on implementing the Family reunification directive in 25 EU Member States, on the legislative and administrative rules on issuing visas for a stay of more than three months and residence permits, on multiple nationality in Germany and the Netherlands, and on the rights of domicile of women with a migrant partner.

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Societal impact
Prof. S. Kortmann chairs the Advisory Committee to the Minister of Justice on the reform of Dutch Insolvency Law. On 1 November 2007, the Advisory Committee submitted a proposal for a new Insolvency Act to the Minister of Justice and the Members of 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. Hartkamp is Council Member of UNIDROIT and a member of the Royal Netherlands Academy of Arts and Sciences (KNAW). Prof. J. van Hees is Chairman of the Board of INSOLAD. Prof. W. Rank has been appointed as technical assistance advisor by the International Monetary Fund (IMF). Prof. C. Sieburgh is a Member of the Young Academy of the 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.

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

The Centre’s publications on the Schengen Information System and the role of the State in regulating labour migration have affected both the political and the public debate on these issues. In March 2007 the Centre organized an international seminar on the topic Passengers at risk, which brought together researchers in the field of privatizing migration law and in December 2007, the Centre organized an international seminar at which researchers and civil servants from 25 EU member states discussed implementing the new EC Directive on minimum standards on procedures in member states for granting and withdrawing refugee status (the Procedures Directive). These two seminars were co-funded by EC COST ACTION 24. In June 2007, the Centre organized an international seminar to discuss the outcome of a review of the first year of implementing the Family Reunification Directive.

The Centre for State and Law works to gether with the Study Centre for the Administration of Justice in Zutphen, the District Courts the Courts of Appeal and the Supreme Court of the Netherlands. An agreement has been concluded between the Faculty of Law and the District Court in Arnhem.

Prof. Y. Buruma chairs the Admittance Committee Regarding the Evaluation of Completed Criminal Cases (Toegangs-commissie Evaluatie afgelopen strafzaken) – in other words the Dutch Innocent Convicts Commission. Prof. C. Kortmann, who holds an Academy Professorship endowed by the Royal Netherlands Academy of Arts and Sciences, is a member of the Royal Academy. Prof. P. Tak is Secretary General of the International Penal and Penitentiary Foundation. Prof. Y. Buruma is a member of the Supervisory Council and the Programme Committee of the Research and Documentation Centre of the Dutch Ministry of Justice (WODC), as well as chairman of the Scientific Advisory Board of the NSCR in Leiden. Prof. K. Wellens is chairman of the Advisory Committee on International Law Issues, which advised the Dutch government on pre-emptive action in war zones.

The interaction between science and notarial law practice advocated by the Centre for Notarial Law involves a strong bond between the Centre and legal practice. Researchers are actively involved in lectures, training and legal advice, while acting as preliminary advisors. Prof. F. Schols, B. Schols LL.M. and W. Burgerhart LL.M. are lecturers for the Stichting Beroepsopleiding Notariaat (SBN), and are also involved in training the estate planners of EPN, the Association of Estate Planners in notarial law. Prof. F. Schols is member of the Commission Succession Law II of the Royal Notarial Association (KNB) and is guest professor (2007-2008), holding the prestigious TPF chair at the University of Gent (Belgium).

Prof. M.J. A. van Mourik is chief trainer at the SBN and legal advisor to the Dutch Province of the Roman Catholic Church (statute-law). Moreover, he is president of the supervisory board of the Institute for Agricultural Law in Wageningen, the Netherlands.

**Future research**

Future research within the OO&R will cover the following topics: delegation of powers regarding the issue of securities, corporate acquisitions, market abuse, attachment and enforcement, corporate litigation and special judicial remedies, structured finance, the proposal for a new Insolvency Act, European insolvency law, business and pension, ring fencing of pension funds, protected funds in the EU, security rights in Europe, security and finance in historical and comparative perspective, the precise influence of European law on national private law.

Several researchers will participate in HiiL (the Hague Institute for the Internationalization of Law), specifically in the Expert Group on Private Actors and Self-Regulation. Various researchers will participate in the deliberations of UNCITRAL Working Group V on Insolvency Law and Groups of Companies. Members are expected to play an active role in the forthcoming INSOL International conference in Shanghai in September 2008 and the INSOL Europe Annual Conference in Barcelona in October 2008. A number of conferences are planned by the OO&R for 2008, including a conference on the
proposal of a new Insolvency Act in May 2008 and a conference in conjunction with the Institute for Law and Finance of the Johann Wolfgang Goethe University of Frankfurt on European insolvency law. Depending on the acquisition of further research funds, consideration may be given to establish International Working Groups on Avoidance Provisions in European Insolvency Law, Receivables Financing, Distressed Debt Trading and/or Public Filing.

As part of the CHALLENGE programme, the Centre for Migration Law will organise three seminars in Brussels in 2008 in collaboration with the Centre for European Policy Studies. The Centre also has been commissioned by the European Commission to coordinate the Network on Free Movement of Workers in the EU for the next four years.

The Centre will participate in a project under EU Framework VII (ENACT), on withdrawal of nationality, together with four partners (Open University, CEPS, CEU Budapest and the University of Istanbul).

Mr. B. de Hart has been awarded a Vidi project by the Netherlands Organisation for Scientific Research (NWO). This research will focus on the recognition of divorces/child abduction comparing the situation in the Netherlands, Morocco and Egypt. The project will be carried out in cooperation with the Institute for Sociology of Law.

At present the Centre for State and Law (SteR) finds itself in a transitional phase and in the successful Centre for Migration Law will be integrated within its research environment. Research on the ‘Administration of Justice’ will be continued. A new research unit will be established that will focus on basic principles of public law, including criminal law, emphasizing the influence of international and European law on Dutch constitutional and legal principles. The ‘Administration of Justice’ research unit will organize a conference on ‘Convergence of procedural law’ in the near future.

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 legal meaning of the term ‘value’ and the term ‘appraisal’ concerning the succession of companies, the exegesis of last wills, the international aspects of estate planning, the new law concerning non-liability partnerships (‘personenvennootschappen’) and the developments in the legislation on marital or matrimonial property.

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The Institute for Management Research (IMR) conducts fundamental and applied research on the trends in design, institutionalization and performance of the public and private structures that regulate, govern and manage human interaction. The structures that are studied exist at various levels, ranging from societies as a whole to urban networks and from macro-economic systems to individual organizations and firms. The performance of these structures is evaluated in terms of their legitimacy, effectiveness and efficiency.

IMR’s multidisciplinary composition enables the analysis of such structures from a variety – and sometimes a combination – of theoretical point of view including managerial, economic, geographical and political perspectives. Research projects focus on the process of constituting networks of the public and/or private partners involved, collaboration and interactive decision making, the institutional and organizational conditions for strategic behaviour among network partners and the impacts of intervention strategies on the performance of the systems involved. Through this research the Institute offers richer insights into societal and organizational phenomena in all their complexity. Research is performed in a variety of empirical domains. It is the theoretical, methodological and empirical variety and integration of this research that has helped the IMR gain recognition as a strong player in the international research arena.

IMR’s six research programmes are carried out by approximately about 90 researchers (FTE) in the following groups:

Governance and Places (GaP) deals with the processes, substance and context of spatial-environmental analysis and governance. Research includes cross-sectional and case-study oriented empirical approaches, using a wide range of positivist, institutionalist, constructivist and interpretatist theories. The research aims to make scientific contributions, as well as contributions to spatial policy praxis.
Research in the Nijmegen Centre for Economics (NiCE) is based on three themes: Institutions and culture, new economic approaches and the empirical analysis of markets. It acknowledges pluralism in economics and includes multifaceted topics influenced by economics, such as Accounting and Finance. Research in Accounting mainly concentrates on the impacts of organizational changes.

Researchers in Organizational Cybernetics (OC) develop and combine cybernetics and social systems theory to study two related topics: organizations (in particular ethical issues and corporate social responsibility) and interventions with respect to ‘messy’ problems. The research is descriptive-analytical as well as constructive, using laboratory experiments for studying interventions and behaviour by stakeholders.

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

Specialists in Relationship Management (RM) study the governance and management of relationships between firms and their stakeholders from both a strategic and a marketing perspective. Horizontal as well as vertical co-operation and the building of and performance of alliances between companies are studied. A variety of research methods are used, including case studies and the use of cross-sectional data.

The programme on Shifts in Government and Governance in a Comparative and International Perspective (SHIFTS) deals with changes in public governance and management. The main hypothesis is two-fold: (a) many of the traditional forms, mechanisms, capabilities and styles of government have never ‘shifted’ to the extent current theories suggest, and (b) to the extent that there have been such shifts, a counter trend back to ‘old’ forms of government takes place. The research is theoretical as well as empirical.

Awards
The researchers at IMR seek to achieve excellence in both academic and applied practice. In 2007 the most prestigious fact is that Dr J. Smits received a ranking from CentER in Tilburg, the Netherlands as one of the top 40 Dutch economists.


**Research facilities**

The most important event was the opening in spring 2007 of the NSM Decision Lab, supervised by Prof. A. van Deemen. This laboratory undertakes experimental research based on game theory and social choice theory to study cooperative decision making in various empirical domains. The software used to perform the experiments, which was developed by the team, is unique. Experiments include those in health insurance and policy making in various domains. This unique approach brings researchers together from different departments in Nijmegen and from around the globe.

IMR also uses the Visa Skills Lab, an Electronic Meeting/Group Decision Room at the Nijmegen School of Management, which is equipped for studying group processes such as agenda setting and specifying and evaluating policy alternatives. These facilities were, for example, used in the context of PhD research on external safety and spatial development. Research on the effects of model-based interventions used the Visa Skills Lab. Researchers in Organizational Cybernetics (OC) have initiated the development of an instrument for measuring the effects of system dynamics interventions which is now used by researchers in various countries including the USA.

Finally, research programmes developed at IMR use specialized national and international databases, adapting and combining them to match the Institute’s research themes and requirements. For example, researchers in the business sciences use mergers, acquisition and alliances data from the MERIT-CATI database and Thomson Security Data as well as company-specific data from Worldscope, Osiris and Dun and Bradstreet. Country and sector level data from the World Bank, United Nations and OECD are also used. The 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 and a panel dataset of companies listed on the stock exchange in several European countries is being developed, covering the topics employee share ownership and performance data. Furthermore, the CRANET database is used for the analysis of performance and innovation data of companies. This is a compendium of surveys on human resource management practices in more than 40 countries. On this note, PARTNER has been nominated within the Development Group of the CRANET Network to develop a global International Human Research Management Survey in 2008. Researchers within GaP use databases on property prices from the real estate company DTZ Hazelhoff and a national database on transport behaviour.

Collaboration
IMR aims to open up windows of opportunity for cooperation in research and teaching with interesting partners in the Netherlands and abroad. In addition to participating in the International Research University Network (IRUN) NSM has taken further initiatives in 2007 to work with several partners in Europe, supported by NSM’s International Office. The aim is to initiate joint international curriculum development at the Masters level, cross-accreditation of teaching programs, develop joint PhD programs, and apply for EU subsidies.

Further, In 2007 the Institute continued to collaborate with the following Dutch research schools and networks: Research School for Resource Studies for Development (CERES), Netherlands Graduate School of Urban and Regional research (NETHUR), Netherlands Network of Economics (NAKE), Netherlands Institute of Government (NIG), Netherlands Organisation for Research in Business Economics & Management (NOBEM) and the Research School on TRAnsport, Infrastructure and Logistics (TRAIL). IMR participates in numerous other national and international research networks. Examples of new research-related collaboration that began in 2007:

- Cooperation with Buck Consultants International, Euregional Platform Logistik, Ridderhaven BV and HAN in the project European Logistics networks II, as part of the national BSIK programme on TRANsition SUSTainable MObility (TRANSMO) (contact: Prof. R. van der Heijden/Dr G. Ziggers).
- Public-private collaboration in the BSIK programme Transforum Agro & Groen: Identifying Critical Stakeholders. The aims is to provide a more sustainable perspective for the Dutch agro sector and green spaces (contact: Prof. F. Boekema/Prof. L. Tavasszy).
- IMR, together with Wageningen University and the University of Amsterdam, started a BSIK programme on Water and Climate Change (2007-2009) studying the impact of climate change on water management policies (contact: Dr S. Meijerink).
- A framework agreement was signed with NICIS (Netherlands Institute for City Innovation Studies). IMR’s contribution concentrates on economy and governance issues in city development (Contact: Dr E. van der Krabben/Prof. R. van der Heijden).
- Participation in the EU Network of Excellence CINEFOGO (The Network on Civil Society and New Forms of Governance in Europe). This network aims to enhance the understanding of social and democratic processes, citizenship and democratic participation in Europe (contact: Dr T. Brandsen).
- Bilateral research collaborations in research on dynamic decision making in social systems were strengthened with Delft University, the University of Mannheim, the University of Albany and State University of New York, the Helmut Schmidt Universität, with the Technische and Freie Universität Berlin (contact: Prof. J. Vennix).
- Research cooperation with Twijnstra and Gudde consultants was initiated, designed to create synergy when applying intervention methods in societal problems (contact: Prof. J. Vennix / Prof. H. van Kranenburg).
- With Nuffic, the Institute of Social Studies in the Hague and the consultancy firm MDF in Ede a Centre for Migration Studies has been initiated in Ghana to chart migration and its effects (contact: Dr L. Smith).

Research results
The research programmes within IMR have contributed to developing theoretical, methodological and empirical insights into the management of public and private organisations. These new insights came to expression in contributions to national and international conferences, books, scientific and professional journal articles and dissertations. The fact that the average quality of the publications is steadily improving can be seen in the growth in academic publications and the number of successfully defended dissertations. Moreover, the volume of NWO-financed research is steadily growing.

IMR is witnessing a shift towards more vital, dynamic and outward-directed research with a stronger international focus and higher quality. IMR researchers increasingly participate in national and international networks. In recent years there has been a consistent trend towards more international publications, international exposure, and an increasing number of dissertations. Apart from these publications, the research resulted in a number of applied knowledge projects and new research proposals involving second and third level sources of funding. Examples of interesting applied knowledge projects (third level) are:
Prof. Y. Benschop studied the effectiveness of ‘LEF!’ coaching, a form of coaching that focuses on encouraging daring and perseverance among women in the job market. The client was GTP.

Dr J. van der Lijn studied the factors for success and failure of UNMIS (United Nations Mission in the Sudan) and UNAMID (African Union/United Nations hybrid Operation in Darfur) for CORDAID. The UNMIS operation appears to be average in the sense that it walks a tightrope, but has a good chance of making a relatively successful contribution to a durable peace. It is less likely that UNAMID will be able to contribute to a durable peace. In the absence of a political process, it will most probably not be able to offer the civil population of Darfur more than a breathing space.

Dr E. van der Krabben and Prof. R. van der Heijden performed a study for the OECD in 2007 on the relationship between the speed of planning processes related to infrastructure and the organization of these processes. Special attention was paid to the degree of collaboration between stakeholders.

Prof. Vennix carried out various applied projects for the Dutch Tax Office, TNO Defence and Safety and the Ministry of Justice. The Tax Office wanted to get more insight into the processing of tax forms. TNO is looking to extend its methodological skills to include instruments for messy problems. The project for the Ministry of Justice focused on proposed policies for increasing control by government of the building sector.

Alongside these and other applied knowledge projects, several initiatives designed to generate research based on second-level sources (NWO) were successful. Within the NWO theme ‘Shifts in Governance’ Prof. M. Leyenaar started the research programme ‘Disputed Democracy’. The programme considers democracy as a model and a practice that is constantly being redefined, repositioned, re-evaluated, re-legitimized and adapted.

NWO awarded Dr S. Beugelsdijk a Veni grant to perform multi level analyses of social capital and innovation in economic geography. The project focuses on better understanding the drivers of innovation (especially the role of social capital), given the emphasis on innovation for economic development and the interest in it among policy makers at the Dutch national level (Innovation platform) and within Europe (the Lisbon agenda for the knowledge economy).

**Societal impact**

IMR researchers frequently participate in debates on economics, politics, spatial developments and organizational and labour market issues. They lecture on these issues, write articles for newspapers, are members of national and international policy institutes, and are regularly contracted to conduct cutting-edge research. To ensure that the Institute’s activities remain relevant and topical, participants in the programmes also maintain close relations with professional partners and policymakers. Increasingly, researchers from IMR are invited to participate in regional policy debates, with underlines the growing recognition of Radboud University Nijmegen’s role in regional development.

Below is a selection of memberships and projects:

- On the day before Prof. H. van Kranenburg delivered his inaugural lecture at the end of November, he organized a seminar on strategic alliances in the media world in Hilversum together with IMMovator Cross Media Network and Synergy Alumni.
- Prof. E.- M. Sent, Dr J. Vyrastekova and Drs. F. van Beest have appeared regularly on the radio programme ‘Noorderlicht’ (Northern Light), to explain their research on the new health insurance system. An experiment, in which listeners were invited to participate, led to the conclusion that supposed market competition – yielding price advantages for consumers – actually has a very limited effect.
- Prof. B. Prakken used his farewell address to call students and teachers to reflect on university education, stating that a culture of mediocrity (a so-called C+ culture) is not acceptable. This led to an inspired plea to return to the core of a university education: a teacher who inspires students, leading them into new fields of knowledge. The address attracted considerable media attention.
- Prof. M. de Vries has become vice president of The International Association of Schools and Institutes of Administration (IASIA). The IASIA is an association of organizations and individuals whose activities and interests focus on public administration and management. The association aims to promote and support cooperation among participating organisations and individuals in order to enhance their capacity to strengthen the administrative and management capabilities of governments, organisations, agencies and enterprises they serve.
- Prof. M. de Vries was invited to join the ‘Commissie Evaluatie Spoorwetgeving’, which will advise the Minister of Transport, Public Works and Water Management on the rail network law of 2005.
- Dr E. van der Krabben gave a keynote lecture for the annual ‘Real Estate report’ in the Arnhem-Nijmegen region. The theme this year was: ‘Investments in the Arnhem-Nijmegen City region’. The annual real estate report is the result of cooperation between municipalities, real estate brokers and regional authorities.
- Prof. W. Verschoor joined the Academic Board of the Global Finance Forum, a prestigious new think tank that addresses financial issues.
Future research
The plan for 2008 is to continue the initiatives taken in previous years, thus further increasing productivity and improving quality. This approach will be supported by the following strategies.

The first relates to an external quality assessment. Originally scheduled for 2007, the evaluation of IMR research took place in March 2008. The assessment will endorse new research programmes for the period from 2008-2013. In anticipation of the assessment, the business sciences programmes have been combined and new research themes are currently being developed. Further, some changes in the organization of research programmes are expected: more emphasis will be placed on multidisciplinary research.

Secondly, IMR management has decided to put more energy into generating research funds and contracts. The aim is to substantially increase the proportion of external funding. Initiatives have been taken to increase the number and the quality of proposals submitted to various funding programmes, including the MagW Open Competition, the NWO personal grants and certain programmes from NWO, such as the recently announced programme on The accessibility of the Randstad (the conurbation in the west of the Netherlands). The growth in external research funds and contracts, for example those from EU and Dutch public-private research programmes, has been made possible by an increase in the budget for matching (i.e. costs not covered by the grant). Moreover, specialist support staff are involved in supporting these initiatives.

The third strategy relates to the quality assurance of researchers and research output. In a follow-up to the mid-term research evaluation in 2005, IMR put considerable emphasis on improving the quality of publications in order to generate more top-level journal articles. The Institute will implement a new quality assessment protocol, including a publication strategy designed to further enhance its positioning and development. Moreover, IMR has set targets to increase the number of articles published in top academic journals by extending international cooperation with top researchers and institutes, and attracting new scholars with an excellent publication performance, external acquisition track record and international network.

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Prof. J.M. Mastop
Hans Mastop joined the Faculty of Policy Sciences, now Nijmegen School of Management, in 1988 as Associate Professor of Spatial Planning. In 1993 he became a Full Professor and Vice-Dean of research. From 1995 to 1999 he was Dean of the faculty. In 2002 he was reappointed as Dean. In 2007 he temporarily also held the position of Director of the Institute for Management Research. Prof. Mastop is an expert in strategic spatial planning and spatial planning methodology. He has been a member of various national and international scientific and professional boards and councils, was both Vice-president and President of AESOP (the Association of European Schools of Planning, 1999-2003) and Secretary-general of GPEAN (the Global Planning Educators Associations Network, 2003-2006).
Research groups from various societal science disciplines have developed an integrated cooperative comparative approach to research and established a Research Masters programme. The latter has been accredited and the former is firmly on track to being acknowledged by the Dutch authorities. The groups study a wide variety of phenomena and processes in a broad range of Western and non-Western societies, but similarities in their theoretical approaches, data collection, research design and data analysis form a common research framework.

Three themes guide the research in the various disciplines: inequality, cohesion and rationalization. Researchers examine these three aspects, both within a single society and between societies, i.e. from a historical perspective within one society and comparatively (between two or more societies). A comparative approach has been chosen, both because it is more informative and because it leads to a better understanding of societal phenomena and processes than research on a single society in one historical period. The main comparative research areas are:

**Inequality**
The Institute explores comparative questions related to differences in access to and control over resources that affect peoples’ opportunities in life, such as educational level, labour-market success and differences in lifestyle. Research focuses on the effect of resources on socio-economic achievement and on how variation between and within countries is affected by structural differences and national policies. How individual and family resources affect outcomes such as cultural participation, media access and media use is also studied.
Cohesion
In this area the focus is on describing and explaining social participation in formal organizations as well as in informal social networks, including families and other groups. Three topics form the core of this research. First, there are developments in the relationship between social participation and both pro-social and antisocial behaviour and the variation 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 stability and longevity.

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

Additional funding
Researchers received major additional funding from NWO (Middelgroot) for an exercise in collecting large-scale panel data, labelled ‘Panel Study of Social Dynamics in the Netherlands’ to improve upon answers to longitudinal questions. Other researchers received major funding from New Opportunities for Research Funding Agency Cooperation 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.

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 vital 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 from a variety of research groups within the Institute. Researchers also have access to collections of data on 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 an international level the Institute collaborates with the Universidad Católica Cardenal Raúl Silva Henríquez (Chile), University of Aarhus (Denmark), Centre National de Recherche Scientifique (Paris, France), 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, London, Oxford and Southampton (UK), and Harvard University (USA).

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

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**Prof. P.L.H. 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 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 for Research Methodology in the Faculty of Religious Studies at the University.
In order to assess global social cultural change, take into account historical, political and the relevant discourses of responsibility and reconciliation are constructed, and how be identified, how deserving cases of justice about how the perpetrators of injustice can be responsible for the harm that colonialism inflicted. This lead, in turn, to further questions and the related issue of who was harmed. These paradox of the decolonization process in the Pacific, where anti-colonial sentiments seem to have proliferated in the recent past. The question is how to address this contemporary form of counter-hegemonic resistance in the Pacific. Requests for the repossession of objects representing cultural heritage reflect the uneasy relationship between colonizers and colonized. Political discussions in such circumstances generally revolve around the issue of who is responsible for the harm that colonialism inflicted and the related issue of who was harmed. These lead, in turn, to further questions about how the perpetrators of injustice can be identified, how deserving cases of justice and reconciliation are constructed, and how the relevant discourses of responsibility take into account historical, political and cultural change.

In order to assess global social inequality and policies to reduce this, other researchers at the Institute have published The Netherlands Yearbook on International Cooperation 2007. The yearbook has a section with articles on: selectivity and country selection in the Dutch aid programme, discourses on ‘good governance’ and aid selectivity in Germany and the Netherlands, the cracks in the new aid paradigm and the new aid architecture, shifting perspectives on disaster reduction, and finally on colonialism, Christian missions and development. In the ‘Forum’ section articles were written on the history of Dutch development cooperation, dilemmas around the Dutch contribution to peace-keeping in fragile states, the changes in the co-financing system for NGOs in the Netherlands, the Christmas tsunami and its effects on public support for development cooperation, and the response of recipients of aid.

Other researchers from several groups have joined forces to arrive at insights into the consequences of rationalization processes, investigating changes in public opinion in the Netherlands about two controversial issues: homosexuals and euthanasia. They find that a rapid reduction in opposition to both issues in the 1970s and early 80s was followed by a period of stable minority opposition. They identify period and cohort indicators to test which characteristics are associated with the changes in attitude. For both attitudes, it turns out that the changing composition of Dutch society with regard to religiousness accounts for the largest changes in public opinion. Furthermore, they find that the influence of religion on both the attitude towards euthanasia and the attitude towards homosexuals became stronger over time, whereas the influence of educational attainment weakened over time.

Last but not least, there are researchers from one group at the Institute (communication scientists who focus on social cohesion), who follow up researchers from another group (i.e. sociologists), building on a stream of research on the exclusion of ethnic minorities, to shed light on the way the popular Dutch newspaper Algemeen Dagblad reports on Islam. Clearly, there was a greater focus on Islam in the period from 1998 to 2004. Foreign Islam is more often associated with terrorism than Dutch Islam. Reporting on Dutch Islam generally involves religion and politics. Analysis of articles written before and after the murder of Theo van Gogh reveals that journalists began to write more negatively about Muslims after that event: articles tended to be longer and journalists did more investigative research. The Netherlands clearly became the focus of attention and there was less interest in the Middle East.

**Societal impact**

As a spin-off of our scientific research, members of the Institute participate as advisers in several public and private institutes. These advisory positions are in a variety of domains. Several hold positions related 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 Vluchtelingenzorg (refugee assistance).

**Future research**

New research within NISCO is both comparative and multi-disciplinary. Researchers from one group (anthropologists) cooperate with the affiliated Institute for Gender Studies, focusing on gender and re-emerging religious voices for physical restoration of two European pilgrimage sites. They explore


**Dissertations:** 12
**Scientific publications:** 180
**Professional publications:** 74
issues related to \textit{rationalization processes}, asking how, at these sites, conservative groups spread their message against women’s reproductive rights and gay rights; and how feminist groups and individuals resist such claims and worked to achieve the religious empowerment of women.

Other researchers jointly analyze the underlying rationale and effects of national geographic choices made by Private Aid Agencies (PAAs) attempting to reduce social inequality. Central issues relate to (1) the determinants of the geography of PAA aid, (2) the occurrence of spatial agglomeration effects and aid overlaps, (3) the role of back-donors in aid allocation and (4) the role of risk perceptions among donor organizations and implications for the efficiency of aid.

As part of a stream of research in which researchers from various groups (e.g. sociologists and anthropologists) cooperate and exchange knowledge on themes related to \textit{rationalization} and \textit{cohesion}, the focus is on secularization in a very large number of European countries, including Central and former Eastern European countries, taking a longer perspective (1970-2006). Crucial questions include: (1) to what extent is institutional religiosity (e.g. membership and church attendance) declining in each of the European countries? (2) to what extent has this presumed decline been replaced by personal religiosity (e.g. individual prayers or spirituality) in Europe? and (3) to what extent is solidarity with primary, secondary and tertiary groups declining across Europe?

The key questions are: (1) how do young and old adults rate elderly people on a scale of warmth and competence? (2) to what extent are elderly people – compared to middle aged adults – portrayed as warm and competent? and (3) to what extent have such portrayals become more positive in terms of both warmth and competence in the period from 1980 to 2010?

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In order to improve teaching and learning, the Centre’s focuses on the relationships between students’ domain-specific learning, the ways in which teachers influence that learning, and teachers’ own learning processes. These learning processes are seen as dynamic and nonlinear. Dynamic because prior conceptions and beliefs held by these learners (students and teachers) evolve over time as they acquire new knowledge, skills, and understanding, which are affected by interactions with other students and teachers (the students’ perspective), as well as with students and colleagues (the teachers’ perspective). And nonlinear because acquisition can be rapid and at a tacit level, while consolidation of knowledge and understanding can be slow (or in some cases missing altogether).

To acquire insight into these processes, the Centre collaborates closely with teachers in schools in order to analyze and identify successful teaching practices. The primary area of interest is analysis of students’ domain-specific learning and investigating how this learning can be promoted by advanced instructional arrangements that are developed by teams of teachers and
experts in the domain. In terms of teachers’ professional development, the Centre distinguishes two areas of research. The first is related to ways in which teachers engage in teaching and encouraging student learning, while the second focuses on how schools and teams of teachers and experts serve as learning communities for teachers. These three areas are clearly interrelated, as the teachers’ professional development ultimately contributes to students’ learning and learning outcomes. A topic of special interest within these three areas is the development of school subjects in secondary education and how this is related to teachers’ professional development and student learning.

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

**Research facilities**

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

**Collaboration**

The Centre cooperates with ICLON Graduate School of Education at Leiden University and IVLOS at Utrecht University (both in the Netherlands) and participates in a national research project on ‘Teacher learning’, which is funded by the Netherlands Organisation for Scientific Research. Together with Volkshochschule Aachen (Germany) and eight other institutes from six European Union countries, the Centre participates in ‘Living and learning in border regions’ (an EU Socrates programme). Together with the Ruud de Moor Centre / Open University, (Netherlands), the Centre is engaged in a pilot study called Academic School, which is funded by the Dutch government. Together with Free University (Amsterdam, Netherlands) the Centre coordinates a national project on innovation of the biology curriculum. Together with the Department of Education at Radboud University Nijmegen and Hogeschool Utrecht, the Centre coordinates the National Expertise Centre on Mother Tongue Education.

**Research results**

In design projects for biology and chemistry that follow the ‘concept-context’ approach the misconceptions of students are explored and new educational materials and lesson plans are tried out and their impact on teacher instruction is tested, resulting in promising improvements in student learning outcomes, in particular their understanding of concepts in science.

Research on school-university partnerships contributes to the development of ‘local theory’ on teachers’ professional development in schools’. Teachers gradually come to understand theory, which they increasingly apply in daily classroom practice.
Substantial additional grants have been obtained for research on collaboration by teachers and researchers. These teachers design teaching methods and materials for a variety of school subjects and explore the effects of these methods and materials on student learning. Various reports of teachers’ design research have been completed. These teacher research reports and their practical implications are the subject of further study that is planned for the future.

Research on teacher learning in the context of mandated national reform shows that the way teachers interpret innovations should be conceptualized as an ongoing process of positioning and adjustment, in which teachers as well as the innovations are constantly developing. Research on teacher learning in daily practice has yielded rich insights into learning activities and learning results among teachers engaged in peer coaching and collaboration in teams, without external control. Such a new insight is that teacher learning can best be analyzed in terms of patterns of learning activities of teachers rather than isolated learning activities, and that these patterns are related to specific learning results of teachers.

Societal impact

Members of the Research Centre hold leading positions in national and international organizations for the development of school subjects and educational reform.

The national biology curriculum project sponsored by CVBO promotes the introduction of the concept-context approach in Dutch biology education.

Together with the Faculty of Science, the Research Centre coordinates a national in-service programme designed to prepare mathematic teachers in secondary schools for teaching courses in advanced mathematics to senior high school students.

As a result of the school-university partnerships in which the Research Centre participates, schools and teachers have come to
Jeroen Imants has been an Associate Professor at Radboud University Nijmegen Graduate School of Education/ILS since 1999. From 2001-2004 he chaired the International Committee of division A of the American Educational Research Association. In 2005 he was a visiting scholar at OISE (Ontario Institute for Studies in Education), a leading institute in the field. In 2007 he became Acting Head of Research of the school’s research centre. He is a member of the editorial boards of several international educational research journals.

better appreciate the importance of practice-oriented small-scale research with and for teacher and schools. A new element in national educational policy is to provide schools with financial resources for promoting school-based research. The Centre successfully participates in these externally funded school-university partnerships, and promotes research on domain-specific curriculum design within these partnerships.

**Future research**

In 2008 the programme will continue to focus on domain-specific learning and teaching processes in the classroom. Research on characteristics of students’ and teachers’ learning will be conducted in teams and networks of researchers and practitioners. Through this partnership, perspectives, knowledge, and solutions from teachers will become available for further explorations and, together with results from more fundamental studies, new insights will arise for designing more effective teaching environments.

Three research questions are central to the programme. All three avenues of research are explored in the context of school-university partnerships.

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

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

Thirdly, what conditions foster or constrain students’ and student-teachers’ learning at professional development and academic schools (those in which the role of teachers as innovators and researchers is promoted)?
The aim of the Centre for Language Studies (CLS) is to carry out top-quality research in Linguistics, Language and speech technology and Communication studies in a stimulating environment. 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:

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

In 2007, three key research themes were formulated to further structure and focus the research, and to create critical mass by establishing sub-themes on which participants in programmes could collaborate. These themes are:

• Language and cognition
  Here we go beyond grammar and address language in a broader sense, extending the domain of investigation on the one hand from the word and sentence level to discourse and text, and on the other to how input cues (auditory speech, but also visual and contextual cues) are used in language production and comprehension and how children use these cues to build a representation of their natural language.

• Infrastructures
  This group is involved in creating language resources and tools. Empirical research in linguistics depends crucially on the availability of a wide range of language resources in combination with appropriate tools for processing the data. CLS has ample experience
and know-how related to the creation of corpora, the management of corpus projects, and the development of tools.

- **Language and Diversity**
  This theme covers diversity in language structures and patterns of use. Language diversity manifests itself both at the macro level in large differences between languages in different parts of the world, and on the micro level: smaller, sometimes minute subtle differences between varieties of a single language. The intention is to incorporate insights from evolutionary science and neuroscience.

**Awards**
Prof. Pieter Muysken was awarded a prestigious academy chair by the Royal Netherlands Academy of Arts and Sciences (KNAW), which will allow him to devote five years to his research project on the indigenous languages of South America, and to consolidate his research themes with talented young researchers.

Dr Mirjam Ernestus was elected as a member of the ‘Young Academy’, a branch of the Royal Netherlands Academy of Arts and Sciences.

Two Associate Professors were appointed to full professorships: Prof. Paula Fikkert (chair for First Language Acquisition and Phonology), and Prof. Helen de Hoop (chair for Theoretical Linguistics: Syntax and Semantics).

Prof. Carel Jansen was reappointed as Extraneous Professor at Stellenbosch University (South-Africa), Department of Afrikaans and Dutch (January 2008 - December 2011).

Dr Marianne Starren won the Netherlands Organisation for Scientific Research (NWO) Bessensap award for the best press-oriented presentation of her research on the relationship between language and cognition.

At the end of 2007, CLS was extremely successful in the NWO programmes research call, receiving funding for four programmes.

In 2007 eleven dissertations were defended, one of which was awarded a cum laude: D.B.M. Haun’s ‘Cognitive cladistics and the relativity of spatial cognition’.

**Research facilities**
CLS research is becoming increasingly experimental with facilities such as experimental laboratories, experimental equipment and software. In 2007 software and hardware were purchased that offer the...


Collaboration

- There is long-standing collaboration with a number of groups at the Max Planck Institute for Psycholinguistics on campus, involving language processing, sign language and gesture studies, descriptive and comparative linguistics, databases and digital infrastructure, multilingualism (also involving the Donders Institute’s Centre for Cognition and the Behavioural Science Institute (BSI)) and child language (also involving the Centre for Cognition).
- Collaboration with the Meertens Institute on the NWO-funded research projects ‘intonation in language of Dutch’ (also involving Leiden University), the ‘Dutch Bilingualism Database’ (also involving the University of Tilburg), and ‘Roots of Ethnolects’.
- The Typological Database System (TDS; 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 Nijmegen and the OSTT Development Centre for Speech and Language Technology in a Communication Assessment project.
- Collaboration on EU’s Sixth Framework Programme (FP6) ACORNS project with the Royal Institute of Technology, Stockholm, the University of Sheffield, Technical University Helsinki and the Katholieke Universiteit (K.U.) Leuven
- Participation in NWO-STEVIN project MIDAS with K.U. Leuven Research and Development.
- CLS collaborates in the BSIK Programme ICIS with the Centre for Cognition, Delft Technical University, the University of Twente, TNO Defence and Security, Thales Research and Technology and DECIS Lab
- The European Young Investigator (EURYI) project Ernestus involves collaboration with the Max Planck Institute for Psycholinguistics, University of Glasgow (Rachel Smith), LIAMSI, 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 College for Science & Art in Brussels.

Research results

In 2007 Helen de Hoop’s PIONIER project ‘Case cross-linguistically’ was concluded. In this project three separate areas of linguistics, namely theoretical linguistics, language typology and psycholinguistics were linked. This combination of different linguistic traditions has proved to be very productive, since it has led to fresh insights and to a new theory on the functions of case in language and its processing.

New data collections were completed for research on the intonation of non-Standard Dutch by Carlos Gussenhoven.

Onno Crasborn’s sign language research shows that there is no globally dominant language like English, although American Sign Language is slowly gaining importance.

Work on the corpus Dutch in Transition (DiT) for the NWO programme ‘Variation and Standardization’ has stopped at 4.2 million words, covering all the major dialect areas from 1400-1650. The research group working with the corpus has obtained more insight into the relationship between migration, dialect contact and the shape of the emerging Dutch standard language.

Mily Crevels completed her fieldwork on Itonama and started working with the last speakers of highly endangered Cayuvava. Swintha Danielsen defended her thesis on Baure and almost completed a large database for the Arawak languages. Hein van der Voort, together with Eduardo Ribeiro, discovered genetic links between the Jabuti languages and Macro-Je.

The last five volumes of the Limburg Dialect dictionary were finished and the last four were published early in 2008. The project, which began 45 years ago, comprises 39 volumes with a total of 10,000 pages. A project on digital dialect data was concluded late in 2007. All planned data (the complete lexicographic database of the Brabant and Limburg dialect dictionaries) became available in digital form, including cartographic tools. All data will be available in a database (www.ru.nl/dialect).

The results at the end of the first year of the FP6 ACORNS project ‘Future and Emerging Technologies’ look highly promising. Experiments by Lou Boves and Louis ten Bosch show that an artificial agent can learn to recognize its first words without the need to first learn to detect phonemes.

Mirjam Ernestus started her EURYI project ‘Acoustic reduction in European languages’. She showed that segment deletion typically delays comprehension, but that shorter segment durations, unexpectedly, speed up comprehension, especially for words with high-frequency competitors. Frequency plays a more important role for unreduced than for reduced words, which casts serious doubt on the popular hypothesis that speakers...
adapt the fine details of their pronunciation to the listeners’ needs.

Margot van Mulken and Mirjam Ernestus conducted a series of experiments to examine the processing of slogans that contain idiomatic expressions. It appears that idiomatic expressions are processed faster than slogans without idioms. Furthermore, slogans with idioms that involve dual meanings (and can therefore be considered puns) are processed even faster than idioms with only one meaning.

An investigation into the effect of Dutch-flavoured English showed that having a Dutch accent, even a very slight one, is disadvantageous for the speaker in terms of status and comprehensibility. A quantitative investigation into the occurrence of English in product advertisements in Dutch-speaking Belgium, French-speaking Belgium, France, Germany, the Netherlands and Spain showed that more than two thirds of those advertisements contained one or more English words. In particular, English was used for advertising products that can be associated with modernity. There are considerable differences in the amount of English used among these countries.

**Societal impact**
The exhibition ‘Bent u een goed verstaander?’ featured the research results of the project ‘Conflicts in Interpretation’ that was on display at the University Museum of Groningen from January to September 2007. The exhibition was a great success and we are currently preparing an online continuation.

Work on the Corpus of Dutch Sign Language is followed closely by members of the deaf community and professional groups of sign language teachers and interpreters.

Research on first language acquisition was presented to the general public on a variety of occasions and work on the intonation of varieties of Dutch attracted considerable media attention.

Hein van der Voort continues to be very active in raising public awareness of the endangered languages of Rondonia (Brazil).
Two research proposals funded by STEVIN have direct societal impact, one by applying speech technology for pronunciation and grammar training, the other by building pronunciation dictionaries for proper names for mobile information services.

A contract with LogicaCMG involving collaborative R&D in speech-driven telephone information systems has been completed.

Members of the research group ‘Language in Time and Space’ were actively involved in issues related to language policy on dialects and regional languages in the provinces of Limburg, Brabant and Gelderland.

As a follow up of the EPIDASA project (2003-2006) which was designed to improve the effectiveness of HIV/AIDS information and education documents for specific target groups in South Africa (for the research output, see www.epidasa.org), the first version of a website for information and document designers in this field was developed: www.hivaidsinformationdesign.org.

A TV programme about differences in communication styles between Dutch and Flemish professionals (Café de Buren) was broadcast in November on the Wereldomroep. The programme will be repeated in March 2008 by TELEAC.

**Future research**

For next year, the five programmes and the three key research themes will continue to shape research at CLS. The grants that were obtained in 2007 will substantially strengthen the research lines.

- Prof. P. Muysken received a Chair from the Royal Netherlands Academy of Sciences (KNAW). As part of the activities for this chair, he will focus on two kinds of research: (a) The historical relationship between the many languages of the South American Indians, by systematically comparing newly available structural and lexical data on often highly endangered languages and (b) An experimental study of code-mixing processes in the speech of bilinguals. In this research the original focus was on Papiamentu-Dutch bilinguals, but Turkish-Dutch bilinguals will also be studied.
  - ‘The interplay between the speaker’s and the hearer’s perspective’, De Hoop. NWO Internationalisation grant.
  - ‘Forms and functions of Prosodic Structure’, Gussenhoven. NWO Internationalisation grant.
  - ‘On the other hand: the linguistic impact of having two symmetrical articulators on sign language’, Crasborn, Vidi grant, NWO.
  - ‘Between you and me: local pronouns in language’, De Hoop. NWO research programme grant.
  - ‘Numerosity in Dutch and related languages’, Neijt and Schreuder. NWO research programme grant.
  - ‘Syntax and Information Structure: discourse options after the loss of Verb Second’, Los and Van Kemenade, NWO research programme grant.
  - ‘SoNaR’, NWO STEVIN grant.
  - ‘AUTONOMATA TOO’, NWO STEVIN grant.
  - ‘DISCO’, NWO STEVIN grant.
  - ‘A computational model of language acquisition’, Boves and Fikkert, NWO research programme grant.
  - ‘Speech Communication with Adaptive Learning’ (SCALE), Boves and Ten Bosch, FP7 Marie Curie Initial Training Network.
  - ‘Grammaticised forms underlying information structure: Hurdles for advanced German and Dutch learners in achieving native-like competence in Japanese’, Starren, NWO grant for a Post-doc within NWO’s Language Acquisition and Multilingualism Programme.

Centre for Language Studies

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In 2006 BSI received accreditation as a research school from the Royal Netherlands Academy of Arts and Sciences. The Institute offers a two-year course leading to a Research Master’s degree in Behavioural Science (www.ru.nl/master/behaviouralscience).

BSI researchers investigate questions about 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, psycho-physiological measurement, behavioural and social neuroscience methods, behavioural genetics paradigms, randomized clinical trials, and intensive longitudinal designs.

BSI maintains the following research programmes: Social cognition, Social development, Learning and plasticity, Work, stress and health, Developmental psychopathology, and Cognitive processes in psychological dysfunctions.

Awards
- Prof. A. Dijksterhuis was awarded the Theoretical Innovation Prize by the Society for Personality and Social Psychology.
• Prof. M. Riksen-Walraven is member of the Social Sciences Council (SWR) of the Royal Netherlands Academy of Arts and Sciences (KNAW).
• Dr J. van Hell and Dr M. van Turennout are members of the Young Academy of the Royal Netherlands Academy of the Arts and Sciences (KNAW).
• Prof. C.L.M. Witteman was appointed Professor II at the Faculty of Psychology, University in Bergen (Norway).

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 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. This offers the opportunity to perform highly controlled experiments to test theories and relations between psychological, physiological, and behavioural variables that are difficult or even impossible to test in ‘real life’.
• The two BSI mobile labs, with flexible furnishing, can be used to accommodate different experimental set ups outside university (e.g. 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.
• The observational laboratory comprises several rooms with one-way screens and multiple cameras. The rooms are childproof, 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 (e.g. 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

Staff
- Full Professors: 10.1 FTE
- Associate Professors: 7.5 FTE
- Assistant Professors: 1.3 FTE
- Researchers: 10.7 FTE
- Researchers: 5.1 FTE
- Doctoral candidates: 46.2 FTE

- Prof. E.S. Becker (o)
- Prof. A.M.T. Bosman (p)
- Prof. J.A.M. Bransen (o)
- Prof. A.H.N. Cillessen (o)
- Prof. A.J. Dijksterhuis (p)
- Prof. F. Dittmann-Kohli (o)
- Prof. C.C.C. Duker (e)
- Prof. R.C.M.E. Engels (o)
- Prof. J.R.M. Gerris (o)
- Prof. C.A.L. Hoogduin (o)
- Prof. G.J.M. Hutschemaekers (e)
- 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. van 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. van Nijnatten (c)
- Prof. J.M.A. Riksen-Walraven (p)
- Prof. C.P.F. van der Staak (p)
- Prof. T.W. Taris (p)
- Prof. J.W. Veerman (c)
- Prof. L.T.W. Verhoeven (o)
- Prof. R. Vonk (p)
- Prof. R.W.H.J. Wiers (e)
- Prof. D.H.J. Wibbaldus (o)
- Prof. C.L.M. Witteman (o)
and a professional beer tap, is used for observation studies of social behaviour in a natural setting.

Collaboration
Researchers within the Social cognition programme collaborate with Prof. Vincent Yzerbyt, the Catholic University of Louvain, Belgium, on an ESF-funded project on emotions. On the basis of a joint NWO investment subsidy for a Virtual Reality Lab, collaboration on VR research was continued with Prof. Henk Aarts of Utrecht University, the Netherlands. 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. 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, 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. The Developmental Psychopathology programme started formal collaborations with the Trimbos Institute on testing and evaluation of primary and secondary prevention of alcohol use in youths. The Cognitive processes in psychological dysfunctions programme has close collaborations with Dr Emily Holmes, Dr Bundy Macintosh, and Dr Andrea Reinecke from Oxford University, England, on research on intrusions and cognitive biases in anxiety. A research network on cognitive processes in anxiety and depression was established with Prof. Renate de Jong Meyer and Dr Andrea Gerlach from the Westfälische Wilhelms-Universität Münster, Germany. The diagnostic decision making group closely collaborates with the DICE (Decision making, Intuition, Consciousness and Emotion) and JDM (Judgment and Decision Making) groups at the University of Bergen (Norway) and with Prof. Corneille from the Catholic University of Louvain, Belgium, on mood and decision making.

Research results
The central theme of the Social cognition programme involves the interplay between automatic and controlled processes underlying social behaviour. Research and theorizing on unconscious thought focused on how people make choices without deliberation (Dijksterhuis, 2007). Research on selective responses to stimuli revealed that stimuli that need to be repeatedly ignored tend to become devalued (Veling, Holland, & van Knippenberg, 2007). Research on forgiving in close relationships showed that the inclination to forgive is relatively automatically evoked in response to an offence (Karremans & Aarts, 2007). Research on mimicry demonstrated that interpersonal mimicry heights one’s perception of interpersonal closeness with unspecified others and decreases one’s physical proximity to others (Ashton-James, Van Baaren, Charttrand, Decety, & Karremans, 2007). Other research shows that ambivalent attitudes are characterized by relatively strong positive as well as negative implicit object-valence associations (De Liver, van der Pligt, & Wiboldus, 2007). Finally, research on goal pursuit showed that people disengage from social goals when these goals are primed in temporal proximity of negative information (Aarts, Custers, & Holland, 2007).

Research on social interaction processes in various age groups yielded new insights. In research with infants, a new device for saliva collection and cortisol determination among young children was developed. Another study showed that, contrary to an important theory, perceptions of behavioural aggression in school-age children were not more accurate when examined at the dyadic level (examining who was aggressive to whom) than at the generalized level (examining who was aggressive in general). In a study with young adults, interactive effects were found of the serotonin transporter 5HTTLPR polymorphism and stressful life events on college student drinking and drug use. A study on stereotypes about older adults demonstrated that younger and older people have similar stereotypes about their own and the other age group. This research also showed that the extent to which aging persons see themselves as better or worse than the stereotype for their age group was related to their general degree of adjustment.

Within the Learning and plasticity programme, the neural basis for learning about navigation and object function was investigated. Special attention was paid to the cognitive and neuro-cognitive dynamics of language and processes related to literacy in relation to the emergence of phonological awareness in bilinguals, the identity of morphological units in word reading, and the interaction of discourse context and world knowledge in online sentence processing. Validation studies were carried out on the screening of language and phonological awareness in kindergartners, and of reading literacy in older children. Intervention studies investigated the use of mnemonics in teaching kindergartners letter sounds, the learning of spelling with the help of a spelling checker and other forms of feedback, and the effectiveness of neuro-feedback training. In addition, gender-related effects were found in instruction in mathematics for low performers. With respect to special populations, one series of studies focused on screening behaviour flexibility and intellectual disabilities as well as diagnosing specific syndromes. Another series of studies addressed the behavioural treatment of drooling, motor problems, eating problems and environmental control problems. Finally, the role of teacher perceptions and self-images of children in primary education was studied.

Within the Work, stress and health programme, Beckers et al. (2007) demonstrated that for Dutch full-time workers overtime hours were accompanied by higher work motivation. A daily-diary study (Van Hooff et al., 2007a) showed that high levels of work-related effort are associated with activity patterns that hinder recovery from fatigue, with a higher expenditure of effort after work time and diminished health. Another study (Van Hooff et al., 2007b) demonstrated the validity of a single-item measure of daily fatigue. Trying to bridge personality and stress theory, Van der Linden et al. (2007a, 2007b) published two papers on reinforcement sensitivity theory.
Within the Developmental psychopathology programme, research on smoking cessation demonstrated the effects of parental anti-smoking socialization on smoking cessation (Van Zundert et al., 2007), but did not find support for the ‘transtheoretical model’ (Kleinjan et al., 2007ab). Research on precursors of the initiation of alcohol use in early adolescence shows substantial genetic effects on early onset (Poelen et al., 2007) and environmental effects of norm setting and modelling due to parental use, as well as the effects of a lack of rule-setting and monitoring (Van der Vorst, et al., 2007ab). A birth-to-maturity study showed that negative parent-child bonds are indirectly related to low-quality partner relationships and dissatisfaction with life in adulthood through conflictual parent-adolescent communication and low-quality partner relationships in young adulthood (Overbeek et al., 2007). Longitudinal research on bullying revealed that children who bullied or who were victimized only in childhood did not differ significantly in adolescence from those who were never bullies or victims (Scholte et al., 2007) and that classroom norms affect the relation between involvement in bullying and peer preference (Sentse et al., 2007).

In the programme on Cognitive processes in psychological dysfunctions, research suggests that avoidance behaviour is a central mechanism in maintaining anxiety (Rinck & Becker, 2007; Heuer et al., 2007). Approach and avoidance reactions were used successfully in conditioning procedures in students (Woud et al., in press), and alcoholics (Hesse et al., submitted). Further, fMRI was used to study the neural foundation of memory biases in depression and MEG was used to study face processing in social phobia (Langner et al., submitted).

Furthermore, an intervention study on the efficacy of a home-visiting programme for depressed mothers and their babies proved successful in preventing poor the quality of mother-child interaction and insecure attachment in children, which are important risk factors for psychopathology (Van Doesum, Riksen-Walraven, Hosman & Hoefnagels, 2007). The development of expertise in clinical decision making was investigated (Witteman at al., 2007).

Clinicians often do not explain their clients’ complaints, but proceed directly from the symptoms (De Kwaadsteniet et al., 2007). Furthermore, complex decisions such as diagnostic decisions seem to be more effective when clinicians are in a positive mood, whereas simple decisions can be made effectively when they are feeling sad (De Vries et al., 2007).

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 researchers.

• Prof. L. Verhoeven is head of the Expertise Centrum Nederlands (National Language Education Centre), which was set up to improve the teaching and learning of the Dutch language and literacy at Dutch primary schools.

• The BSI has strong links with the Expert Centre for Atypical Communication, where researchers collaborate with national institutions for children.


Janzen, G., Wagensveld, B. & Turennout, M.I. van (2007). Neural representation of navigational relevance is rapidly induced and long lasting. Cerebral Cortex, 17 (4), 975-981.


Dissertations: 24
Scientific publications: 346
Professional publications: 76
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 for those with a mental handicap (Winkelsteeg, Trajectum, Pluryn, Borg), physical handicaps (Groot Klimmendaal, Werkenrode), and sensory handicaps (Vitaal, Sint Marie, Sensis).

- Prof. M. Kompier served as an international expert and project leader to the UK government’s Foresight project on ‘Mental Capital and Mental well-being’.

- Prof. C. Hosman chairs the World Consortium for the Advancement of Prevention and Promotion in Mental Health and of the Dutch Steering Group on Evidence-based Interventions for Youth, and prevention advisor to the US Institute of Medicine.

- Findings from Dr Van der Vorst’s PhD thesis have been used by NIGZ and the Trimbos Institute to develop a national prevention campaign on the role of parents in relation to alcohol use in adolescence.

- Dr G. Westerhof published a manual on the residential care of older adults. This received widespread media attention and is already being used in institutes.

- Research on the direct impact of alcohol portrayal in the media on alcohol consumption among young men (Prof. R. Engels), on parental role in adolescent drinking (Dr H. Van Der Vorst,) and observational research on peer influences on binge drinking (Dr S. Bot) attracted substantial media attention (in newspapers and interviews on radio and TV). Moreover, two new books – one on the psychological factors of dieting and overeating (Dr T. van Strien) and one on unconscious thinking (Prof. A. Dijksterhuis) – received a great deal of media attention.

- Prof. R. Vonk, Prof. A. Dijksterhuis and Dr T. van Strien have made numerous media appearances in newspapers, magazines and on radio and television. They occupy the 2nd, 13th and shared 14th place, respectively in Radboud University Nijmegen’s ‘Mediatop 2007’.

Furthermore, research in the Social Cognition programme played a central role in a highly successful researchers’ night entitled ‘Buiten Bewustzijn’ that was organized by the University and the LUX cultural centre in Nijmegen.

**Future research**

In December 2007 the BSI Media Lab group was formed, a new research initiative that focuses on the way the media affect human behaviour, which cuts across various BSI research programmes. Complementing a substantial number of existing 1st, 2nd and 3rd funding stream projects in this domain, this initiative was further stimulated by allocating an additional PhD project to this lab group. BSI’s management intends to invest increasingly in such multidisciplinary research groups. In 2008 several other lab group initiatives are expected to emerge to which BSI-funded projects may be allocated.

In 2007 two new Veni projects started: one on prototypes and drinking and one on the role of fathers in early child care. In addition, BSI postdoc projects on parental drinking and early alcohol associations and the dynamic processes that govern the early roots of social cognition started. In 2008, a Vidi programme on spatial navigation is expected to begin.

In the autumn of 2007 an NWO-funded project on the cognitive, affective and motivational components of religious beliefs and a PhD project on the nature of virtual identity and the embodiment of self in multiplayer online role-playing games started.

Recently, a new project on processes of social interaction between caregivers and aging adults with somatic problems in residential treatment centres started. Furthermore, new projects were established on lexical learning processes in deaf children, the neurocognitive basis of dyslexia, the communicative competence of deaf children, interventions for autistic disorders, competence-based learning in disabled group settings, and medical and behavioral treatment of clients with multiple disorders.

Finally, PhD projects started on fear associations in children, on the effects of the media on smoking behaviour, the development of implicit associations in early adolescence, imitation in eating behaviour and intimate relationships in adolescence, the role of intuition in judgement and decision making, and the effects of prior expectations on forensic investigations.

In 2008, several new PhD projects will start, with research on unconscious thought, the effects of mood on learning, and the effects of approach behaviour on prejudice. Also in 2008, the study of learning and plasticity in relation to language and communication will be extended to include the following cognitive domains: numeracy, navigation and perception, and motor abilities.

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The Centre for Cognition conducts interdisciplinary research and offers a PhD programme in cognitive neuroscience, cognitive psychology, artificial intelligence and related disciplines. At the Centre for Cognition, scientists from different disciplines jointly study the psychological, formal and neurobiological principles of information processing in biological and artificial cognitive systems. This Centre, which was accredited by the Royal Netherlands Academy of Arts and Sciences in October 1992, plays a central role in the University’s research focus on Cognitive Neuroscience, co-operating closely with other partners, in particular with the Donders Institute’s Centre for Cognitive Neuro-imaging, the Donders Institute’s Centre for Neurosciences and the Max Planck Institute for Psycholinguistics (MPI).

The Centre comprises five research divisions, each with its own specific focus, although there is also an increasing degree of integration.

**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 name of this division reflects its investigation of action, ranging from initial ‘planning’ to the motor coordination.
necessary to execute the movement and the relationship to other cognitive functions, such as perception and language. Research focuses on understanding goal-directed actions such as object manipulation and behavioural studies in healthy and clinical populations including infants, using neuro-imaging and computational modelling.

Perception
Researchers in this division study the microgenesis of perceptual organization, visual processing, and perception of objects, with a special interest in the interactions between structural complexity, regularity, hierarchy, brightness, spatial frequency, colour, depth, and occlusion. To this end, mathematical formalizations and quantitative models are developed, and psycho-physical and neuro-imaging studies are conducted in healthy and clinical populations.

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

Cognitive Artificial Intelligence
The team in this division designs, builds and evaluates cognitive systems that enhance communication and cooperation among human agents and their artificial counterparts. Research uses insights from other divisions (e.g., Perception) and from embedded embodied cognition (studied by means of simulation, formal techniques and conceptual analysis). Research on multimodal interaction extends from pen-based interaction to dialogue systems and music cognition, including direct Brain Computer Interfacing, now a prominent unifying research technique.

Awards and acknowledgements
• Prof. A. Coenen received an award as a long-term adviser of the EBIA (European Bedding Industry Association) with respect to the topic of sleep.
• Dr A. Roelofs became a member of the Society for Cognitive Rehabilitation.
• Dr P. Desain was awarded a grant to head BrainGain: a Brain-Computer and Computer-Brain interface research consortium.
• Prof. R. Meulenbroek became a member of the NWO-MAGW Veni Competition Grant Evaluation Committee.
• Prof. H. Bekkering chaired the Royal Netherlands Academy of Arts and Sciences (KNAW) committee “Van moleculen tot mensen: Over de toekomst van de Cognitiewetenschappen in Nederland”.
• Prof. H. Bekkering chaired the Netherlands Organisation for Scientific Research (NWO) committee “Contours of the National Initiative on Brain and Cognition”.
• Prof. R. Meulenbroek became a member of the NWO-MAGW Open Competition Grant Evaluation Committee.
• Dr B. Steenbergen became a member of the NWO-MAGW Veni Competition Grant Evaluation Committee.
• Dr A. Roelofs became a member of the Rubicon grant committee (Humanities and Social Sciences) of NWO.

Research facilities
• a baby-lab including a Tobii eye-tracker and a 48-channel active EEG set-up
• a vestibular sled with combined EEG apparatus (96 channels) and motion-tracking devices
• 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 analyse 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, the Centre’s researchers have access to the brain-imaging facilities of the Centre for Cognitive Neuro-imaging (fMRI, MEG and EEG).

Collaboration
The Centre for Cognition is engaged in structural collaboration with many 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
• Institute of Psychology, Jagiellonian University Kraków, Poland: Emotion and Motivation
• Johann Wolfgang Goethe-Universität, Frankfurt, Germany: Vigilance
• Katholieke Universiteit Leuven, Belgium: Motor Control
• Max Planck Institute for Human Cognitive and Brain Science, Leipzig, Germany: Cognition and Action
• Russian Academy of Science, Institute of Higher Nervous Activity and Neurophysiology, Moscow; Lomonosov Moscow State University, Department of Human and Animal Physiology: Absence Epilepsy
• UNESP, Marilia, Brazil: Philosophy of Science

Research results
Researchers in the Psycholinguistics division investigated cognitive control and monitoring processes in monolingual and bilingual language use. A computational model was developed to explain how bilinguals can speak one language and exclude another. Control issues were also examined in bilinguals’ language switches during utterance production and comprehension, and for form-similar translation equivalents (cognates). The issue of cognitive computation versus storage was investigated in adult and developmental studies of the mental lexicon. Research involving Event-Related Potentials (ERPs) showed the effects of prosodic information on sentence processing and indicates that novel meanings are immediately integrated into context.

The focus in the Action, Intention and Motor control division was on the relationship between cognition and action. Using behavioural and neuro-imaging techniques, the setting (cooperative or competitive) in an experiment was adjusted to achieve a goal efficiently. Further adjustments made on a trial-by-trial basis in terms of harmful or helpful trial components. The mechanisms underlying joint action were addressed in relation to the Mirror Neuron System, motor simulation and coordination. Special attention was paid to the role of language versus perceptual-motor processes in human cooperation, using the expertise of the Psycholinguistic division. The complex higher cognitive impairments in adolescents with Cerebral Palsy were also analyzed.
The team in the Perception division examined the interaction of various visual factors. In agreement with formal models, depth and regularity cues were shown to interact in a way that differentiates between symmetry and repetition. In multiple symmetry, symmetry axes in separate spatial-frequency bands interacted as a function of their relative orientation; Gestalt grouping affected perceived lightness and, in binocular-rivalry conditions, the visibility of perceptual elements and ERP studies demonstrated the fact that perceptual organizations are hierarchical. Finally, novel contrast-dependent motion illusions and colour-afterimage illusions were discovered.

Researchers in the Cognitive Neuroscience division investigated how cognitive processes in humans and animals are altered by waking and sleeping, hormones or drugs, as well as by pathologies, such as epilepsy and pain. Features of EEG parameters and signal-analytical tools were used to study the basic properties of brain oscillations and the mechanisms of epileptic seizures. This gave rise to a new theory on the genesis of absence epilepsy – the ‘cortical focus’ theory. Other studies examined attention and vigilance processes related to sensory gating of perceptive processes. This produced new insights into the mechanisms of attention. A new research line focuses on the neurocognition of normal ageing for healthy subjects and of memory for brain-diseased patients.

The investigations in the Cognitive Artificial Intelligence division were focused on cognitive aspects of human-centred interactive technologies. A large-scale project on 'Interactive Collaborative Information Systems' resulted in new computational models of pen-based interactions, which are useful for recognizing drawings and handwriting. In the NWO-ToKeN project ‘Trigraph’, pattern-recognition algorithms were developed for forensic applications and assessment of handwriting skills. In both domains, the classifier outcomes precisely matched human expectations. Cognitive aspects of automated information retrieval were exploited in 'VindIT', a project that combines image and text-based information. As a unifying theme, the division studies Brain-Computer and Computer-Brain Interfaces.

**Societal impact**

The Centre for Cognition’s researchers contribute to the dissemination of fundamental research and its technological and educational applications via teaching programmes, public conferences and the media.

The Centre has co-initiated an interfaculty two-year MSc programme in cognitive neuroscience (www.ru.nl/master/cns).


Dissertations: 5
Scientific publications: 154
Professional publications: 5
Furthermore, the Cognitive Artificial Intelligence division is setting up an Erasmus Mundus Masters Programme in Cognitive Science, with the Universities of Osnabruck (Germany), Rovereto (Italy) and Sofia (Bulgaria).

The Centre's scientists presented their research on Dutch television, in Dutch and Swedish radio programmes, in regional and national newspapers (e.g. Baby-lab, Brain-Gain) and in popular magazines (Karakter). Members of the Centre participated in workshops and summer schools (e.g. a Summer University on Consciousness in Kraków) and gave various lectures (e.g. the Soeterbeeck lecture series). They also designed a TV item on the Powerturn for the popular science television programme HOE?ZO!, including a quiz on joint action, put to popular TV personalities during prime time. This contribution incorporated the Centre for Cognition’s research from the European Joint-Action-Science-Technology (JAST) project.

With the help of an STW valorisation grant and venture capital from NVOOST, RE-phrase BV was founded, a the Centre for Cognition’s spin-off company, which elaborates new ways to communicate over the Internet (e.g. multilingual interfaces, which are useful to the handicapped). The Centre was also involved in the development of a cochlear implant for deaf children.

**Future research**

In 2007 the Centre for Cognition was evaluated as follows by an international evaluation committee: “Of the five programmes, two are uniformly excellent or close to excellent on all scales and the other three programmes, on average, are very good.” This assessment provides a firm basis for various the Centre for Cognition initiatives that are stimulating frontier research and collaboration on cognitive science and neuroscience in Nijmegen.

The Centre for Cognition contributes to the University’s research focus on cognitive neuroscience, and will be a centre in the Donders Institute for Brain, Cognition and Behaviour. In line with the aims of the Donders Institute, the Centre’s research examines the functional architecture of cognitive systems, especially in relation to action, perception and language. A key development is the active integration of topics across the Centre’s divisions. New PhD-projects investigate goal-directed movement planning, using insights from studies in Perception and Psycholinguistics. In return, these divisions use insights from AIM (e.g. those related to the role of imitation in language production). This research is accompanied by intensive studies of the underlying neural substrate. Research on cognitive and computational issues in the human interaction with artificial cognitive systems is also continuing. Members of the DIBC are setting up a Graduate School of Cognitive Neuroscience for PhD training, designed to complement the MSc programme in Cognitive Neuroscience. At the same time, there has been an increase in the collaboration with the Behavioural Science Institute, working on applied research in various cognitive-psychological domains such as congenital right hemiparesis and bilingualism.

The Centre for Cognition continues to focus on external financial resources for scientific research. Research in 2008 will be strengthened by new grants, for example, an NWO grant to the BrainGain consortium and an now Medium Investment Grant to AIM. Other ongoing projects are the European project on Joint Action (6th Framework Programme, Cognitive Systems), the projects ICIS, VindIT and Trigraph, two Vici-projects (Bekkering and Roelofs), a Vidi project (Medendorp) and several open competition projects funded by NWO. The Centre has joined the Senter projects DEAL (on optimal use of trans-port capacity using agent-based technology) and CIM (Cybernetic Incident Management) as an official partner.

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The Centre also aims to establish how the different brain areas coordinate their activity with very high temporal precision (in the order of tenth of milliseconds) to enable human and animal cognition. A further aim is to understand how neurons make networks, and how networks carry out cognitive functions – in other words, how to get from neurons to cognition. Another important aspect of the research is to improve the imaging methods themselves, by optimising the combination of imaging techniques with high spatial (fMRI) and high temporal (MEG and EEG) resolution (i.e. multimodal imaging) and by developing advanced data analysis tools to extract the relevant information from the highly complex signals which these imaging systems provide.

The Centre’s research is organized in nine research groups, each headed by a Principal Investigator (PI):

Neurocognition of Language (in association with the Max-Planck Institute for Psycholinguistics, Principal Investigator (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.

Intention and Action (in association with the 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.

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

Learning and Plasticity (in association with the Behavioural Science Institute at the University, PI: Dr M. van Turennout)
This group studies the principles of neural plasticity in relation to learning-induced changes in cognitive functions. Dr. van Turennout resigned in September 2007 and a replacement is currently being sought.

Cognitive Neurology and Memory (in association with the Department of Neurology at the UMC St. Radboud, PI: Prof. G. Fernández)
This group focuses on the neural underpinnings of memory, emotion and their interaction in healthy and disordered states.

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

MR methods for Cognitive Neuroscience (PI: Prof. D. Norris)
This group develops and improves 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).

Measuring and Modelling Electromagnetic Brain Activity (PI: Dr O. Jensen)
Roshan Cools was appointed as Principal Investigator at the Centre for Cognitive Neuroimaging in conjunction with the Department of Psychiatry at the UMC St Radboud.

Peter Hagoort was awarded an honorary doctorate by the University of Glasgow and Pascal Fries was awarded the Bernard Katz Prize and the Boehringer Ingelheim FENS Research Award.

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

The new institute will maintain close connections with other researchers on the Nijmegen campus, in particular with those working in the Behavioural Science Institute (BSI) and the Max Planck Institute for Psycholinguistics (MPI).

In addition to interdisciplinary research designed to achieve a better understanding of cognition and behaviour, the new institute will act as a Graduate School, offering excellent training facilities to PhD students and students from the Research Master’s Programme in Cognitive Neuroscience.


This group develops and applies advanced methods for EEG and MEG data analysis. It also develops computational models and interprets related experimental findings. Of particular interest is the role of oscillatory brain activity in perception and memory.

**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
- a behavioural laboratory for collecting behavioural data (e.g. reaction times)
- integrated stimulus presentation facilities for auditory and visual presentation, somatosensory stimulation, etc.
- a computer infrastructure that combines personal desktop PC computation with centralized storage management and central computation power
- a facility for awake monkey neurophysiology, allowing simultaneous recording from 256 sites across the brain
- access to a laboratory for Transcranial Magnetic Stimulation (TMS).

**Collaboration**

The Donders Institute’s Centre for Cognitive Neuroimaging is a research centre at Radboud University Nijmegen with participation by the universities of Leiden, Maastricht, Tilburg, and Twente (Netherlands) as well as the Radboud University Medical Centre and the Max Planck Institute for Psycholinguistics (MPI), which is also located in Nijmegen. It has formal collaborations with a large number of international institutions, including the University of Aalborg (Denmark), the Institute of Medicine of the Forschungszentrum Jülich, the Department of Medicine of RWTH Aachen, the Department of Medicine of the University of Bonn, the Departments of Psychology and Medicine, and the MEG Center of the University of Münster (Germany), the University of Düsseldorf, the Karolinska Institute in Stockholm (Sweden), Umea University (Sweden); Norwegian University of Science and Technology (Trondheim), the Helen Wills Neuroscience Institute and Department of Psychology at the University of California at Berkeley; Dept of Experimental Psychology, University of Cambridge; the Department of Neurophysiology of the University of Oxford (UK), the Cold Spring Harbor Laboratories in New York, the Departments of Psychology and Neuroscience of the University of Arizona, the Department of Cognitive Science of the University of California at San Diego (USA), the Chinese Academy of Sciences (Beijing), Erasmus University Rotterdam (Research School ERIM), University of Hamburg, the Max-Planck Institute for Brain Research (Germany), the McGovern Institute at MIT (USA). 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 to be used by a Dutch research group.

**Research results**

In 2007 the Centre for Cognitive Neuroimaging maintained the high standard of research set in previous years, with publications in a number of high impact factor journals including Science.

Prof. Hagoort’s group: “Our research on the language system focuses on two key aspects: Unification, i.e. how are different sources of information that are retrieved from memory and/or provided by sensory input unified in an interpretation (comprehension) or message (production) beyond the single word level? Secondly, in the Language in Action project we study how core linguistic (i.e. semantic, syntactic, and phonological) information is integrated with non-linguistic information, such as that provided by co-speech gestures, visual input, or background information about the speaker?”

In the Unification project a series of fMRI and MEG studies was combined with computational modelling. “In an fMRI study we tested the hypothesis that the left inferior frontal gyrus (LIFG) is involved in syntactic unification operations, and that the left posterior temporal cortex is involved in retrieval of lexical frames. We found that the LIFG is sensitive to ambiguity, but only when the ambiguous words are presented in a sentence and not when presented in scrambled order. In a gating study in the context of Language in Action involving a series of fMRI studies we found that an overlapping area in the LIFG is involved in integrating both lexical meaning and the semantics of iconic gestures.”

Dr. Indefrey’s group: Research in the Language and Multilingualism group using event-related potentials (ERP) showed that lexical access to word forms in picture naming is just as fast in the second language as in the native language for proficient Dutch learners of English. “In another study using MEG we found that German learners of Dutch show syntactic violation responses to incorrect word order in Dutch sentence-final verb clusters two weeks after starting to learn Dutch. These violation responses appear before the learners are able to reliably judge the incorrect word order to be wrong.”

Dr. Toni’s group: “We study the cognitive and cerebral properties of ‘movement plans’, given their crucial role in organizing our movements and in imaging future actions. Recently, we have investigated how impaired activity in one brain circuit can be compensated by activity in other circuits, with the result that behavioural performance is not altered despite neuronal loss. We found that increased dependence on visual information processing, which is typical of Parkinson’s disease patients, suggest the existence of compensatory mechanisms during the generation of motor plans.”

Dr Cools’ group: “Our primary research focuses on the role of dopamine in the motivational and cognitive control of goal-directed behaviour. A series of neuroimaging studies (using either fMRI or neurochemical PET) has revealed the contrasting
effects of dopamine receptor stimulation as a function of task demands, baseline levels of dopamine in associated fronto-striatal circuitry and impulsive personality.”

Dr van Turenne’s group: “Our research involves investigating how the brain encodes navigational information, using a virtual maze task. In one study, we demonstrated that the brain can persistently encode navigationally relevant information after just one exposure. In a further study the activation patterns of good and bad navigators were compared: and evidence for increased bilateral hippocampal activation and parahippocampal consolidation was found for good navigators only.”

Prof. Fernández’s group: “We focus on the neural underpinnings of memory, emotion and their interaction in healthy and diseased states. For instance, we conducted a functional MRI study probing the mechanisms through which progesterone – a key hormone relevant for mood regulation, brain development and repair – modulates memory performance. Our data revealed that progesterone does not modulate mnemonic operations underlying memory formation and retrieval per se. Instead, progesterone affects the probability that these mechanisms are executed effectively, most likely via GABAAergic inhibition.”

Dr Fries’ group: “We focus on rhythmic neuronal synchronization, the functions that it might subserve and the mechanisms through which it might subserve these functions. We have put forward the Communication Through Coherence (CTC) hypothesis, which states that the specific pattern of interactions among neuronal groups is governed by a specific pattern of synchronization. In the past year, we have provided experimental evidence in support of this hypothesis.”

Dr Norris’ group: “In 2007 we demonstrated that it is possible to perform high spatial resolution fMRI in humans with sub-millimetre resolution and sufficient temporal resolution to be compatible with a block design. Furthermore we published a solution to one of the longest-standing problems in fast MRI. This will enable the development of highly sensitive imaging experiments for both functional and diffusion-weighted imaging that do not suffer from image distortion.”

Dr Jensen’s group: “We investigated the role of oscillatory brain activity in human memory and perception. The primary technique we use to investigate this is magnetoencephalography (MEG), which makes it possible to detect oscillatory activity and localize where in the brain it is produced. In a study of a working memory task involving either the dorsal or ventral processing stream, the analysis revealed stronger alpha power around the parieto-occipital sulcus during retention of face identities (ventral stream) compared with the retention of face orientations (dorsal stream). In contrast, successful retention of face orientations was associated with an increase in gamma power in the occipital lobe relative to the ability to retain face identities.”

Societal impact

According to the World Health Organization diseases of the nervous system will become the top medical priority during 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), attention deficit disorders (neglect) and Parkinson’s disease (motor function), among other conditions.

Life-long learning is a crucial component of technologically advanced societies. According to the OECD, brain-based learning science is urgently needed. Such science, which focuses on learning and plasticity is one of the key research lines at the Centre for Cognitive Neuroimaging.

The Centre for Cognitive Neuroimaging is also involved in disseminating 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 analysing MEG and EEG data (source modelling) has been developed and made available to the neuroscience community. In addition, staff at the The Centre’s researchers give numerous lectures for the general public (e.g. extracurricular lectures and lectures for patient societies).

The Centre for Cognitive Neuroimaging celebrated its first five years with an open day ‘lustrum’ event in September 2007. This event, which was reported extensively in the popular press and broadcast media, was visited by many representatives from scientific and funding organizations.

The Centre is closely involved in a Smart Mix project on man-machine interfaces. In recent months significant progress has been made in using signals obtained from the MEG to perform robotic motion.

Future research

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

Dr Jensen’s group: “We will further investigate the role of oscillatory brain activity, focusing on cross-frequency interactions. Based on animal findings and computational modelling it has been argued that synchronization and cross-frequency interactions play a key role in neuronal computation. This work will be used to gain a better understanding of the physiological substrate of human memory and perception.”

Dr Norris’ group: “We will continue to explore the potential for high spatial resolution in fMRI and are currently developing fast single-shot 3D experiments for both functional and diffusion-weighted imaging. We will also investigate the relationship between anatomical connectivity as measured with diffusion tensor imaging and functional connectivity as measured by resting-state fMRI.”
Dr Toni’s group: “Outside the laboratory, actions are often selected in the context of ongoing preparatory activity for a series of potential responses. Action selection is also influenced by temporal contexts, such as the history of actions recently selected by an organism. We plan to study the mechanisms supporting this contextual dependency.”

Dr Cools’ group: “We are probing the effects of steroid hormones on specific brain operations that underlie mood regulation, stress perception, and memory. Moreover, we intend to identify a mechanistic account for stress effects on memory and mental health, tackling three dimensions in a fully integrated approach involving pharmacology, genetics and neural processes.”

Prof. Fernandez’s group: “Future studies will extend this work by assessing the role of genetic predisposition in predicting dopaminergic drug efficacy. We will examine ways of controlling behaviour by reward and cognition and by combining psychopharmacology with genetic imaging. In upcoming experiments our group will focus on the role of EEG responses in predicting the success of second language learning.”

Prof. Hagoort’s group: “Our research on the human language system will focus on the functional and structural connectivity between areas in the language cortex that involves differential contributions (e.g. those of memory, unification and control) to language comprehension and production. In addition, speaking will be studied in a paradigm that employs repetition suppression in picture descriptions with overlapping syntactic structures. Moreover, brain imaging genomics is planned for candidate genes that might be involved in brain structures and processes that support language functions.

By the end of 2008 all of the projects within the NWO Cognition Programme will have been finished. These projects have been extremely successful, making her a major contribution to the rapid growth of the Centre. In 2007 several projects in NWO’s Veni, Open Competition, Rubicon and Toptalent programmes started. The BrainGain consortium – a collaboration between Radboud University Nijmegen, the universities of Maastricht and Twente, the Dutch Organization for Applied Research (TNO), as well as several industrial partners and patient organizations – started. Furthermore, Pascal Fries’ European Young Investigator (EURIY) started and several other grants such as the award of the highly competitive grant of the European Research Council to Gabriele Janzen were acquired.

Peter Hagoort is the founding director of the Donders Institute’s Centre for Cognitive Neuroimaging. In November 2006 he was appointed director of the MPI in Nijmegen. Since 1990 he has been leading the research group “Neurocognition of Language Processing” at MPI. He is also Professor of Cognitive Neuroscience at Radboud University Nijmegen. His research interests relate to the domain of the human language and how it is instantiated in the brain. Professor Hagoort has been a visiting scholar in Cambridge (UK) and California (USA), and a member of many international scientific boards and councils. For his scientific contributions, the Royal Netherlands Academy of Arts and Sciences (KNAW) awarded him with the Hendrik Mullerpris in 2003. In 2004 he was awarded the “Knighthood of the Netherlands Lion.” In 2006 he received the Spinoza Prize from the Netherlands Organisation for Scientific Research (NWO). Hagoort is an elected member of the KNAW. He was awarded an honorary doctorate by the University of Glasgow in 2007.
The Centre for Neuroscience focuses on all these levels, bringing together multi-disciplinary basic and clinical research groups from the Faculty of Science and the Radboud University Nijmegen Medical Centre. The researchers at the Centre for Neuroscience 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. The strength of the Centre lies in combining basic research on cognitive neuroscience – investigating the neuronal processes involved in attention, action, perception, adaptation, emotion and language and applied clinical research at the Centre, with a focus on diagnosis and therapy, on techniques for use in normal and pathological cognitive dysfunction, and on understanding the pathophysiology and aetiology of psychiatric and neurological syndromes.

The Centre for Neuroscience has three research themes: Systems Neuroscience, Functional Neurogenomics and Neuro-informatics.

**Systems Neuroscience**
Researchers in this field investigate the function of neuronal circuits in relation to action, perception and higher cognitive functions such as attention and memory, and the neuronal code for information transfer between sensory and motor areas in the brain. They explore the connectivity of neuronal networks for specific functions such as the visual system, auditory system, motor system, and memory, and how changes in functional connectivity affect behaviour. The research groups involved are:
- Staff at the Depts. of Biophysics (Faculty of Science) and Cognitive Neuroscience (RUNMC) carry out...
experimental and theoretical research on information processing by neurons and neuronal networks in vitro, studying functional connectivity, and in vivo during action and perception.

- Researchers at the Dept. of Neurology (RUNMC) study neurodegenerative disorders, such as Huntington's disease, Parkinson's disease and cortical-spinal interactions as well as the effect of neuromuscular diseases on motor performance.
- The Dept. of Geriatrics (RUNMC) focuses on Alzheimer's disease.
- The Dept. of Audiology and Otorhinolaryngology (RUNMC) studies adaptation after insertion of implantable hearing aids such as cochlear implants and the Bone Anchored Hearing Aid.

**Functional Neurogenomics**

Neurogenomics research takes place at the interface between neuroscience and genomics. It uses various approaches to identify genes that are responsible for neurodevelopment and neuro-degeneration and the various pathways from gene-expression to neuronal function and dysfunction. There are three subthemes:

- The Depts. of Neurology, Psychiatry, Clinical Geriatrics, Rehabilitation Medicine and Medical Psychology (RUNMC) carry out fundamental and applied research on neuro-muscular disorders, neurodegenerative disorders, child neurology, neurorehabilitation, clinical neurophysiology and neuro-developmental and mood disorders.
- Researchers at the Depts. of Audiology & Otorhinolaryngology and Human Genetics (RUNMC) study the genetic mechanisms of neurodevelopmental disorders, such as mental retardation, and retinal and cochlear disorders.
- The Depts. of Cognitive Neuroscience (RUNMC) and Molecular Animal Physiology (Faculty of Science) carry out fundamental and applied research on the genetic basis of adaptation and

**Donders Institute for Brain, Cognition and Behaviour**

Cognitive Neuroscience is a key research theme at Radboud University Nijmegen. Our 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.

Understanding the structure and function of the brain requires a truly multi-disciplinary approach. To strengthen collaboration and increase our visibility, both nationally and internationally, the research activities of the F.C. Donders Centre for Cognitive Neuroimaging, the Nijmegen Institute for Cognition and Information (NICI) and the recently reorganized Institute for Neuroscience will be combined in a new institute: the Donders Institute for Brain, Cognition and Behaviour (from September 2008). At the same time, the NICI will change its name to the Centre for Cognition, the Institute for Neuroscience to the Centre for Neuroscience, and the F.C. Donders Centre for Cognitive Neuroimaging to the Centre for Cognitive Neuroimaging (see figure).

The new institute will maintain close connections with other researchers on the Nijmegen campus, in particular with those working in the Behavioural Science Institute (BSI) and the Max Planck Institute for Psycholinguistics (MPI).

In addition to interdisciplinary research designed to achieve a better understanding of cognition and behaviour, the new institute will act as a Graduate School, offering excellent training facilities to PhD students and students from the Research Master's Programme in Cognitive Neuroscience.
cognitive processes, with particular emphasis on neuropharmacological approaches and on the molecular/cellular mechanisms involved.

The Centre has several multidisciplinary integrated clinical and research expert centres for neuropsychiatric disorders, such as the Alzheimer Centre Nijmegen, the Parkinson Centre Nijmegen, and the Neuromuscular Expertise and Consultation Centre Nijmegen.

Neuroinformatics
The Biophysics group focuses on theoretical studies of neuronal interactions, in particular the mechanisms underlying synchronization of neuronal activity and their role in selective attention. This work is closely related to experimental data obtained by researchers from the Donders Institute’s Centre for Cognitive Neuroimaging.

The Dept. of Neurophysiology/Neuroinformatics aims to map anatomical connectivity to functional connectivity in order to understand functional loss due to brain damage and to predict therapeutic effects. The approach is to link neurophysiological data on single- and multi-unit activity to large-scale brain organization by analyzing neuroimaging data, relating these data to the anatomical substrate in anatomical databases.

Insight into neuronal information processing provides a bridge between intelligent behaviour in neuronal networks and its implementation in machine-learning techniques in artificial intelligence. Information on visual and auditory perception and localization, in combination with theoretical models of neuronal information, is used for pattern classification on EEG data in the context of Brain-Computer Interfacing. The aim is to use information from EEG for interaction with external devices, such as computers and prosthetic devices.

Research facilities
The Centre for Neuroscience has access to both in-house research facilities and large patient groups and databanks, reflecting strong links between fundamental research and clinical applications.

Patient groups/databanks
The Centre has access to several patient groups, such as i) well phenotyped and genotyped population of children, adolescents and adults with various neurological and psychiatric disorders, ii) large samples of genetically hearing-impaired families, as well as with age related hearing impairment and clinical otosclerosis and iii) genetically visually impaired families and populations with age related macula degeneration and iv) large cohorts of patients with X linked mental retardation, autosomal forms of mental retardation and a variety of severe neurodevelopmental disorders. There is a bio bank of cerebrospinal fluid, blood and DNA of patients with neurological disorders, especially neurodegenerative disorders.

Proteomics
The Centre has access to advanced genomic facilities such as mRNA expression profiling, comparative genome hybridization (CGH), real-time quantitative PCR apparatus (Rotor Gene 6000, Corbett) with Corbett Robotics system, and gel electrophoretic analysis.

Equipment
The Centre for Neuroscience has advanced technical equipment, including:

- facilities for Transcranial Magnetic Stimulation (TMS) at the Dept. of Clinical Neurophysiology including a stereotactic image guidance
- a Transcranial Doppler device used to measure cerebral blood flow in the elderly
- Near-infrared spectroscopy
- a platform to investigate postural control after perturbation of stance
- facilities for cinelimetry of neuromuscular patients
- non-invasive techniques for high-resolution Electromyography (EMG)
- ultra-sound echography for diagnosis of neuromuscular diseases
- audiological and electro-neuro-physiological (auditory event-related potentials) experimental setups
- facilities for research on speech output and kinematic studies of speech motor control using acoustic signal processing techniques and articulography (Electro-Magnetic Midsagittal Articulography, EMMA)
- Advanced neuro-imaging facilities (1.5-Tesla, 3-Tesla, and 7-Tesla fMRI and high-resolution EEG and MEG)
- Patch-clamp set up for in-vitro recording to measure synaptic coupling and ion-channel activity
- Advanced stimulus facilities for visual, auditory and vestibular stimulation.

Collaboration
The Centre for Neuroscience collaborates nationally with:

Theme 1
- The Dept. of Neurology at Utrecht University Medical Centre on neuronal outgrowth and connectivity
- Faculty of Human Movement Science, Free University Amsterdam on Human Motor control and muscle properties
- University of Maastricht on auditory perception
- The Dept. of Neurology, University of Amsterdam on deep-brain stimulation
- The Dept. of Neurology, Leiden University on startle responses
- The Dept. of Clinical Neurophysiology, University of Amsterdam on electrophysiology of neuromuscular diseases.

Theme 2
- Hubrecht Laboratory, Utrecht University, on knock-out rat models
- Free University Amsterdam, on neuronal plasticity and neurodegeneration
- Dept. of Neurology of University of Amsterdam on Alzheimer’s disease
- Rudolf Magnus Institute, University Utrecht on neural outgrowth and connectivity.

Theme 3
- Together with the University of Twente, SmartMix programme BrainGain on Brain-Computer Interfacing.

The Centre collaborates internationally with:

Theme 1
- The Dept. of Physiology, University of Minnesota, Minneapolis (USA) on human motor control
- The School of Neurology, Neurobiology and Psychiatry, Newcastle University
• The Dept. of Applied Mathematics, Weizmann Institute (Israel) on human motor control.
• The Dept. of Audiology and Neurootology, University Basel (Switzerland) on myotonia and falls in patients with neuromuscular diseases
• The Dept. of Cognitive and Neural Systems, Boston University (USA) on computational and neural modelling in speech disorders
• The Institute of Neurology, University College London, London (UK) on transcranial stimulation (TMS).

Theme 2
• Research Center for Infectious Diseases, University of Kyoto (Japan) on knockout mice for mental retardation
• Division of Genetics and Developmental Medicine, University of Washington, Seattle, (USA) on genetic diagnostics of neuromuscular disorders
• Dept. of Genomics Life & Brain Center, University of Bonn (Germany) on neurodevelopmental disorders
• Dept. Molecular Genetics, University of Antwerp (Belgium) on environmental and genetic risk factors of hearing
• Institute of Human Genetics, University of Aarhus (Denmark) on neurodevelopmental disorders
• Child and Adolescent Psychiatry Research, SUNY Upstate Medical University, Syracuse, New York (USA) on genetics of ADHD
• Institute of Psychiatry, University College London (UK) on genetics of ADHD and on genetic risk factors for neurodevelopmental disorders
• Institute of Psychiatry and Dept. of Medical Genetics, University of Oslo (Norway) on genetic variations in schizophrenic patients
• Karolinska Institute, Stockholm (Sweden) on Alzheimer’s disease
• Molecular Psychiatry, RIKEN Brain Science Institute, Hirosawa (Japan) on genetic variations in schizophrenic patients
• Research Institute of Biological Psychiatry, Copenhagen University Hospital (Denmark) on genetic variations in schizophrenic patients.

Theme 3
• The Dept. of Computer Science, Heinrich Heine Universität Düsseldorf (Germany) on brain connectivity
• The Dept. of Mathematics, University College London (UK) on pattern recognition, statistical modelling and computational learning.

Collaboration with preferred partners of Radboud University Nijmegen
• Katholieke Universiteit Leuven, Leuven, Belgium
  - Dr. Alice Nieuwboer (Dept. of Neurology): analysis of gait
  - Prof. S. Claes/ Prof M. de Hert (Dept. of Psychiatry): genetic variations in schizophrenic patients
  - Prof. De Strooper, Center for Human Genetics: on gamma-secretase enzymes.
• Università degli Studi di Siena, Italy
  - Prof. A. Renieri, on gene identification
• Universität Zürich, Switzerland
  - Prof. R. Stoop, Institute for Neuroinformatics on artificial life.
  - Prof. Klaas E. Stephan, Functional...


Dissertations: 20
Scientific publications: 498
Patent: 1
Single unit recordings in the auditory cortex revealed consistent, dramatic differences in neural responses to passive listening (no task) and active listening (a detection task). Despite these differences, the acoustic tuning curves of the neurons obtained in both conditions, are identical. This shows that the cortex modulates the acoustic input with behaviourally relevant signals (such as expectation and attention).

Researchers investigated a longstanding problem: why we perceive a stable visual environment despite the fact that we continuously move our eyes. So far, all theories assumed that the brain uses imperfect eye-movement information. We have shown that the eye movement information is correct, but that the visual system introduces systematic errors around rapid eye movements.

A major result has been identifying over 20 patients with ARSACS mutations in a selected group of about 70 patients with early onset recessive ataxia, establishing that ARSACS may be a common cause of ataxia with onset in childhood or early adolescence.

A system for transcranial magnetic stimulation has been developed to explore motor-cortical excitability. The results support the hypothesis that synchronizing neuronal activity is an effective way of communicating between groups of neurons.

Research on the role of the medial temporal lobe in memory formation has demonstrated that this brain area is not only involved in episodic memory, but also plays a crucial role in working memory function. Computational modelling of developmental apraxia of speech has shown the impact of auditory and sensory processes.

Theme 2

The association of a specific haplotype of alleles of two variable-number tandem repeat polymorphisms has been confirmed within the 3' untranslated region and intron 8 of the dopamine transporter and attention deficit hyperactivity disorder (ADHD).

In 2007 two genes were identified, which are responsible for prelingual hearing deficit, the gene for DFNB35 and the gene for DFNB63. These genes, which both belong to the class of deaf-responsible genes, provide insight into the development and function of the inner ear.

Success was achieved in validating the cerebral autoregulation measurement in elderly patients with and without dementia Alzheimer type and developing neurochemical biomarkers for diagnosing dementia.

Researchers helped identify 12 of the 25 genes for non-syndromic X-linked MR that are known to date. Loss-of-function mutations in a gene from the pyrimidine metabolism pathway result in a severe and early lethal type of mental retardation. Based on these findings a therapeutic intervention with S-adenosyl methionine (SAM) was hypothesized to correct for the metabolic defect. At present two Australian patients are being treated with SAM.

It was shown that members of the p24 protein family assist in transporting specific sets of machinery proteins, thus furnishing subcompartments of the secretory pathway with the means to provide the correct microenvironment for proper secretory protein processing.

The molecular genetic basis in a rat model for schizophrenia was studied in order to understand the complex molecular regulatory mechanisms underlying the development of this disease. A comparative genome hybridisation (CGH) analysis was performed on Wistar rats with high and low apomorphine susceptibilities. Ninety regions were found with a possible link with apomorphine susceptibility; 45 probes represented a deletion in rats with high apomorphine susceptibility and another 45 represented a duplication.

To identify genetic factors predisposing for schizophrenia, we performed a screening of 600 non-synonymous single-nucleotide polymorphisms (SNPs) in three independent Caucasian schizophrenia case-control...
coherent neuronal pattern of neuronal interactions. This could be explained by a simple feed-forward neuronal network architecture. Our study shows that the well-known kinematic nonlinearity of saccadic eye movements resides in the motor map of the superior colliculus.

Gene expression in the rat primary somatosensory cortex was studied in order to better understand the molecular mechanisms involved in neural plasticity underlying long-term learning. Striking changes involving neuronal plasticity were observed in the barrel cortex. ‘Connectional fingerprints’ were identified as a unique feature of primate cortical areas and ‘small-world networks’ in large-scale functional brain connectivity data.

It was found that communication between neuronal groups depends on the phase relation between their rhythmic activities. Phase relations supporting interactions between the groups preceded these interactions by a few milliseconds. The pattern of synchronization flexibly determines the pattern of neuronal interactions. This could be explained by a simple feed-forward neuronal network architecture.

Prizes and awards

National

- Magdelt Zeitler-Geurts MSc has been award the Frye Stipendium by Radboud University Nijmegen.
- Dr Bloem and Dr Munneke received a grant from the ZonMW Programme Sport, Bewegen en Gezondheid for their study on physical activity in Parkinson’s disease: the ParkFIt study. Also Stichting Robuust awarded Dr B. Bloem and Dr M. Munneke for organizing a good infrastructure for monitoring patients with Parkinson’s Disease.
- The SmartMix ‘BrainGain’ project, which focuses on deep-brain stimulation in Parkinson’s disease, neurofeedback in psychiatric patients and for EEG-pattern recognition for the control of external systems, such as prostheses.
- A grant from the Queen Wilhelmina Fund for research on fatigue in fully recovered oncology patients went to the Dept. of Neurology.

International

- An NIH grant for the IMAGE study on the Genetics of ADHD in the context of the GAIN (Genetic Association and Information Network) for a Genomewide Association Scan on our data.
- The PARKFIT study. Effectiveness of an active lifestyle promotion programme for patients with Parkinson’s disease. A subsidy was made available by the Michael J. Fox Foundation to Dr B. Bloem and Dr M. Munneke.
- A National Institute of Health Grant was awarded to Dr P. Hu for research on the vestibular system.
- A grant from the Royal National Institute for Deaf People to Dr J.W.J. Kremer, prof. C.W.R.J. Cremers and prof. F.P.M. Cremers for their project on a novel strategy for identifying the genetic cause of hereditary hearing loss in young children; novel deafness genes and DNA diagnostics.

Societal impact

Media appearances

Members of the Donders Institute’s Centre for Neuroscience participated in many public media: Prof. J. Buitelaar in the eight-o’clock NOS Journaal (news programme) about early screening of autism (8 August 2007) and Dr B. Bloem in a television programme on Parkinson’s disease (May and September 2007). In addition, members of Centre made several contributions to national news journals.

Scientific boards and committees

Researchers from the Centre were represented in various boards and committees:

- Prof. M. Olde Rikkert participated in the NFU Expert Group on future research programme on geriatric care and in evaluating the National Dementia Programme VWS.
- Prof. A. van Opstal is a member of the NWO (ALW) Vici evaluation committee.
- Dr. J. van Gisbergen is a member of the NWO (ALW) Vidi evaluation committee.
- Prof. C. Gielen is member of the board of the committee of Biochemistry and Biophysics of the Royal Netherlands Academy of Sciences.
- Prof. C. Gielen is a member of the board of the Physics of Life committee of FOM.
- Dr. J. Claassen helped develop the 2008 guidelines for stroke (CBO richtlijn Beroerte; secondary prevention after TIA or stroke).
- Prof. B van Engelen is a medical advisor of the Vereniging Sperziekten Nederland, the Research Committee of the European Neuromuscular Centre, a member of the board of the Commisie Wetenschappelijk Onderzoek Neurologie, and a member of the Editorial Board of Health Direct.
- Dr. van Bokhoven was an expert witness for the patient group with Möbius syndrome in the USA on Genetic studies and microarray analysis in HCFP and Möbius syndrome.
- Prof. H.P.H. Kremer is a member of the scientific advisory board of the Dutch Huntington’s Disease Association and president of the scientific advisory board of the Dutch Autosomal Dominant Cerebellar Ataxia Association.

Economic and societal valorization

- PROMEDAS BV is a spin-off company which develops a medical expert system that assists physicians in medical diagnosis.
- A patent application: Gene variants in neurodevelopmental and neuro-
Future research
The main goal of the Centre for Neuroscience is to further bridge the gap between genetic, molecular, and neuronal processes and the activity of complete brain structures, with special reference to how these influence normal and pathological behaviour. The results will be used to develop new techniques for diagnosis and therapy, as well as for applications in research on artificial intelligence and machine learning.

Theme 1: Systems neuroscience
This group will investigate the role of brain networks in shaping neuronal dynamics and brain function by studying the precise nature of lesions in human brain networks and their effect on functionality.

A new research project will be initiated, focusing on the nature of hereditary prelingual hearing loss in a Dutch population. The results of this study will provide ample opportunities for DNA-based diagnostics for this type of hearing loss.

The Parkinson’s Centre will start a large national randomized controlled trial on the effects of sport on patients with Parkinson’s.

A project will be started to elucidate the molecular mechanisms that underlie the reversible ataxia in Protein tyrosine phosphatase (PTPRR)-deficient mice. This model will help identify molecular mechanisms that contribute to cerebellar dysfunction.

Theme 2: Functional neurogenomics
New biomarkers will be developed to evaluate and validate the development of Alzheimer’s disease in the Alzheimer’s Research Consortium.

An attempt will be made to identify novel genes that cause mental retardation and other neurodevelopmental disorders – also to put this genetic knowledge into perspective by elucidating the functions of the encoded proteins and their biological pathways and to disentangle phenotypically relevant genetic networks.

Genetic approaches will be used in a number of independent Caucasian schizophrenia case-control cohorts as well as those with other neurodevelopmental disorders. One or two of the most convincing SNPs will be selected for functional studies, including the generation of knock-in mice with a genetic modification corresponding to the SNP of interest.

Gene expression profiling will be performed on the barrel cortex in the rat primary somatosensory cortex and on other brain regions from Long-Evans rats subjected to different kinds of whisker manipulations and sensory learning to influence sensory experience.

Theme 3: Neuroinformatics
Advanced pattern recognition algorithms will be developed in order to analyse EEG data in the context of Brain-Computer interfacing. This will include a placebo-controlled study on the underlying neural mechanisms of neurofeedback involved in treating ADHD. Advanced adaptive pattern recognition techniques will also be used to apply EEG data in controlling external devices such as prostheses.

Novel hypotheses on the role of neuronal synchronization (in particular beta and gamma oscillations) in coding neuronal information will be assessed. These theoretical results will be tested both in human subjects and in primates.

Data on lesion studies in animals will be used to analyze the effects of brain damage on human brain networks and to make predictions about possible therapeutic results and plasticity after brain damage.

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

**Oncology**

The Oncology Research Programme has the following objectives:

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

**Nijmegen Centre for Clinical and Translational Research**

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

Human *in vivo* research in healthy subjects and clinical trials in patients represent the final crucial step in exploiting new pathophysiological concepts that emerge from molecular medicine, from animal research and from epidemiological databases. Using clinical expertise and an advanced research infrastructure, this institute translates observations from its two sister institutes – Nijmegen Centre for Molecular Life Sciences and the Nijmegen Centre for Evidence-Based Practice – into medical practice and stimulates bedside-to-bench research. This approach underlines the central position of the patient in the Radboud University Nijmegen Medical Centre.
Major clinical research themes include functional imaging and interventional oncology & epidemiology.

**Cardiovascular diseases**
The integrity of the cardiovascular system is vital to quality of life and cardiovascular disease is still the most important cause of mortality in Western societies. Disturbances of the cardiovascular system can be caused by cardiovascular disease, whose congenital forms usually involve the right ventricle. In acquired forms, the pathophysiological momentum is generally provided by the vascular process of atherosclerosis. Blood flow is regulated by various systemic and local mechanisms. This research programme is focused on these mechanisms both in health and in disease.

Clinical research in the field of heart function and circulation has four main objectives:

- to assess and introduce new diagnostic techniques for disorders of the heart and blood vessel walls
- to develop human in-vivo models for testing new pathophysiological concepts that emerge from molecular and cellular research in cardiovascular medicine
- to investigate vascular and metabolic mechanisms in various organ systems, in health as well as in disease processes such as atherosclerosis, ischemia, hypertension, heart failure, the formation of aneurysms and diabetes mellitus.

**Infection, inflammation and repair**
Clinical research focuses on the encounter between the host immune system and microbial and non-microbial attacks. Major themes of research include:

- Pathogenesis and inflammatory response
- Invasive mycosis
- Compromised host
• Infection, epidemiology and control
• Poverty-related infections
These topics are explored from a medical perspective, i.e. in relation to infectious and non-infectious inflammatory disease, the ultimate goal of research being to improve human well-being through innovation and optimization of diagnostics and therapy.

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

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

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

Awards
In 2007 Dr Barbara Franke received the iustrum award within the programme Genetics and Metabolic Disorders. Prof. Jan Kremer received the Telemedicine award as well as the FREYA award for his innovative work on the outpatient clinic for fertility. Prof. J.W.M. van der Meer was appointed Fellow of the Royal College of Physicians (Edinburgh) and as vice-chairman of the European Academies Scientific Advisory Council.

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

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

Research results
Radboud University Nijmegen Medical Centre has been very successful in acquiring AGIKO Clinical Research Grants from ZonMw. Over the past eight years, almost 40 such grants have been acquired for projects that closely combine clinical work and research. Dr. R Roepman and Dr. B. de Vries received a Vidi grant. Finally, several projects were initiated within the TOP Institute Pharma (Prof. B-J Kullberg, Dr. M. Netea, Prof., . R. Sauerwein, Prof. P. Verweij and Dr. W. Melchers). TI Pharma is a collaborative structure consisting of industrial and academic research teams. TI Pharma conducts groundbreaking, cross-disciplinary research and trains their personnel in improving the efficiency of the entire drug discovery and development process. Within the programme 'Infection,
inflammation and repair’, Dr. Andre van de Ven, MD, PhD was very successful in acquiring grants for research on tuberculosis, HIV infections and malaria. Within the research programme ‘Genetic and metabolic disorders’, the Department of Anthropogenetics became a partner in EUROGENTEST, a collaborative venture between 40 European laboratories within the 6th Framework programme ‘Life Science Health’. From a strategic point of view, the implementation of the Affymetrix SNP arrays and the development of the Metabolomics facility are of great importance for the NCCTR. Within the Oncology programme, Prof. J. Barentsz received an extensive grant for applying new MRI techniques in the detection of prostate cancer. Prof. W. Feitz acquired an impressive grant within the European 6th Framework programme. The project focuses on soft tissue engineering for treating congenital birth defects in children: From ‘biomatrix – cell interaction – model systems’ to clinical trials.

Thanks to the growing impact of translational and clinical research, the NCCTR has been able to appoint four new professors at the Radboud University Nijmegen Medical Centre: Cees Tack, Professor of Internal Medicine with special interest in Diabetes, Maria Hopman, Professor of Integrative Physiology and Jan Kremer, Professor of Fertility Medicine and Winnette van der Graaf, Professor of Translational Medical Oncology.

**Societal impact**

As fundamental research and epidemiological surveys continue to reveal new biological concepts, human in-vivo models are crucial for proof-of-concept studies on data emerging from the molecular life sciences and from population studies. While the main causes of death are still cardiovascular disease and cancer, a considerable role in chronic diseases is played by infections and immunological disorders. Because polymorphisms and mutations of genes are proving to be increasingly important in the aetiology of diseases, the societal impact of genetics is growing every year.

Because of the societal impact of NCCTR research, several investigators play an important role in health-related committees. Prof. Jos van der Meer is vice-president of the Science Division of the Royal Netherlands Academy of Arts and Sciences (KNAW). Mihai Netea, MD, PhD is a member of ‘The Young Academy’ of this KNAW. Several researchers in the...


institute are members of the Health Council of the Netherlands (Gezondheidsraad), an independent advisory body charged with providing Ministers and Parliament with scientific advice on public health matters. Finally, several colleagues at the Centre made a significant contribution to the work of the Dutch Medicines Evaluation Board. This board is responsible for the authorisation of safe and effective medicinal products and for their subsequent monitoring on the Dutch market. The Medicine Evaluation Board does this by providing scientific advice, assessing marketing authorisation dossiers and promoting the safe and effective use of medicinal products.

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

The majority of topics within the Cardiovascular Diseases programme fit within the Nijmegen Centre for Evidence-based Practice. As from 2008, this programme will be included in that Centre.
The Nijmegen Centre for Evidence-Based Practice (NCEBP) was established to carry out high-quality research in this field, focusing on two key questions:

• What can be defined as effective, efficient and acceptable patient care and prevention?

• How can we best guarantee that patients and populations receive such care?

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

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

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

**Determinants of Health and Disease** (Prof. F. Kraaimaat)

Here the research focus is on the medical, genetic, psychosocial, cognitive and exogenous factors that determine health and disease. Results are used to improve the quality of prognostics, diagnostics and treatment of chronic somatic diseases, as well as to help prevent diseases such as cancer, reproductive disorders and mental health problems.

**Effective Hospital Care** (Prof. G. Zielhuis and Prof. G.J. van der Wilt)

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

**Effective Primary Care and Public Health** (Prof. C. van Weel)

Research on primary care addresses common chronic diseases encountered in general practice, such as asthma/COPD, diabetes mellitus, hypertension/cardiovascular diseases and depression/mental health problems, as well as preventive and restorative dentistry. In the field of public health, an extensive international research programme has been built around the prevention and care of the three main poverty-related infectious diseases: malaria, tuberculosis and HIV/AIDS.

**Quality of Care** (Prof. R. Grol and Dr M. Wensing)

One of the most important and challenging developments in health care today is to set up quality-control systems. This requires feasible, cost-effective methods for improving quality, such as evidence-based guidelines, performance and outcome indicators, and instruments for assessing performance in practice. Moreover, this programme focuses on tools for quality management, strategies


Dissertations: 23
Scientific publications: 659
for changing individual professional behaviour, organizational structures, communication and concerted action in teams and in health care chains. The programme also addresses the ethical, philosophical and historical dimension of health care practice, focusing on palliative care, biomedical research and biotechnology, clinical and organizational ethics, nursing and related health-care issues.

**Prizes and awards**

Dr M. Wensing is an honorary senior research fellow at Manchester University’s National Centre for Primary Care Development and Research.

Prof. Th. van Achterberg was appointed as a board member of the European Academy of Nursing Science. He also held the 15th Mebius Kramer lecture at the Utrecht University Medical Centre, which was entitled ‘From learning to practicing: about the complexity of evidence-based nursing’.

Maud Graff, MSc, received the 2007 ‘Codde en Van Beresteyn Gerontologieprijs’.

Prof. R.A.B. Oostendorp became an Honorary Member of the Royal Association of Physical Therapists (KNGF). An annual ‘Prof. R.A.B. Oostendorp lecture’ was announced by the board of the Netherlands’ Association for Manual Therapy – with first lecture being presented by Prof. Oostendorp himself.

The Nijmegen Parkinson Centre (ParC) was evaluated as “excellent” by the American National Parkinson Foundation. The Michael J. Fox Foundation for Parkinson’s Research sponsored the ParkFit study, which was coordinated by Dr Marten Munneke and Dr Bas Bloem, both of whom work at ParC.

Wietske Kievit, MSc, was awarded the Frye stipendium for her research on pharmacotherapy for patients with rheumatoid arthritis.

Dr S.H. Lo Fo Wong received the CaRe Award 2007 and the Van der Doesspeld.

Prof. F.W. Kraaijmaat received the Special Contribution Award of the Dutch Association for Rheumatology.

**Research facilities**

**Networks**

- General Practice Academic Network; primary care and public health practices and institutions; Nursing Home research; General Practice National Registration Network (LINH)
- COPD and asthma in primary care; patients with Parkinson’s disease (ParkNet); patients with Prader Willi Syndrome; patients with neuromuscular diseases
- The Nijmegen Biomedical Study (coordinated by the NCEBP).

**Databases/registries**

- Urology patients; patients with psoriasis and eczema; cohorts of men and women exposed to pesticides and/or organic solvents with referent populations of non-exposed people; follow-ups of IVF and ICSI children; fertility episodes and IVF treatments; cohorts of pre-term infants; patients with low back pain and neck pain
- AGORA data bank 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, recording 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)
- Automated Population Registry (GBA).

**Equipment**

- Automated high-speed scanners for data entry of questionnaires, CRFs and Teleforms
- Toxicology laboratory for the development and assessment of 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 electrophysiological 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 the relationship between the environment and child health
- The Telefysiek consulting system.

**Collaboration**

**National collaboration**

- Several research schools that are recognized by the Royal Netherlands Academy of Arts and Sciences (KNAW)
- 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 located in Nijmegen, Amsterdam and Maastricht
- Mental health problems and alcohol: Universities of Amsterdam (VU), Leiden, and Groningen, the Netherlands Institute for Health Sciences Research, Trimbos, NHG, CBO
• Cancer research: KWF, IKO, RIVM, Wageningen University
• The Consortium Mental Retardation (‘Consortium VG Oost Nederland’): Institutes for the Mentally Retarded.

International collaboration
• European Geriatric Network GERONT-TONET (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 (the aetiology of Wilms’ tumour)
• Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, Atlanta, USA (drug use and birth defects)
• 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 (psychological determinants of chronic diseases)
• 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 (Parkinson Centre Nijmegen)
• Universities of Berlin, Lübeck, Basel, Umea and Vienna (Gender in medical education)
• WHO regional Centre for Oral Health Services Research in Damascus, Syria; Ege University, Izmir, Turkey; Witswaterand University, Johannesburg, South Africa; and the Pan-American Health Organization (PAHO), Oral Health Department, Washington, USA (prevention in dentistry)
• APRIORI is a collaboration between RUNMC, UMCM, 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 the development of core-sets of the International Classification of functioning, disability and Health for different 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 (Genetics of ADHD)
• Department of Cognitive and Neural Systems, Boston University (computational and neurological modelling of speech motor control and disorders).

Research results
This was again a successful year for the NCEBP with a large number of scientific publications in high impact-factor journals, a substantial number of PhD theses supervised within the institute, as well as many new research grants.

In 2007, the first results became available from the EU 6th Framework project POLYGENE. In close collaboration with deCODE Genetics, whole genome association studies were conducted on breast cancer and prostate cancer. New genes and additional candidate genomic regions were identified and published in four papers in Nature Genetics in 2007. Genomic scans have also been performed on 2000 controls (participants in the Nijmegen Biomedical Study).

Remarkable reductions in breast cancer mortality have been shown and screening performance has been evaluated in particular subgroups of participants. In 2007 a project was started that is designed to assess the contribution of each elementary component of the screening program to the ultimate overall effectiveness and efficiency (the testing, development, occurrence and course of the disease, quality of screening performance, and treatment).

Significant sex-related differences in brain responses to disgusting stimuli were observed that are conclusively linked to greater disgust sensitivity scores in women. We also found that the enhanced ventrolateral prefrontal cortex response was driven by predominantly female Obsessive-Compulsive Disorder subjects with high levels of washing symptoms.

Asymptomatic spontaneous cerebral emboli (SCE) were found to be associated with an accelerated cognitive and functional decline in dementia. SCE may be a potentially
treatable cause of disease progression in dementia.

In a study on the prevalence of psychiatric disorders in children among children of different ethnic origin, 11% of the children had one or more impairing psychiatric disorders, which did not differ between native and non-native children. A clear relationship was observed between the prevalence of psychiatric disorders and gender, parental psychopathology, peer problems and school problems, but not among specific ethnic groups. This suggests that mechanisms associated with the prevalence of psychiatric disorders may not be influenced by ethnicity.

Innovative research on exercise patterns in patients with leg ulcers – using both self reporting and accelerometers – demonstrated a worrying lack of exercise in this group, even though care providers already encourage exercise in this group in order to ameliorate their condition.

A Geriatric Intermediate Care Programme (DGIP) combining the expertise of family physicians, nurses and geriatricians was evaluated as both feasible and effective in achieving functional improvement in the elderly.

Research on pain and pain treatment in emergency care departments demonstrated high pain prevalence rates as expected, but also showed a general lack of treatment and little pain relief at discharge.

New methods were developed to standardize gait assessment in frail elderly patients.

Home-based occupational therapy has been shown to be an effective way to improve the functioning of those with dementia in the community and to enhance caregivers’ feelings of competence. Such an intervention is a cost-effective way to improve quality of life.

The ParkNet health-care programme was implemented in more regions in the Netherlands. This makes it possible to evaluate the intervention programme and improves the quality of care.

New methods were evaluated for quantifying brain-specific proteins in Alzheimer’s disease.

The Dutch Easycare Study demonstrated the feasibility and cost-effectiveness of community-based geriatric care interven-
tion, in which a specialized geriatric nurse, a geriatrician and a general practitioner co-operate in problem-based care for frail elderly subjects.

A model was developed for the comprehensive assessment of geriatric oncology.

A randomized controlled trial of cognitive-behavioural therapy in fibromyalgia showed that this type of treatment is effective for improving the physical and psychological functioning of patients.

**Societal impact**

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

The following activities attracted special attention in the media in 2007:

- Participation in an advisory group on revising the Quality and Outcomes Framework in the UK, the largest pay-for-performance project in the world, which focuses on indicators for patient experience.
- Media coverage of various research findings, including the quality of out-of-hours services, treatment of urinary tract infections in young children, and practice nurses in primary care.
- Giving advice to the Health Council and the Association of Medical Specialists (Petrus Camper Instituut) on revising professional roles in health care (Prof. R. Grol, Dr M. Laurant).
- The Health Council, of which Prof. ALM Verbeek is a member, published a report on active follow-up protocols in cancer, advocating systematic research on the efficacy and effectiveness of routine follow-up protocols.
- Research on the genetics of cancer yields supplementary information on the genetics of all other phenotypes that are collected on cancer patients and controls. As an illustration, we discovered six genetic loci for pigmentation characteristics (eye, hair and skin colour and freckling). This has attracted huge interest, not only in the lay press but also at the Netherlands Forensics Institute.
- An interview with Prof. J. Buitelaar in the 8 p.m. prime-time news show (NOS Journaal) on August 8, 2007 about early screening of autism.
- Making the Regional Expert Centre for Pressure Ulcer Prevention and Care (RED) operational for consultation, prevention and treatment across a range of health-care settings, following an initiative by nurse scientist Dr E. de Laat and the head of the Department of Plastic Surgery Prof. P. Spauwen.
- Guidelines for the assessment, preventing and treating oral mucositis were developed by the Nursing Science group, in collaboration with the NIVEL and LEVV institutes.
- Guidelines for the assessment, prevention and care of behavioural problems in dementia were developed by the Nursing Science group.
- Report on aggression & behavioural problems and sexual abuse in institutions for care for the elderly, nursing homes, home care and mentally handicapped persons by the Nursing Science group for the Netherlands Health Care Inspectorate.
- Participation in the NFY think tank on future research on geriatric care.
- Key lecture during the Geriatric Research Days on Interaction research in multimorbidity (Prof. M. Olde Rikkert).
- Publishing patient information and a self-help book on coping with cognitive impairment in collaboration with the Netherlands Alzheimer Foundation and organizing a symposium on this topic in the LUX centre in Nijmegen.
- Organizing a national symposium on Medical Psychology, followed by a special issue on this topic in the Dutch Journal of Behaviour Therapy (2008).

**Future research**

In 2008, the themes within NCEBP will be reclassified. Key categories include:

- **Molecular epidemiology**
  - Colon cancer and prostate cancer screening, nutritional epidemiology
  - Whole genome association analyses
  - Biomarkers.
- **Evaluation of complex medical interventions**
  - Screening programmes, health outcome models, disease monitoring protocols
  - Specific designs for assessment of complex interventions
  - Methods to evaluate complex treatment strategies.
- **Implementation science**
  - Performance indicators
  - Fundamental research of factors associated with improvement
  - Pharmaceutical care
  - Methodological tools to explore determinants.
Quality of hospital and integrated care
• Methodological tools to explore determinants, process evaluation
• Timely and adequate care to optimise the functioning of frail people
• Enhancement of patient autonomy and quality of life and reduction of crisis care.

Health care ethics
• Impact of religious beliefs on ethical decision-making of patients
• Moral deliberation
• Ethical decision-making.

Psychological determinants of chronic illness
• Skin diseases, cancer, paediatric cardiac diseases, paediatric diabetes, asthma and cystic fibrosis various chronic pain populations and mild cognitive impairment in the elderly
• The relation between ‘lower-order’ speech and sensory-motor pathology and ‘higher-order’ cognitive and language development
• Auditory functions, speech motor control in relation to communication; cognitive switching in relation to aggressive behaviour; and prevention of falling incidents in elderly persons with mental retardation.

Effective primary care and public health in ageing populations
• Collective and individual prevention
• Self-management and empowerment
• Expertise on pain and palliative medicine will be broadened to include the care of patients with Alzheimer’s, stroke, COPD or heart failure.

Quality of nursing and allied health care
• Developing and implementing new evidence-based interventions in daily clinical practice
• Continuity of care for selected patient groups.

Mental health
• Variations of the genome as an important source of genetic variation for ADHD, ASD and mood disorders
• Various cognitive and brain mechanisms that mediate therapeutic effects, and research on the genetic factors that predict response to treatment.

Sensorimotor problems and fatigue
• Falls and fall-related injuries
• Transcranial magnetic stimulation (TMS)
• The cost-effectiveness of physical therapy, occupational therapy and speech therapy in neurodegenerative and neuromuscular diseases, as well as developing and implementing guidelines.

Nijmegen Alzheimer Centre
• Longitudinal database, from early symptoms to severe dementia stages
• Longitudinal database with phenotypes of patients and information of carers and professional care.

Human reproduction
• Safety, effectiveness, and patient-centeredness of reproductive care
• Aetiology and prevention of reproductive and developmental disorders
• Prevention of prematurity, the follow-up of premature born infants, and research on the causes, prevention and late effects of premature vascular compromised pregnancies.

International infectious disease control
• Improving therapeutic outcomes of invasive fungal infections
• Referral clinic for presumed late Lyme cases
• Completing and further implementing existing research grants, strengthening malaria research in Indonesia, and improving antimicrobial policies in developing countries.
The NCMLS brings together researchers from several groups at Radboud University Nijmegen Medical Centre and the Faculty of Science. There is a particular emphasis on the relationship between fundamental and translational research. All research and education within the NCMLS focuses on the study of molecular life sciences in relationship to disease. There are three main research areas:

- 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 autoimmune responses that are harmful to the host. In maintaining this balance, there is a complex interplay between immune and tissue cells and many stimulatory and inhibitory circuits operate simultaneously. Outcomes are further shaped by genetic and environmental factors. Deregulation of this intricate balance is associated with human diseases, ranging from inflammatory and autoimmune disorders to cancer, infection and transplantation disorders.

Nijmegen Centre for Molecular Life Sciences
Director: Prof. C.G. Figdor

Overall objective: Understanding the cellular basis of disease.

The NCMLS seeks to achieve greater insights into the complexity of living cells in order to obtain comprehensive knowledge of both normal and pathological processes. It 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.

Research by Prof. Peter Friedl yielded a composite microscopic image showing immune cells passing from a blood vessel into tissue (lower part), their communication and activation (middle part), and the clustering of their surface receptors (upper part).
In each case, prolonged deregulation can initiate a cascade of events, ultimately leading to tissue damage and destruction. Tissue engineering is a relatively new field of research with the aim of 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 (involving molecular science, mice and patients) is taken to finding the molecular basis of immune regulatory circuits. These are crucial to any understanding of immune-related disorders, infectious diseases, tissue pathology and regeneration as well as stem cell behaviour and differentiation.

**Metabolism, transport and motion**
(Prof. B. Wieringa)
Energy and redox metabolism (Prof. B. Wieringa) and Membrane transport and cell dynamics (Prof. R. Bindels).

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

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

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

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).

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

- Unravel the molecular basis of cell behaviour, which emanates from the genetic and epigenetic code contained in the nucleus – in the context of health and disease (e.g. cancer, developmental disorders, mental handicap, cognitive impairments, neurodegenerative disorders and age-related bone diseases).
- Elucidate protein structure and protein-protein interactions within cellular signalling pathways that control cell proliferation and differentiation.
- Exploit the potential of molecular chemistry to modify, design and mimic proteins and their building blocks in order to modulate and analyze their activities and properties in the cellular environment.

Prominent researchers within this theme participate in interdisciplinary research. They are engaged in basic research as well as technology development for subsequent diagnostic and therapeutic approaches and translational research. Examples include microarray-based genomic profiling (ArrayCGH, SNP arrays), expression profiling arrays, whole-genome ChIP-on-chip technology to study epigenetic profiles and target sites of protein (complexes) such as ER and p53 bound to their chromosomal sites of action, proteomics platforms (high accuracy and high throughput mass spectrometry). Integration with high-profile

Prof. C.G. Figdor

Carl Figdor has been a Full Professor of Cell Biophysics at the University of Twente since 1992, and a Full Professor of Immunology at Radboud University Nijmegen since 1994. From 1984 to 1994 he was a staff member at the Netherlands Cancer Institute. His research focuses on the immune system and its ability to resist cancer. He specializes in the role of dendritic cells in immune responses. In 2006 he received the Spinoza prize from the Netherlands Organisation for Scientific Research (NWO) – the most prestigious science prize in the Netherlands.
bio-informatics groups is invaluable for all of these activities. The applications for these experimental approaches are many and varied and research across the NCMLS benefits from such state-of-the-art technological advances.

Awards
Prof. Peter Friedl was appointed to the Chair in Microscopic Imaging of the Cell. Peter Friedl specializes in cellular processes, cell interactions involving immune and tumour cells and cancer metastasis.

Dr Annette Schenck is the first to receive the NCMLS tenure-track research fellowship. Dr Schenck is a group leader in the Molecular Genetics division at the Dept. of Human Genetics. Her team dissects the molecular networks and mechanisms underlying human brain function and disease, using the fruit fly Drosophila as a model organism.

Prof. Frans Cremers, Professor of Ophthalmogenetics at the Dept. of Human Genetics has been awarded this year’s prestigious European Vision Award for his extraordinary contribution to the field of Vision Research.

Prof. Frans Russel, Professor in Molecular Pharmacology & Toxicology, was elected president of the Netherlands Society of Toxicology (NST). NST is one of the largest toxicological societies in Europe, representing more than 600 members from different branches of science.

Prof. Nine Knoers, clinical geneticist, at the Dept. of Human Genetics, was appointed as a member of the Medical Council (RMW) at the Royal Netherlands Academy of Arts and Sciences (KNAW).

Dr Joost Hoenderop of the Dept of Physiology was elected as a member of the Young Nephrologists Committee (YNC) in the International Society of Nephrology (JSN). ISN, which has over 8000 members, selected just 10 young members worldwide in 2007.

Research facilities
These are grouped in the following categories:

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

Molecular imaging
Imaging at the molecular level is an essential tool for life scientists. Electron microscopy and other high-resolution instruments such as Atomic Force Microscopy are available within a state-of-the-art facility. Furthermore, confocal laser scanning microscopy, flow cytometry and other fluorescent microscopic techniques are combined to carry out dynamic measurements of fluorescent GFP-based tagged proteins (such as FRET & FRAP) and intracellular metabolites. Magnetic resonance facilities for in vivo NMR and MRI of animals and humans (11 Tesla) are also available.

Translational research (cellular therapy)
A GMP facility with clean rooms is used for translational research e.g. immunotherapeutic cell therapy, stem cell transplantation and gene therapy. In 2005 a total of 65 patients were treated in NCMLS translational research studies.

Centre for Molecular and Biomolecular Informatics (CMBI)
Prof. G. Vriend www.cmbi.ru.nl

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

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


Genomics and proteomics
DNA sequencing as well as micro-array technology for gene expression profiling are now basic tools used by molecular life scientists. Novel microfluid-based quantitative PCR are available for high-throughput quantitative RT-PCR. A state-of-the-art proteomics facility has also been launched with, for example, 2D-electrophoresis, SELDI-TOF and Mass spectrometry (MALDI-TOF, FT-MS, nLC-MS/MS).

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

Molecule to Man
The NCMLS is actively involved in the ‘Molecule to Man’ (M2M) imaging platform (www.molecule2man.eu). M2M is an innovative multi-institutional research program with imaging as a central theme. Included within M2M are a variety of imaging techniques ranging from visualizing small molecules to picturing organs and the whole body, hence the name Molecule to Man. M2M encompasses the scientific strengths and proven track record of the participating institutes under one umbrella for current and future research programmes. M2M aims to reinforce local and national infrastructure for the development of innovative imaging tools and techniques and their application in early diagnosis and personalized therapy.

Collaboration
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 Centre for Molecular and Biomolecular Informatics (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 (see below). In addition, the NCMLS contributes to the Center for Translational and Molecular Medicine (www.ctmm.nl). A CTMM taskforce has been set up in Nijmegen in which the NCMLS plays a leading role.

The ‘Molecule to Man’ platform house great potential for early detection of disease and monitoring of treatment of disease states. Besides the NCMLS, the platform represents research groups from a number of other institutes and research groups, i.e. the FC Donders Institute, the Institute for Molecules and Materials (IMM), and the Radboud University Nijmegen Medical Centre (UMC St. Radboud).

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

### Research results

The NCMLS carries out research both in a national and in an international context.

- A number of European 7th Framework research projects have been awarded to members of the NCMLS: Elixir (Gert Vriend, CMBI), STOPPAM (Adrian Luty, Parasitology), EUNEFRON (Peter Deen, Cell Physiology) and ENCITE (Carl Figdor, Tumour Immunology and Peter Friedl, Cell Biology)
- A TI Pharma project was awarded to a consortium that includes Prof. Robert Sauerwein, Dept. of Medical Microbiology to develop a highly protective malaria vaccine.
- Prof. Martijn Huynen received an award as part of the Horizon programme (designed to promote high-quality and visionary fundamental research in the field of genomics and/or biomolecular informatics). In direct collaboration with other NCMLS departments, functions of hereto hypothetical mitochondrial proteins will be predicted – using bioinformatics methods – and experimentally tested and verified.
- Dr. Gert Jan Veenstra has been awarded a National Institutes of Health (USA) R01 grant. The project, which will run for five years, will interrogate the *Xenopus tropicalis* genome using tile path microarrays.

### Societal impact

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

Several examples of translational research are being developed within the NCMLS and between the NCMLS and its collaborators.

### Future research

The following grants, which were awarded to members of the NCMLS, will be the basis of important future research. L. Vissers (Human Genetics) and M. Zweers (Dermatology) received Vici awards for their contributions to ‘Unravelling molecular mechanisms underlying genomic copy number variation and their role in disease’ and ‘Tenascin-X: a key player in extra cellular matrix organization’, respectively. R. Roepman (Human Genetics) and Dr L.B.A. de Vries (Human Genetics) received Vidi awards for ‘Cilia (mal)function in the retinal system’ and ‘Genes and mental retardation’. Future lines of research will focus on the following topics:

### Infection, Immunity and Tissue Repair

The examples below are illustrative of future research that will be carried out within the sub-themes Inflammation and infection (J. Schalkwijk), Immune regulation (G. Adema) and Tissue engineering and pathology (T. van Kuppevelt).

- The role of synovial activation in cartilage damage (van den Berg, LKRC)
- Defining the role of the intracellular suppressor-of-cytokine signalling (SOCS)-3 protein in cartilage pathology (van de Loo, DAA)
- Identification of new therapeutic targets in prostate cancer (Oosterwijk, Ludwig Institute)
- The role of the novel oncoprotein alphaB-crystallin in aggressive behaviour of squamous cell carcinomas in relation to radiotherapy (Boelens, KWF)
**Exploiting Toll like receptors for drug discovery (Adema, TI Pharma)**

**Dendritic cell-mediated reactivation of functionally impaired T cells to improve graft-versus-tumour responses after allogeneic stem cell transplantation (Dolstra, KWF)**

**Therapeutic T cell inhibition (Joosten, Organon NV)**

**TRPM7, a novel regulator of cytoskeletal tension: implications for cancer progression, invasion and metastasis (Leeuwen, KWF)**

**Translational excellence in regenerative medicine (TeRM; Jansen, Senter/NWO).**

**Metabolism, transport and motion**

The examples below illustrate future research that will be carried out within the sub-themes Energy and redox metabolism (B. Wieringa) and Membrane transport and cell dynamics (R. Bindels).

- **Mitochondria: ‘from evolution to function’ (Huynen, NGI Horizon)**
- **New tools for the identification of nutritional modulators of mitochondrial activity (Smeitink, IOP Genomics)**
- **Role of the novel slit diaphragm-associated channel TRPC6 in glomerular disease: a TR(i)P in to the podocyte (Bindels, NSN)**
- **Heme oxygenase as a novel target in the prevention of vascular complications of type 2 diabetes mellitus (Smits, DFN)**
- **Molecular regulation of the renal water homeostasis (Deen, NWO-ALW)**
- **Glutathione transport in Plasmodium falciparum (Russel, NWO)**
- **The efflux pump, breast cancer resistance protein 1, as a novel pharmacological target to regulate steroid metabolism and insulin (Masereeuw, RUNMC).**

**Cell growth and differentiation**

The examples below illustrate future research that will be carried out under the sub-themes Genetic and epigenetic pathways of disease (H. Van Bokhoven) and Chemical and physical biology (J. van Hest).

- **A novel strategy for identifying the genetic cause of hereditary hearing loss in young children; novel deafness genes and DAN diagnostics (Cremers, Royal National Institute for Deaf people)**
- **LCA5 (lebercilin): molecular genetic, functional, mouse knock-out, and gene rescue studies (Hollandere, Foundation for Retinal Research)**
- **Clinical and molecular characterization of childhood cancer susceptibility syndromes (Hoogerbrugge, NWO-AGIKO)**
- **Identifying the molecular defects underlying hereditary hearing loss (Kremer, The Heinsius Houbolt Foundation)**
- **Novel susceptibility pathways and drug targets for psychosis (Maartens, TI Pharma)**
- **Cilia (mal)function in the retinal system (Roepman, NWO)**
- **The molecular basis of cognition – Systematic analysis of human mental retardation genes and their associated pathways in Drosophila neuronal connectivity, function and behaviour (Schenk, NCMLS Fellowship)**
- **Identifying dosage sensitive genes causing mental retardation (Veltman, UMCN)**
- **Protein tyrosine phosphatase PTPRR deficiency causes ataxia-like motor coordination problems – towards a molecular understanding (Hendriks, UMCN)**
- **Industrially relevant heterocycles through biocatalytic cascades (Rutjes, NWO-ACTS).**

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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 dis-
institute for water and wetland research

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 ten departments, all with state-of-the-art modern laboratory facilities in the new Huygens Building, plus a central analytical service. Some examples of equipment used are:
  • State-of-the-art light and electron microscopy facilities for detailed analysis of the ultrastructure of micro-organisms, animals and plants, including morphometry and immuno-cytochemistry
  • Extensive molecular biological facilities such as quantitative RT PCR, RNA-interference and in situ hybridisation techniques for analysis of single cells, right up to 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.

Collaboration
Research is conducted in close collaboration with over one hundred national and international research groups, research institutes, companies and governmental organisations. These include the Institute for Society and Information systems (ISIS), Centre for Wetland Ecology (CWE), the Darwin Centre for Biogeology, the Netherlands Centre for River Studies (NCR), the Graduate School Experimental Plant Sciences (EPS), the Graduate School Functional Ecology (FE), The EUROpean


Dissertations: 17
Scientific publications: 233
Professional publications: 31

Research School for Neuroscience (EURON), the Research School for Socio-Economic and Natural Sciences of the Environment (SENSE), environmental biotechnology companies, various water boards, the Joint Genome Institute (Walnut creek, USA) and Genoscope - the French National Sequencing Centre (Evry, France).

**Research results**

The past year was a very successful one for IWW with three papers published in Nature and Science and extensive coverage of these findings on national TV, radio and in newspapers. The institute also welcomed three new extra-ordinary professors, who will stimulate research on stress and adaptation and further strengthen the high quality and focus of our research.

Plant scientists at the IWW elucidated the role of microRNA R169 in the control of the formation of male and female gametes in *Petunia* flowers. In cooperation with Keygene NV (Wageningen), they successfully developed a technology for massively identifying transposon insertion flanking sequences by using novel pyrosequencing technology.

New volcano microbes responsible for methane oxidation below pH 1 were discovered by the microbiologists at the IWWR in mud pots near Naples in Italy. The genome and proteome of the microbes was elucidated using pyrosequencing and advanced mass spectrometry. The activity of these microbes can lead to a complete new methane sink with global implications for counteracting climate change.

The plant ecologists presented an alternative hypothesis to explain the ecological significance of idiosyncratic root behaviour in Science. In this and other work they re-analysed current research on interactions among roots in plants. It is becoming increasingly clear that roots can distinguish roots of a neighbour from roots of their own, and grow faster in an alien neighbourhood.
Environmental biologists at the IWWR discovered the excretion of fythosiderophores, which – in combination with iron – acts as a very strong catalyst for the oxidation of sulphides in brackish environments.

The environmental scientists published several papers in which the contribution of various sources of variability (molecular properties, environmental variables and spatial heterogeneity) to the risk assessment of chemicals was quantified. Flooding and temperature increase were found to limit the ecological rehabilitation of riverine communities.

The plant scientists documented the fact that S.dulcamara and S.lycopersicum responded to both biotic (P.infestans) and abiotic stress factors (heat-stress and water flooding). S.dulcamara also formed adventitious roots under conditions of flooding. These root primordia develop on the stem and are ‘ready to grow’ as soon as water arrives.

The aquatic ecologists discovered two previously unknown genes that are probably involved in the onset of flowering in the clonal plant species Trifolium repens.

The microbiologists investigated the global distribution of anammox bacteria, calculating that marine anammox bacteria may contribute as much as 50% to the nitrogen loss from the ocean. The genome and proteome of the marine anammox bacteria was elucidated by using 454 pyrosequencing technology and advanced mass spectrometry. Three more genomes of anammox bacteria will be sequenced by the Joint Genome Institute (USA).

The animal ecophysiologists at the IWWR made a breakthrough in ecological research of tropical coastal systems, using stable nitrogen and carbon isotope ratios in the tissues of migratory juvenile fish. Their findings were the first evidence that mangroves and sea-grass fields act as nurseries for coral reef fishes. The devastating effects of the invasion of molluscan and crustacean species from the Ponto-Caspian area on the ecosystem of the river Rhine were documented.

The Department of Organismal Animal Physiology expanded its research on stress physiology to include leptin endocrinology, thyroid physiology and other fish welfare-related topics.

The cellular physiologists focused their research on the way animals and humans adapt to their environment. Together with the Department of Anaesthesiology at the University Medical Centre Nijmegen (UMCN) they started to test the role of the EW (Edinger-Westphal) nucleus in patients with neuropathic pain. It was shown that the difference between males and females in their capacity to adapt to stress, may be based on oestrogen receptors in the EW, which appeared to be controlled by neuropeptide Y and corticosteroids. Further indications were obtained that the EW nucleus may be involved in feeding control.

The Department of Cell Biology elucidated the nature of calcium action potentials in density-arrested normal rat kidney fibroblasts. Moreover progress was made in characterizing allele-specific expression of the growth factor receptor PDGFRA in glioma tumour cells.

**Awards**

The flower developmental work done by the Department of Plant genetics received the RijkZwaan Plant Sciences Award and the award for the best internship report on a genetic subject from the Dutch Genetics Society.

Dr J.H.P. Hackstein received the 2007 Miescher-Ishida Award of the International Society for Endocytobiology.

**Societal impact**

The IWWR departments for Environmental Science and Animal Ecophysiology organized a large conference in Nijmegen in 2007 which received a lot of public attention. Highlights of the meeting included the hypothesis that flooding and increases in temperature may limit the ecological rehabilitation of riverine communities and that the massive invasions of exotic animal species have a huge environmental impact, causing considerable economical damage.

Fundamental research data in the Department of Cellular Animal Physiology, which focuses on the basal mechanisms of adaptation in animals and man, received strong support in the biomedical area. Together with the Department of Anaesthesiology (UMCN) and Organon BV (Oss), collaborative projects were started to evaluate the role of neural and endocrine adaptation systems in the epigenesis of chronic neuropathic pain, feeding disorders, depression and suicidal behaviour.

Polypeptide growth factors studied by cell biologists at IWWR play a central role in the proliferation control of mammalian cells. Together with Organon (Oss), synthetic EGF factors were designed that may have great potential as drugs for treatment of neural and cardiac disorders.

Collaboration with Keygene was further intensified by both plant scientists and microbiologists at the IWWR using novel 454 sequencing technology.

The IWWR and Faculty of Science extended the Centre for Wetland Ecology (CWE) for a further period of five years. The CWE was also actively engaged in cooperation with Dutch consultant engineering companies to improve the management of wetlands in general, with respect to water quality, sediment quality, hydrological regimes, and ecological and socio-economical development.

The experimental plant ecologists, environmental scientists and microbiologists at the IWWR have extended their 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.

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

The discovery and distribution of anammox bacteria in the oceans had considerable impact on current models of the global nitrogen and carbon cycles used by oceanographers. This discovery and global distribution was the basis for further expeditions to various marine ecosystems. Furthermore, two new waste-water treatment plants based on the anammox concept were built to remove ammonia from industrial waste streams more cost effectively.

Studies by the IWWR animal ecologists and ecophysiologists provided tools for restoration and nature development projects. One of these focuses on nature evaluation and nature development in the Rotterdam ecoport. In biofouling research, cooperation with KEMA Power Generation and Sustainables in Arnhem was further intensified. In addition, studies on biological invasions are carried out in cooperation with RIZA, Lelystad.

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

**Future research**

In 2007 the institute will 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 technology stimulated new initiatives in this programme in collaboration with other universities and industries. An NWO-ALW project entitled ‘Transcriptional profiling of inbreeding depression and genetic erosion in *Solanum tuberosum*’ received funding for studying the variation of genes (and their expression) in inbreeding depression in plants. 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 bioinformatists at the UMCN in an NGI Horizon programme to develop new tools to accurately and rapidly analyze the massive volume of sequence data generated by the new technologies.

Within the DARWIN Centre and CWE consortium, IWWR research groups will continue to address 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 that is carried out together with Utrecht University. The effects of climate change on soft water ecosystems (in a project financed by the Danish Science Foundation) will be studied by aquatic ecologists. These and other studies will provide experimental input for developing models for ecological risk assessment in river, wetland and estuarine ecosystems. Future plans include a study on biotic and abiotic stress factors in plant biology and how plants adapt to their natural environment. Genetic diversity and physiological adaptations to different environmental conditions (temperature and water, or pathogen attack) in plants of the genus *Solanum* will be studied in 2008.

In 2008, animal scientists and cell biologists will perform research on the basal mechanisms of adaptation in growth factors and endocrine systems of animals and man in collaboration with Schering-Plough (Oss). The role of the EW nucleus in the epigenesis of chronic neuropathic pain, feeding disorders, depression and suicidal behaviour will be studied. Together with the Donders Centre for Cognitive Neuroimaging, the role of the EW nucleus will be investigated in the context of adaptation to stressors during a war situation (Dutch soldiers in Afghanistan). Physiologists at the IWWR will participate in a SmartMix consortium to study the zebra fish and its genome as a model in stress and bone (osteoporosis) physiology and related drug development.

In 2008, IWWR experimental plant ecologists and environmental biologists 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 scientists at IWWR will continue to work on 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. Collaboration with the National Institute for Public Health and the Environment (RIVM) was intensified with the appointment of a new extraordinary professor. Several new, externally funded PhD projects on environmental risk assessment will be initiated together with RIVM in 2008.

The microbiologists at the IWWR will continue to investigate the role of anaerobic ammonium oxidation in marine waters and sediments. Together with the NIOZ and Utrecht University, the role of aerobic and anaerobic ammonium-oxidizing microorganisms in past and present oceanic nitrogen cycles 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 2008, 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 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 sea-grass beds will also be a topic in the study of the Wadden Sea, where interaction with mussel beds will be included.

In 2008 over 80 research projects will be continued or initiated. These include:

- 30 NWO-ALW, STW, and DARWIN-ALW projects (together with several ecological restoration projects for the Dutch Ministry of Agriculture, Nature and Food Quality)
- several projects designed to produce indicators for comparative environmental risk assessment (financed by the Dutch Ministry of Housing, Spatial Planning and the Environment)
- several EU and industry-based projects

Prof. M.S.M. Jetten

Mike Jetten has been a Full Professor of Microbial Ecology at Radboud University Nijmegen since 2000. Since 2002 he has also been an Extraordinary Professor of Environmental Biotechnology at Delft University of Technology. He is an expert in the ecology, physiology and application of anaerobic micro-organisms. These micro-organisms are used to clean nitrogen and sulphur from water and air. Prof. Jetten is editor of the journals Applied Environmental Microbiology and FEMS Microbial Ecology, and editor-in-chief of Environmental Microbiology. He was the winner of the STOWA prize for the design of a new, more sustainable wastewater treatment system (1996) and received the Machevo prize for sustainable development in 2002. He is a Fellow of the Netherlands Organisation for Scientific Research and the Royal Netherlands Academy of Arts and Sciences.
In physics, chemistry and biochemistry the desire to understand complexity in systems is spurred by the wish to manipulate their functionality. In recent decades scientists have approached the problem of complexity from two directions. 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 systems. In this way the structure and functionality of atomic nuclei, atoms, and (small) molecules have been investigated and analyzed. Combined experimental and theoretical efforts have helped develop knowledge of the behaviour of these systems.

On the other hand, continuous efforts are made to study macroscopic systems with well-known properties or to analyze the constituents of a large system that has already been investigated extensively. Examples include many-body problems in physics and experiments in life sciences designed to understand systems on the cellular and subcellular scale.

One of the major challenges is to understand the complexity and functionality in the area where these two trends meet, namely the field of Nanoscience. This research area is extremely broad, encompassing traditional topics in physics, such as liquid crystals, nanotubes, thin films, as well as chemical and biochemical research.

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. The emphasis is 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 spurred by the wish to manipulate their functionality. In recent decades scientists have approached the problem of complexity from two directions.

Dr Jeroen Cornelissen received an EURYI Award for his study of reactions in virus balls. These balls are ideal study material and a good basic tool for making new materials.
on for example proteins and protein complexes and the self-assembly of supra-molecular systems.

It is precisely in this area that the IMM aspires to become a key player. The institute is, with its infrastructure and expertise, ideally suited to answering some of the most pressing questions in Nanoscience. It actively promotes scientific interplay between researchers with different backgrounds and expertise in physics, chemistry and biological chemistry, carrying out a multidisciplinary research programme with strong interaction and feedback among the research groups.

Key qualities of the IMM are:
• 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 (HFML)).
• Strong organic, bio-organic and supra-molecular chemistry.
• Strong interaction between physicists and chemists and between theoretical and experimental groups. Extensive collaboration, both internally and externally.

The 19 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 centres. 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 investi-
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.

In addition, the institute 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, MALDI-TOF mass spectrometers and mass-spectrometer combinations, and high-pressure liquid chromatography facilities as well as X-ray diffractometers.

Finally, the Institute for Molecules and Materials recently received a €26 million grant to develop a brand new internationally important spectroscopy 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 – via a network called IRUN, which stands for ‘International Research Universities Network’.
IRUN was established to further improve the quality of research and teaching at the universities involved. Within the network, exchange of researchers, lectures, and students will be encouraged and facilitated. This may lead to a joint curriculum development and joint degree programmes for Masters students and PhD candidates. The IMM currently collaborates with groups from Münster, Duisburg/Essen and Barcelona.

Collaboration with other universities includes the Catholic University of Leuven in Belgium in the field of single molecule spectroscopy (the group led by Profs. J. Hofkens and F.C. de Schryver). This collaboration involves exchange of PhD students and post-docs 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 six joint publications in highly ranked journals. There are also strong links between the IMM and the Fritz Haber Institute of the Max Planck Society in Berlin Germany (Director Prof. Gerard Meijer), and the Fraunhofer Institut für Mikroelektronische Schaltungen, Duisburg, which has led to two filed patents on the joint project ‘Process on a chip’. Collaboration between the IMM and the Duisburg/Essen Center for Nanointegration (CENIDE) is currently being formalized.

Further collaboration takes place between the IMM and the Ioffe Institute in St. Petersburg in Russia. This includes shared PhD students and joint projects that have already led to a number of high-ranked publications including two articles in Nature. Likewise, the collaboration with the Jozef Stefan Institute in Ljubljana, Slovenia, deserves to be mentioned.

Joint work with this institute has proved successful as has been demonstrated by a filed patent on Liquid Crystal Displays.

Many of the groups in the IMM participate in EU projects with other European partners, which are very rewarding, both with respect to strengthening research contacts and training PhD students and post-docs. Five senior members of the IMM (Profs A. Fasolino, R. de Groot, R. Nolte, L. Meerts and F. Rutjes) hold part-time professorships at other universities in the Netherlands.

Research results

The decision taken among physicists and chemists at Radboud University Nijmegen in 2005 to form a single institute has delivered the desired synergy. Scientists have started venturing into uncharted waters with often unexpected, at times even surprising, results. Below is a summary of the results within the three main research themes at the IMM.

Electron-correlated systems

In Prof. Rasing’s group the effect of laser pulses on spin precession in electron-correlated systems was further investigated, showing that the action of linearly polarized laser pulses is equivalent to the action of magnetic field pulses (PRL). Profs. Katsnelson and Fasolino demonstrate in their work on graphene that thermal fluctuations in the two-dimensional carbon layer cause it to form ripples (Nature). Equally exciting are new results on the graphene system in Prof. Maan’s group, where recent experiments at the HFML reveal the room temperature quantum Hall effect (Science). A study of amorphous semiconductors in Prof. De Groot’s group led to the discovery of band gaps that are free of localized electron states. And Prof. Kentgens and coworkers extended their world-renowned NMR techniques to include analyses of natural products in minute quantities by designing a novel route towards microchip-integrated NMR measurements.

Self-organizing systems

Prof. van der Avoird and his colleagues obtained a new water force field, thus correctly describing the behaviour of water in the liquid phase (Science). Prof. Vlieg’s group shed light on the mystery surrounding single-handedness in molecules in nature by elucidating the mechanism of chiral purification using crystallization (JACS). Prof. Rowan cum suis improved the performance of organic electronic devices by studying the photovoltaic effect in polymeric nanowires. Profs. Hageman and Vlieg showed – in the Applied Materials programme – that re-use of thin film substrates is possible, which can help develop low-cost, high-efficiency solar cells. In Prof. van Hest’s group significant progress has been made in developing a microreactor platform enabling accurate measurements in synthetic chemistry, leading to the establishment of a start-up company (FutureChemistry). Prof. Speller’s laboratory provided real-time and real-space data on the nonspecific adsorption of proteins at solid surfaces, important for biosensors and medical implants, by using cutting-edge atomic force microscopy. In the interdisciplinary field of Biotechnology and Laser physics, Prof. Parker’s coworkers Harren and others show that plants do not produce methane, thereby contradicting the popular belief that plants contribute substantially to the production of greenhouse gases. The group led by Prof. van der Zande exhibited ways to control the energy distribution in nitric oxide by employing two-pulse stimulated Raman excitation, emphasizing the fact that coherent control is possible in Raman transitions. Finally, analyzing the average soot particle as a function of crank angle, Prof. Ter Meulen and colleagues characterized the combustion process in heavy-duty diesel engines.


Biomolecular systems

In our biomolecular research programme, the group led by Prof. Buydens has developed a promising new technique for analysing large sets of tens of thousands of genes in the field of transcriptomics. Prof. Wijmenga et al. provided further insight into the molecular mechanism of riboswitching by reporting on the structural organization of the G-riboswitch aptamer. In the group led by Prof. Nolte, a virus-based single-enzyme nanoreactor was generated, allowing the monitoring of enzyme processes at the single-molecule level (Nature Nanotechnology). And the members of Prof. Rutjes’ group investigated the biological relevance of a triazole function as an amide isostere and became intrigued by the covalent attachment of carbohydrates to the so-called RGD peptides. Lastly, in the world of diagnosing autoimmune diseases, the group led by Prof. Pruijn reported on new ways of imaging to scrutinize the autoantibody-autoantigen interaction monitored by surface plasmon resonances (JACS).

Prizes and awards

Prestigious grants awarded in 2007 include a Veni grant as well as an ECHO grant and several prestigious ‘FOM Projectruimte’ and IBOS grants. Furthermore, Prof. Theo Rasing was the proud recipient of the FYSICA prize, which is awarded once a year by the Dutch Physical Society to a physicist for an outstanding contribution to the field. Also, the Max Planck Society in Germany gave Prof. Ad van der Avoird the prestigious Humboldt Research award for his work in theoretical chemistry. Finally, Dr Jeroen Cornelissen received the prestigious European Young Investigators (EURYI) Award.

Societal impact

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

An important initiative 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 a completely furnished lab space has been created for this purpose. Financial support for the Innovation Lab comes from the university and now, but the entrepreneurs are also expected to attract their own start-up financing.

IMM’s outreach to small and medium-sized enterprises is embodied in the NanoLab. Its primary goal is 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. This wide range of application areas is facilitated by the availability of a range of Scanning Tunnelling (STM) and Atomic Force (AFM) microscopes as well as other techniques, but most significantly through the embedding of the NanoLab within the IMM, with its High Field Magnet Laboratory, its NMR facility, and other cutting-edge experimental and spectroscopic expertise.

Furthermore, the Institute for Molecules and Materials maintains an active and close collaboration with the Nijmegen Centre for Molecular Life Sciences in order to develop novel tailor-made molecular and macromolecular and biomacromolecular systems for monitoring and addressing personal health issues. This involves the use of real-time NMR and scanning probe imaging techniques for identified species, targeted drug-delivery systems, and diagnostics on a nanometre scale alongside the development of molecular sensors and markers. In addition, an IMM initiative specifically designed to stimulate innovation is the ‘Process on a chip’ programme, which is fuelling progress in sustainable chemistry. Non-invasive diagnostic tools are also being developed such as ‘the breath test’, which allows researchers to analyze the trace gas constituents of human breath for diagnostic purposes. These are all successful examples, which reflect a larger trend in nanotechnology, i.e. finding solutions to 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 are leading to an advanced understanding of novel systems which can be directly linked to applications in the semiconductor industry or in electronics. The manipulation of spins with ultrafast light or extremely high magnetic fields – an innovative approach to the issue of data storage on hard drives – is but one example. developing thin-film solar cells with the highest possible efficiency is another.

Nijmegen techno-campus

At the end of 2005 the Dutch government launched a call for proposals for large-scale research infrastructure in the Netherlands. Among the hundreds of applicants, the IMM was one of just five that were allocated funding, in this case to set up a centre for advanced spectroscopy. This success underscores the IMM’s scientific excellence and strengthens its position as an internationally renowned research institute. The funding, worth around €26 million, will be used to create a techno-campus similar to those at Orsay, Grenoble and Garching.

The advanced spectroscopy centre will complement a number of existing facilities such as the High Field Magnet Laboratory (HFML), the Nuclear Magnetic Resonance Laboratory (NMRL), the Trace Gas Laboratory (TGL), and NanoLab Nijmegen with new laboratories and instrumentation, representing a unique centre for high-resolution spectroscopy of functional molecules and materials. A free-electron laser based Terahertz Facility will be built next to the HFML that will create unique opportunities to study magnetic excitations in inorganic and organic molecules, as well as low energy spectroscopy (far-infrared) on molecular clusters and large molecules and biomolecules. HFML will also build a new hybrid 45 T magnet which will provide new unique research opportunities with cutting-edge technology.

The ultimate aim is to create a techno-campus – combining top class experimental techniques and led by a core group of distinguished principal investigators – that will become a centre of excellence which will attract the best researchers and students from all over the world, while at the same time acting as a catalyst for scientific and economic activity in the region.
IMM scientists sit on various national and international advisory boards, committees and journal editorial boards (including those of prestigious journals such as Science). Apart from these activities in the scientific domain, many leading IMM scientists are actively involved in public debates on a variety of topics.

**Future research**

Future research within the IMM is envisaged within three broadly defined research themes, in which physics and chemistry will merge. These themes will explore the following questions: 1) How can only understand the exciting, yet unresolved, issues in correlated-electron systems and nano-sized materials? 2) What is the science behind the self-assembly of complex molecules? and 3) What are the unique properties of biomolecules which explain their function in cellular systems?

These explorations will be supported by substantial external funding.

The most important opportunity for the coming ten years, though, 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, NanoLab facilities, the NMR Lab and laser facilities in one coordinated infrastructure, a research infrastructure of international standing will be created. A free-electron laser based TeraHertz facility will be built next to the HFML that will create unique opportunities to study magnetic excitations in inorganic and organic molecules, as well as low energy spectroscopy (far-infrared) on molecular clusters and large molecules and biomolecules. HFML will build a new hybrid 45 T magnet, which will offer new unique research opportunities with cutting edge technology. Grouping a combination of these facilities on the same campus and making them also available to external users will boost science and applications in Nijmegen and increase its international visibility.

A grant has been secured from a separate NWO-BIG programme for a new solid-state 850 MHz NMR machine. This important injection of funds will give impetus to the advanced materials science programme at the institute and thus help attract scientific talent. Combining 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 innovations that will become feasible in the next ten years.

In close collaboration with the Nijmegen Centre for Molecular Life Sciences (NCMLS/UMC) the institute has formed a Chemical Biology cluster, in order to further exploit in-house knowledge of organic chemistry and apply it to biochemical, biological, and medical problems. Together with NCMLS research groups and industrial pharmaceutical partners this promising research line will enhance our understanding of complex molecules and make it possible 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 increasingly possible, for instance, to perform calculations on large bio-structures as well as high-resolution spectroscopic experiments on floppy molecules in the liquid phase. The future of science will take shape in the field of interdisciplinary research and the IMM is fully equipped and ready to tackle the challenges that lie ahead in this area.

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Mathematics
This subject centres on three interdisciplinary themes: mathematical physics, algebra and logic (which was added this year with the arrival of Prof. Gehrke), and stochastics (in the process of reorientation from financial mathematics to the stochastics of the brain). There are well-established links between these themes and computer science and physics. The traditional areas algebra, logic, analysis, geometry and stochastics relate closely to these themes.

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

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

Awards
Dr Charles Timmermans was awarded the European Physical Society High Energy Outreach Prize.

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

Collaboration
Mathematicians in Nijmegen are involved in the NWO mathematics cluster GQT (Geometry and Quantum Theory), with a leading contribution from mathematical physicists at the IMAPP.

The elementary particle physics group is a partner in the Nikhef and is associated with the European Laboratory for Particle Physics (CERN in Switzerland) and the Fermi National Accelerator Laboratory (FNAL in the USA). The particle physics theory group collaborates intensively with KEK 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, ESA and the Nijmegen group partly leads the EGAFS survey. Nijmegen is becoming the expertise centre for cosmic ray detection with LOFAR, one of four key programmes. The department is a member of the LOPES consortium, which has radio antennas installed at Kascade-Grande, while particle...


Dissertations: 6
Scientific publications: 158
Professional publications: 17
The Institute participates in the following Dutch national research schools: MRI (mathematics), OSAF (elementary particles), LOTN (theoretical physics) and NOVA (astronomy). All researchers in the institute are member of one of these research schools, which are recognized 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 been reoriented in 2007, with most effort now being directed towards unravelling the logical structure of quantum mechanics. The eventual goal remains the understanding of the physical world in terms of quantum theory, including clarification of the indeterminism of quantum theory and the possibility that the Big Bang was an illusion inherent to the use of classical physics as an approximation to quantum physics. The main mathematical tool is topos theory, a branch of categorical logic that had so far hardly been applied to physics.

It was proven that quantum symmetries at the level of Hopf algebras of Feynman diagrams, as generated by Slavnov-Taylor identities can be realized as Hopf ideal. This is the mathematical formulation that quantum symmetries and renormalization in physics are compatible. With the SISSA completed of a non-commutative family of instantons on a non-commutative 4-sphere, parameterized by the quotient of two quantum groups. Research in quantum probability concentrated on questions related to quantum information theory with applications, e.g. in the LIGO project for the detection of gravitational waves. It was shown that optimal quantum trajectories – solutions of the stochastical Schrödinger equation – are usually pure, unless they are trapped in so called dark sub-spaces. These dark sub-spaces were classified. A connection was made between these dark sub-spaces with error-correcting codes and multi-dimensional generalizations of spectral compression sub-spaces. An elementary geometrical construction of Kepler’s First Law of Planetary Motion was developed as part of a project for education in advanced mathematics in secondary schools.

In Algebra and Logic, research efforts have focused on both applications and internal fundamental problems. In applications, efforts have been focused on identifying the tools and models needed for studying various computational systems, including those involving stochastic information. The efforts included organizing a major international conference (TANCL’07) and associated workshops on computing and quantum physics, which was fully funded by UK agencies. Other applied work in Algebra relates to crystallographic structures. A clarifying treatment of point groups and a systematic approach to partial symmetries addresses issues that have given rise to confusion among crystallographers.

In fundamental research, the description of Ree groups continued within the DIAMANT project, work on intuitionistic mathematics also continued, as well as efforts to find a proof for the Jacobian conjecture, the latter leading to a description of a large class of polynomial mappings with Jacobian determinant 1 in three dimensions.

In dissemination, significant progress was made on a fundamental textbook for the Oxford University Press’s Oxford Logic Guides series. Together with high-school students a project was run to construct Franklin magic squares and research took place on the Dutch mathematician P.H. Schoute’s advances in discrete mathematics in the late 19th century.

With the appointment of Prof. Gehrke a new line of research started in Algebra and Logic.

While the process of reorientation of stochastic research to include a new area, e.g. the stochastics of the brain, still has to begin, research on financial mathematics continued. Recent results by Dr Hendriks, Hoogduin and Van Zuijlen on the two-step procedure for sampling have been submitted to the Annual meeting of the American Accounting Association. Support was given to theoretical environmental research in the field of human exposure to toxic substances. Dr. P. Spreij from the UvA visited the financial mathematics group for seven months.

IMAPP research on compact binaries makes extensive use of the European Galactic Plane Surveys (EGAPS), which chart the plane of our Milky Way in all optical colours. Part of EGAPS is the UV Excess survey (UVEX) that is led from Nijmegen. EGAPS makes extensive use of the telescopes on La Palma and at ESO. The aim of the research at Nijmegen is to come to a homogeneous and uniform census of the population of compact binaries in our Galaxy, which then can be compared directly with population synthesis models, made by Dr. G. Nelemans, in which basic, but currently uncertain, physical assumptions on binary evolution are made. The astronomy group also benefited from the presence of Prof. Henrichs (UvA) on an extended period of leave.

The Pierre Auger Observatory had an extremely successful year. It has been proven that the highest energy cosmic
rays originate from (the vicinity of) Active Galactic Nuclei. This establishes the new field of charged particle astronomy. The Nijmegen group, which has, for the first time, observed cosmic rays with a radio detection technique at the Pierre Auger Observatory, has taken the lead in developing this technique, which promises better duty cycle and angular resolution than the techniques currently employed. Large-scale applications, e.g. in LOFAR have also come a step closer. Exploitation of LOFAR measurements was an important focus for the group. The work in astroparticle physics has been put on a firm footing with an approved FOM programme.

The DØ experiment has doubled its data set in 2007. This makes it possible to approach the point where hints for a Higgs particle may become apparent in mass regions that are so far unexplored.

The Atlas detector was practically completed in 2007 and successful cosmic data recording has started. The LHC will become operational in the summer of 2008. The Nijmegen hardware contribution to Atlas – more than 200 boards with ultra-fast electronics to read out the muon chambers – have been produced and tested in 2007 and are being installed in Geneva. The Nijmegen group actively prepares the data analysis, concentrating on Higgs detection and a search for supersymmetric particles.

Research on effective actions with non-concave potentials has continued. An inventory of WW scattering models has started. This will produce model-independent descriptions that can be fitted to the LHC data when it arrives, making it possible to elucidate the Higgs structure and, perhaps, non-Standard Model contributions to this process. The Nijmegen Extended Soft-Core potentials for baryon-baryon interactions continue to be the world standard and the study of inter-hadron potentials with strange particles has continued. Study of the multi-W/Z effects of linear colliders has also advanced.

**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 mathematics) and Natuur, Leven en Technologie (Nature, Life and Technology. Four staff members teach in the prestigious honours programme at the University. 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. Considerable media impact, leading to press coverage from Serbia to Indonesia, was generated by the construction of a Franklin magic square in a high-school project initiated by and under the supervision of members of IMAPP.

**Future research**
A central theme of IMAPP is the origin and evolution of the universe. In astronomy this translates into the study of compact objects, which test the limits of known physics and the study of cosmic rays as a new window on the universe in a multimessenger approach. For the study of cosmic rays, techniques from radio astronomy and elementary particle physics are used and there is full cooperation between astrophysicists and particle physicists in IMAPP. The appointment of two new faculty members in this area in the astronomy department in 2007 is 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 the mathematical foundations and analysis of quantum 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. Plans to revitalise stochastics research that can contribute to a better understanding of the brain and cognition are an essential ingredient in consolidating the mathematics departments by balancing pure research in mathematical physics, algebra and logic with applied mathematics.
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, 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 2007 research was concentrated within six research groups, each with its own particular focus and aims.

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

**Software technology (ST)**

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

**Information and knowledge systems (IRIS)**

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

**Security of systems (SoS)**

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

**Informatics for technical applications (ITA)**

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

**Biophysics**

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

**Collaboration**

International cooperation is integral to the work done at ICIS, because developments in computing take place around the

Bommel, P. van, Gils, B. van, Proper, H.A., Vliet, M. van & Weide, Th.P. van der
(2007). Value and the information market. Data and Knowledge Engineering,
1,61, 153–175.


types and exact real numbers’. Mathematical Structures in Computer Science.
17 (1), pp. 3-36.

Java-like Language. European Symposium on Programming (ESOP’07),
LNCS volume 4421, pp. 347-362, Springer Verlag. Best Theory Paper Award at
ETAPS’07.

Communications of the ACM, pp. 79-83.

Verification of Medical Guidelines using Background Knowledge in Task
Networks. IEEE Transactions on Knowledge and Data Engineering 19.6, 832-846.

Kusters, J.M.A.M., Cortes, J.M., Meerwijk, W.P.M. van, Ypey, D.L., Theuvenet,
cell-model for calcium oscillations and action potential firing. Physical Review
Letters, 98, 098107.

Ed. Proceedings of the 2007 ACM SIGPLAN International Conference on
Functional Programming (ICFP’07), Freiburg, Germany, ACM, ISBN
978-1-59593-815-2, pp. 141-152.

Illusory Sounds in Noise: Sensory-Perceptual Transformations in Primary
Auditory Cortex. The Journal of Neuroscience 27(46), 12684-12689.

Dissertations: 5
Scientific publications: 200
Professional publications: 10
guideline for managing diabetes mellitus have been successfully applied to medical formal methods and verification tools. Within the EU FET project Protocure II, systems over time. deal very well with changes in software reliability of software. Furthermore, it can re-used for any new case. This high degree to be defined once and it can then be re-used for any new case. This high degree of re-usability considerably increases the re-use is applicable and can be then be re-used for any new case. This high degree of re-usability considerably increases the reliability of software. Furthermore, it can deal very well with changes in software systems over time.

Within the EU FET project Protocure II, formal methods and verification tools have been successfully applied to a medical guideline for managing diabetes mellitus type 2, indicating a number of shortcomings. Also new techniques for the compact representing probability tables in Bayesian networks - based on Boolean functions - were developed. There was successful collaboration with clinicians, demonstrating the usefulness of these techniques.

In ongoing research on electronic voting the Security of Systems (SoS) group played an active role in the public debate about electronic voting machines. In a newly formed Centre for Cybercrime Studies (Cycris), collaboration started with the law faculties at Radboud University Nijmegen and the University of Tilburg (TILT), on an interdisciplinary approach to address the new challenges posed by cyber crime. In the field of software security and correctness, the EU regional project EuroQuis resulted in a proposal for a quality standard for open source services. Work on Java program verification carried out within the EU project Mobius received the best theory paper award at the joint ETAPS conferences.

The Informatics for Technical Applications (ITA) group 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. To develop embedded control systems in a multidisciplinary way, a "lightweight" approach was developed that allows co-simulation of VDM++ and bond-graph models. The first formal proof of a hardware I/O interface was presented.

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

Societal impact

The Institute’s impact is 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 (model checking). The institute plays an active role in the public debate on computer security, including issues such as privacy, open source software, electronic voting, and biometric passports. Prof. Jacobs was a member of the government committee that advised on the future of voting in the Netherlands, headed by the former minister (and current minister of state) Korthals Altes. Many of the recommendations have already been taken over by the government. 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. New algorithms for adaptive control resulted in two spin-off companies. The institute collaborates via the joint LaQuSo Laboratory with the Technical University in Eindhoven on transferring state-of-the-art technology for software analysis from universities to industry via contract research, and runs
CodeYard, an innovative project set up to interest and involve high school students in the Netherlands and Belgium in computer science.

**Future research**
During 2007 the staff jointly decided to concentrate research within three clear themes: Digital security, Intelligent systems and Model-based system development – each with its own focus and aims. From 2008 onwards these themes will be both organizational units and areas of research. The themes fit well into the Dutch national ICT research agenda (NOAG-ICT 2005-2010 ‘Met vaste hand’). ICIS has also adopted the system of Principal Investigators (PIs) to ensure a stronger focus on the quality and dynamics of research. Five members of staff were appointed as PIs.

Within the new section Model-based system development we will be starting three new research projects: The aim of the European FP7 project Quasimodo is to develop new techniques and tools for model-driven design, analysis, testing and code generation for advanced embedded systems, where ensuring quantitative bounds on resource consumption is a central issue.

The goal of the NWO project ARTS is to automatically construct abstractions of embedded system models (e.g. real-time UML) that contain sufficient information to analyze the timing behaviour of the original models, but can still be analyzed using real-time model checkers. The ESI project Octopus (with Océ as the leading industrial partner) explores approaches to modelling and analyzing the adaptable properties of printing systems in their environment.

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 examines the role that software plays on the one hand in providing security and on the other as a source of security vulnerabilities.

The focus in the Intelligent systems section is on developing intelligent systems that are able to 'learn' knowledge and apply reason. This research is highly interdisciplinary. The methods, which are derived from computer science, mathematics, and physics, are often inspired by cognitive science. The work involves applications in many fields, most notably medicine and biomedicine (decision support systems, medical data analysis), mathematics (proof checking, repositories of formal mathematics) and computer science (verification of software).

As from 2008 the Biophysics group will leave ICIS to form part of the new Donders Institute for Brain, Cognition and Behaviour, Centre for Neuroscience.

Institute for Computing and Information Sciences

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In today’s knowledge society, scientific, technological and societal developments are closely interrelated. We find ourselves in the midst of a technoscientific revolution that is affecting all domains 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 interaction between science, technology and society.

The Institute consists of three departments: the Department of Philosophy and Science Studies, the Centre for Sustainable Management of Resources (CSMR) and the Department for Innovation Studies. All three departments have developed substantial research programs combining academic research with societal outreach. The Centre for Society & Genomics (CSG), Managing Innovation, Collaboration & Outsourcing in Research & Development (MICORD), Freude am Fluss and Waalweelde (Wealthy Waal). Moreover, all three departments offer Masters level training in innovation management, science communication and transnational water management.

Theme 1: Society & Genomics
(Department of Philosophy & Science Studies)
In 2004 the Centre for Society & Genomics (CSG) was established at the Department of Philosophy & Science Studies, funded by the Netherlands Genomics Initiative (NGI). CSG is an interactive research centre that combines scholarly activities with innovative societal interaction and collaboration with genomics researchers.
policy makers and societal stakeholders. In the fall of 2006, the CSG management team was invited by NGI to develop a plan for societal research and interaction in the field of genomics for the period 2008-2012. Its basic objective is to improve the societal embedding of genomics as well as the quality of the societal debate. Our research is developed along three lines: 1) governance of genomics applications, 2) agenda setting for knowledge production and 3) communication and education.

Collaboration with all the 14 Genomics Centres funded by NGI is a core element of the plan. This new programme was accepted for funding in December 2007. Related areas of interest at the department are science communication and public perceptions of science, animal philosophy and environmental philosophy. In 2007 a PhD project was initiated on the role of scientific expertise in the knowledge society.

Theme 2: Sustainable water management
(Centre for Sustainable Management of Resources)
An important focus for CSMR has been sustainable water management. It addresses a variety 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 technological mastery of water and river systems. Now, a more ecocentric approach is emerging. 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 important. Research is carried out on a regional, national and international scale (e.g. with the Waal river, Rhine tributaries, the Meuse, Loire, Yangtze and estuarine lakes).

Theme 3: Managing Innovation
(Department of Innovation Studies)
The Department of Innovation Studies was recently established in recognition of the need to provide an organizational vehicle for research activities at the Faculty of Science concerned with technological innovation and entrepreneurship. In close connection with the Masters track Management and Technology, the MICORD research programme was developed, for which funding was secured from various companies, research institutes and Ministries. The


Dissertations: 2
Scientific publications: 47
Professional publications: 4
MICORD programme (Managing Innovation, Collaboration and Outsourcing in Research and Development) studies problems of innovation and collaboration in three sectors that are of economic importance: food, chemicals and equipment manufacturing. Research in the programme is closely related to that taking place in the Centre for Innovation Studies (CIS) of Nijmegen School of Management.

Finally, ISIS has defined three overarching research themes to strengthen collaboration, namely: Visions of nature, the Knowledge society and Sustainability. All three research groups are involved in at least two of these themes. In June 2007 an international expert seminar was organised on visions of nature, resulting in an academic volume which will be published in 2008. In September 2007 two international expert meetings were organized on sustainability: a three-day expert meeting on implementing sustainable land use and water management in the Arnhem-Nijmegen region and a two-day expert meeting dealing with issues related to Sustainability and Religion (academic proceedings will be published in 2008). Finally, in May 2008, an international expert seminar on the knowledge society entitled ‘Common knowledge’ will be organized.

**Collaboration**

ISIS collaborates with a large number of academic and societal organizations, both nationally and internationally.
- Locally: Institute for Water and Wetland Research (IWWR), Nijmegen Centre for Molecular Life Sciences (NCMLS) and Centre for Innovation Studies (CIS)
- Regionally: Waalweelde and Freude am Fluss are projects in which various regional societal partners participate
- Nationally: CSG is a national research centre, located at our institute but collaborating with groups and experts at various universities
- Internationally (see below).

**International collaboration**

**Department of Philosophy / CSG**

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*. They also work together in the EU programme INES (Institutionalization of Ethics in Science Policy), in which CSG was responsible for the work package on medical genetics. This project, which was completed in 2007, will result in an academic volume in 2008.

**CSMR**

- 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).
- The expert meeting on sustainability (September 2007) resulted in an international cooperation with three Swedish knowledge institutes involving research and application of the natural step methodology (TNS) in river deltas.
- Together with Chinese, Netherlands and German governmental and non-governmental 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 forms 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.
- CSMR is either lead applicant or otherwise involved in four research/education projects funded by one of the three European Interreg programs (Interreg A, B and C), in which various GOs, NGOs and universities are involved:
  - River Cross (Interreg IIIC); Germany, Greece, Poland and the Netherlands
  - Freude am Fluss (Interreg IIIB); Germany, France and the Netherlands
  - Transnational Water Management (Interreg IIIA); Germany, the Netherlands
  - SIRE (Interreg IIIA); Germany, the Netherlands.

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<td>Innovation Studies</td>
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Innovation studies
MICORD receives funding from a number of international companies, including Akzo Nobel, Philips, Shell and the Dutch Polymer Institute for its research programme.

Research results
Department of Philosophy & Science Studies
In 2007 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 the previous research programme was completed and a new programme was launched. The previous programme focused on animal philosophy, environmental philosophy and genomics, resulting in four PhD theses. In 2007, PhD theses were defended by Riyan van den Born and Ellen ter Gast. Moreover, in 2007 the new Business Plan for a Centre for Society & Genomics 2008-2012 was approved for funding after intensive consultation with policy makers, genomics experts and societal organizations, and a positive assessment by an international peer review committee.

CSMR
In 2007 scientific progress was made in three research fields:
• Social science/participation processes: an analysis was made of the factors affecting success or failure in applying a joint planning approach to river basin management (the Wealthy Waal project). This led to a modification of a conceptual transition model that was based on a bottom-up approach involving all stakeholders.
• Geographic Information System and computing sciences: substantial progress was made in developing a river basin oriented GIS tool. This tool is now used to assess the hydraulic and ecological consequences of river-bed and flood-plain management measures.
• Environmental Science: greater insight was obtained into the interaction between the furrowing and burrowing activities of small mammals and the fate of pollutants in flood plains (dissertation: Sander Wijnhoven). The results led to a critical evaluation of policy guidelines relating to the handling and transport of polluted sediments.

ISIS research has resulted in twelve articles in international peer-reviewed journals, one academic volume (also translated into Chinese) and one special issue of the journal Hydrobiologia. Eight PhD projects are currently ongoing.

Department of Innovation Studies
In 2007 the MICORD programme was extended. Funding was secured for two additional PhD positions related to innovation in the machinery and equipment sector. The MICORD programme, which now covers innovation processes in all major types of industrial sectors, involves six externally funded PhD projects as well as senior researchers. The programme increased its visibility through a symposium organized on the role of the Dutch state in funding scientific research, especially that involving intermediary institutions. Moreover, the programme organized two sponsor meetings to inform its sponsors (including several large companies as well as ministries, TNO and NWO) about the progress of research.

Societal impact
A high degree of public visibility and relevance for society and policy is inherent in the innovative, interactive research agendas carried out 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 podiums such as cultural centre LUX and popular magazines. Continuous, systematic interaction with a variety of stakeholders and developing new tools for interactive research are key features of CSG’s methodological profile.

Evidence of the societal outreach of the CSMR’s research can be found 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 programs and materials have been developed that are used to train in international professionals and academics and research has been undertaken to resolve specific issues raised by the partners. Regional development plans are structured according to a Joint Planning Approach, a stepwise decision-making method that involves all relevant stakeholders.

The Department of Innovation Studies also involves key societal stakeholders in developing its research program, in particular those from industry. In March 2007, Ben Dankbaar presented a policy paper on the future of the Dutch Manufacturing Industry to the National Congress on Manufacturing, which received considerable media attention and praise from business and policy makers alike.

Future research
The new CSG research programme that will start in 2008 involves a series of projects on new topics such as the societal
Hub Zwart has been a Full Professor of Philosophy of Science at Radboud University Nijmegen since 2000. The focus of his research is on epistemological and ethical issues in the life sciences: biomedicine (1988-1996), research with animals (1996-2003), environmental research (1998-2003) and genomics (2003-now). He was also Coastal Values (1999-2003). Since 2004 Prof. Zwart has been the director of the Centre for Society & Genomics. He is a co-editor of the journal Genomics, Society & Policy and member of the Editorial Boards of the journals Environmental Values and Tailoring Biotechnologies.

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**Glossary**

(e) Extraordinary chair
(o) Ordinary chair
(p) Personal chair
DFG Deutsche Forschungsgemeinschaft – German Research Foundation
DFN Diabetes Fonds Nederland – Dutch Diabetes Research Foundation
ESF European Science Foundation
FOM Stichting voor Fundamenteel Onderzoek der Materie – Foundation for Fundamental Research on Matter (Netherlands)
FP6 EU Framework Programme 6
FTE Full-time equivalent for research
FTE 1st Full-time equivalent for research directly funded by government
FTE 2nd Full-time equivalent for research funded by KNAW or NWO
FTE 3rd Full-time equivalent for research funded by other organizations
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
NHS Nederlandse Hartstichting – Netherlands Heart Foundation
NROG Nationaal Regie-Orgaan Genomics – Netherlands Genomics Initiative
NWO Nederlandse Organisatie voor Wetenschappelijk Onderzoek – Netherlands Organisation for Scientific Research
Senter An agency of the Netherlands Ministry of Economic Affairs which is responsible for managing grant allocation in technology, energy, environment, export and international cooperation
Spinoza The most prestigious prize (€1,500,000) for scientists in the Netherlands who are at the very top of the research profession, awarded by NWO
STW Technologiestichting STW – Technology Foundation STW (Netherlands)
UMC Radboud University Nijmegen Medical Centre
Veni grant Personal grant from NWO (max. value: €200,000) awarded over a period of three years to researchers who have recently obtained their PhD, to allow them to continue to develop their ideas
Vidi grant Personal grant from NWO (max. value: €600,000) awarded over a period of five years to researchers who wish to develop an innovative line of research in which they appoint one or more co-researchers
Vici grant Personal grant from NWO (max. value: €1,250,000) awarded over a period of five years to senior researchers who wish to establish their own research group
ZonMw Zorg Onderzoek Nederland / NWO Medische Wetenschappen – Netherlands Organisation for Health Research and Development