Leiden Science

OUR TALENTS & DISCOVERIES IN 2015

Faculty of Science

Universiteit Leiden

Leiden Science, Our Talents and Discoveries in 2015

We are SCIENCE SINCE 1815

Content


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ONTWERP JE ALSW

We are science!

The year 2015: 200 years of Faculty of Science! On 2 August 1815, the Faculty of Science was established at Leiden University through 'het Organiek Besluit' by King Willem the First. We celebrate this important moment in time during the academic year 2015-2016.

On 1 September, we had a very festive opening of the academic year, with entertainment, food & drinks in and around our buildings. We published a solid book about our rich history. In October, an impressive Science Run was organised. More than 50 teams of students, supporting staff, teachers and professors joined their efforts to raise money in order to support highly educated refugees in the Netherlands.
Since 1815, we aim to excel in both research and education in a broad range of disciplines: from Mathematics to Environmental Sciences. In each of our disciplines our key criteria in building a strong research and education portfolio are scientific impact, technological innovation and societal relevance.

Over the last years, to enhance our impact and visibility, the Faculty of Science has organised most of its activities around two large and recognizable research domains: 'Fundamentals of Science' and 'Bioscience: the Science Base of Health'. These areas offer new opportunities for fundamental research across the boundaries of our disciplines, and connect with important societal challenges.

The key facilities, such as the Metabolomics Facility (established in 2015), NeCEN, the Cell Observatory, the Paramagnetic NMR facility, the Leiden Centre of Data Science and the Lorentz Center are the platforms where scientists meet, exchange knowledge and share research infrastructure. In 2015, we launched our web portal 'Open Access Research Infrastructure' (OARI). Moreover, most of our top research facilities are now accessible for colleagues around the world.

In 2015, the number of students enrolling our faculty programmes has again increased substantially. We aim to challenge talented students, to amaze and inspire them to become the successful academics of tomorrow, making important contributions to science and society, and to create a better global environment.

We are very proud of the efforts and achievements of all our staff, teachers and students. Together we make up our science community in Leiden: We are science!

The Board of the Faculty of Science,

Geert de Snoo

Han de Winde

Gert Jan van Helden

Marieke Vinkenoog

Facts & Figures

Institutes

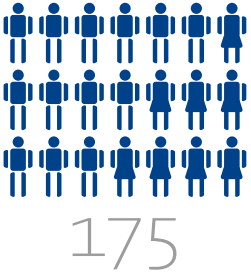
Leiden Observatory, Leiden Institute of Physics, Mathematical Institute, Leiden Institute of Advanced Computer Science, Leiden Institute of Chemistry, Leiden Academic Centre for Drug Research, Institute of Biology Leiden, Institute of Environmental Sciences

University research profile areas we participate in

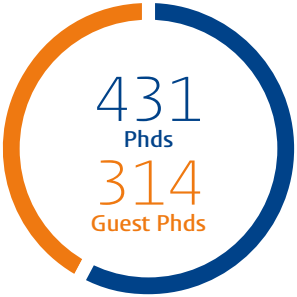
Fundamentals of Science, Bioscience: the Science Base of Health, Translational Drug Discovery and Development

Staff

Total no. of post Docs



Phd's vs Guest Phds



Financial Facts 2015 in K€

Total Turnover

Direct Funding

Ministry of Education, Culture and Science

€ 62,741

Research funding

National funding comprises funding from NWO, KNAW and STW

Other external (research) funding

BSc programmes

Astronomy, Bio-Pharmaceutical Sciences, Biology, Computer Science, Life Science and Technology *, Mathematics, Molecular Science and Technology *, Physics

MSc programmes

Astronomy, Bio-Pharmaceutical Sciences, Biology, Chemistry, Computer Science, ICT in Business, Industrial Ecology *, Life Science and Technology, Mathematics, Media Technology, Physics

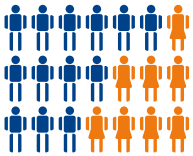
If appropriate with MSc specialisations:
Science Based Business, Science Communication and Society, Education

* Joint programme with Delft University of Technology

Total no. of students

No. of BSc students

2201



M | F

63% | 37%

No. of MSc students

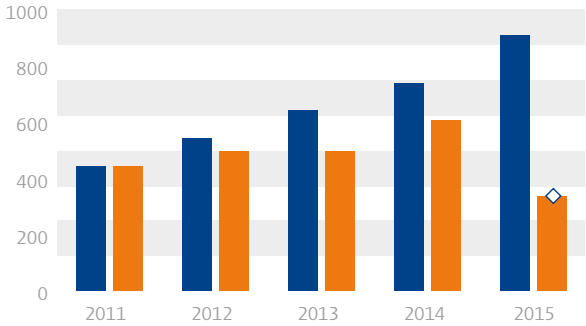
1333

M | F

62% | 38%

Diplomas 2014-2015	Total	Cum Laude	Summa Cum Laude
P-in-1	366	75	6
Propedeuses	519	77	6
BSc	339	33	6
MSc	361	85	6
Honours College	17	10	

Number of students enrolled ■ BSc ■ MSc



◇ Enrollments starting September 2015 (2nd enrollment is in February 2016)

Key Facilities

The faculty hosts a range of key facilities, which have in most cases been purchased with public funds. 'Open access' is an important element in the way we publish our research results, but also in how we see our facilities. We promote the use of our facilities by third parties through our Open Access Research Infrastructure Portal, OARI. The aim is to enable and encourage collaboration between researchers locally and nationally, to make more efficient use of our facilities and to open up our facilities for research outside the faculty, for instance for companies and other institutions.

Metabolomics Facility Leiden

Opened in April this year, the facility is the result of a close collaboration between the Bio Medical Facility of the Leiden Academic Centre for Drug Research and the Natural Products Laboratory of the Institute of Biology Leiden. Metabolomics research makes changes in metabolism visible, which in turn will make it possible in the future to establish diagnoses better, faster and earlier, as well as to predict the effect of different methods of treatment. The facility's ultimate goal is to prevent disease and to improve health throughout the human lifespan.

- http://analyticalbiosciences.leidenuniv.nl/facility_bmfl
- http://science.leidenuniv.nl/index.php/ibl/natural_products_lab

NeCEN

NeCEN is the open access facility for cryo electron microscopy in the Netherlands and offers research institutes and companies access to advanced cryo electron microscopy and expertise. The cryo electron microscopes are specifically designed to explore complex biological structures.

Cryo-electron microscopy (cryo-EM) is an imaging technique wich aims to visualize bio molecular structures such as proteins, macromolecular complexes, bacteria and cell organelles with a resolution better than a nanometer. The methods that are employed in imaging are suitable for a wide variety of research applications that can possibly lead to faster and better methods to understand, diagnose, cure and prevent diseases at a molecular level. NeCEN provides a variety of services, ranging from cryo electron specimen preparation and data collection to image processing and training. In 2015, NeCEN was embedded within the Leiden Institute of Biology, professor Bram Koster was appointed as director, and a new website was launched.

- http://www.necen.nl/

Paramagnetic NMR Facility

The Paramagnetic NMR (nuclear magnetic resonance) Facility in Leiden provides support to researchers who want to apply paramagnetic NMR spectroscopy to biomolecules.

Support is offered in the design and synthesis of paramagnetic probes, either for general applications such as lanthanide tags and spin labels, or for dedicated purposes such as enzyme substrates modified with a paramagnetic group. Help can also be provided with the attachment of probes to proteins and the acquisition, processing and analysis of data.

http://nmr.lic.leidenuniv.nl/paranmr

Cell Observatory

The Cell Observatory houses cutting-edge bio imaging technology and other research facilities, aimed at visualizing the dynamic structures of life - from molecule to cell.

The goal of research at the Cell Observatory is to visualize and comprehend the dynamics of the living cell down to the molecular level and to understand the fundamental mechanisms of life that are essential for progress in tackling disease. The Cell Observatory is host to a broad range of science research, from Biophysical Structural Chemistry, Imaging and Bioinformatics, Toxicology, Medical Pharmacology, Molecular Cell Biology to the Physics of Life Processes and in Ecotoxicological testing and experimental research.

http://cellobservatory.leidenuniv.nl

Hortus botanicus Leiden

The Hortus botanicus, founded in 1590, is the oldest botanical garden in the Netherlands and one of the oldest in the world.

Her mission is to manage a living plant collection for research and education as well as for public interest and enjoyment. The year 2015 was a special year. Not only did the Hortus celebrate her 425-year anniversary, this year also more visitors than ever before were welcomed: over 145,000! In addition, prefect Paul Keβler received the 'World Tulip Summit Award – Tulip Garden of the Year 2015': a crown on this season that started with the gift of the 'Garden of Clusius', a tulip named after one of the founders of the Hortus. In October, the new Chinese herb garden was opened. A garden with an emphasis on plants from traditional Chinese medicine. Finally, the Hortus organised the 'Botanic Gardens in a changing world' Congress: an International Conference on the goals and challenges of botanical gardens worldwide. All in all, 2015 was a year to be particularly proud of.

http://www.hortusleiden.nl

OARI Open Access Research Infrastructure

'For success in research, access to high-quality research facilities is essential'.

At the Faculty of Science we believe that facility sharing contributes to new partnerships, attracts talented researchers and encourages local entrepreneurship. Sharing resources and expertise potentiates individual efforts, increasing the efficiency of scientific output. Moreover, we feel that access to publicly funded research infrastructure is part of our societal responsibility. Following our vision of 'open access in facilities' we have opened up our research facilities by introducing the 'Open Access Research Infrastructure' (OARI) portal in March of 2015. OARI features an online database comprising the available research instruments and related expertise. These are accessible to researchers of universities, knowledge institutions and the industry.

www.oari.leidenuniv.nl

Lorentz Center

The Lorentz Center is an international center that coordinates and hosts workshops, based on the philosophy that science thrives on interaction between researchers.

Workshops focus on new collaborations and interactions between scientists from different countries and fields, and with varying seniority. Through a combination of informal talks, working sessions and discussions, participants are able to assess the status of a field and its future, to collaborate, to establish new international contacts, and to spot upcoming talent. Starting in 2016, interaction with and broadening towards the field of Humanities will be explored. In 2015 the Center hosted 56 workshops.

www.lorentzcenter.nl

The Leiden Centre of Data Science

Data Science is a quickly rising scientific discipline. It deals with finding, analyzing and validating complex patterns in data.

Data Science methods are indispensable for maintaining a competitive edge in all disciplines in science. The Leiden Centre of Data Science (LCDS) is a network of researchers from different scientific domains within Leiden University with an interest and expertise in data science. Its core consists of researchers in the Faculty of Science and the Leiden University Medical Center. LCDS aims to facilitate cooperation between different academic disciplines and to generate knowledge and technology to solve data problems associated with the grand challenges of the 21st century by generating knowledge and technology in the field of data science.

http://lcds.science.leidenuniv.nl

Leiden Science for Innovation and our Society

Academic research is vital for society. Universities are a breeding ground for innovation, collaboration and entrepreneurship. Research and education does not take place in a vacuum: it has a direct impact on society, in many ways. Our science is also for a large part funded by society. This relation is more complex than a simple quid pro quo.

Our graduates are our clearest and most important contribution to society. Each year hundreds of talented and well trained professionals leave our Faculty to work in society or business. Others continue in science. Our research leads to new products and patents which generate market value and jobs. In some cases this research was publicly funded, but sometimes economic value is the explicit goal of research, and funding is provided by the private sector. For all research, the primordialty and integrity of academic standards and values are crucial.

Apart from commercializing an invention through a spin-off company or patent, there are many ways to create impact. Research within our institutes covers a broad spectrum of knowledge transfer to society. For example by making knowledge and expertise available for small and medium enterprises, by applying academic methods to issues such as health and waste, and by disseminating academic insights to general audiences. But also by bringing science into the classrooms of primary and secondary education and by organising events and lectures for a broad audience. We encourage our students and researchers to open up further research and innovation activities to address the challenges society is facing today.

Crowdfunding for a new solar telescope

After nearly 70 years, the Leiden Observatory has a new telescope. With a successful crowd-funding project the required amount of money was brought in to build it.

The first solar telescope, the heliostat, was introduced in Leiden in 1742. The crowdfunding project has allowed for a unique collaboration in which the Leiden Observatory Workgroup and the 'Leidse Instrumentmakers School' built the telescope together.

The solar telescope, which can be visited in the Leiden Observatory's Visitor's Centre, consists of an ingenious mirroring system, which sends sunlight from the roof of the Old Observatory all the way down to the visitor's centre in the basement. The 'live images' of the sun, with a diameter of 1 meter, are projected directly onto a wall. This enables the public to see the sun at close range and experience the solar flares, sunspots and other activities on the surface of our own star.

Leiden Observatory
www.oudesterrewacht.nl

Novel meta material buckles on demand

The promise of meta materials is to realize artificial structures with unusual properties that would be hard to come by in nature. These unconventional properties can be programmed by suitable design of their geometry or topology. Leiden researchers created a 3D-printed working prototype of a novel meta material that displays selective and tuneable buckling.

Researchers designed a novel meta material that buckles on demand. Small structural variations in the material single out regions that buckle selectively under external stress, whereas other regions remain unchanged. The research was carried out in the Topological Mechanics Lab. The lab is fully dedicated to study the mechanical analogues of so-called topological insulators, a recently discovered exotic quantum state of matter. When applied to macroscopic structures, the topological ideas underlying these exotic states give rise to materials with unusual mechanical properties.
Selective buckling materials have a wide range of potential applications in engineering and medicine. The buckling behaviour can be tuned without changing other physical properties such as electromagnetic or heat conduction. A typical application would be in shape-memory materials, in which shape-transitions usually take place when the temperature is changed. Selective buckling regions in such materials would show dramatically different shape transitions from the rest of the structure, without affecting the heat flow, giving engineers an new possibility to tune such devices.

Leiden Institute of Physics
Publication in PNAS www.pnas.org/content/112/25/7639.abstract

Making Sense of Illustrated Handwritten Archives

Many handwritten and illustrated archives contain a wealth of information, but are largely underexplored because they are complex and difficult for computers to decipher. The aim of the Making Sense of Illustrated Handwritten Archives project is to develop a digital environment that resolves this challenge and connects heterogeneous archival content to other digital sources.

The Leiden Centre of Data Science and the Leiden Institute of Advanced Computer Science are part of a consortium that will carry out research on making illustrated and handwritten archives digitally accessible. The project is funded by NWO. The project will be centred around one of the top collections of Naturalis Biodiversity Center: the archive and collection of the 'Natuurkundige Commissie', which contains a rich verbal and pictorial account of nature, cultures and economics in the Indonesian archipelago (1820-1850).
The researchers will use an advanced system for handwriting and image recognition (Monk), complemented with contextual information on species, locations and habitats. Naturalis' taxonomic expertise, in combination with other methods, will be used to refine the system further. The outcome of the project will allow publisher Brill to offer the system as an online service for the heritage sector, as a strengthening of its digital humanities profile. This will serve both curators of illustrated handwritten archives and researchers who wish to further the understanding of these collections.

Leiden Institute of Advanced Computer Science
Leiden Centre for Data Science

Secure Multiparty Computation and Secret Sharing

In today's society, which is for a large part data-driven, we encounter numerous situations where private information is an important resource. How can parties handle confidential data if they do not trust everyone involved? Together with Ivan Damgård and Jesper Nielsen, Ronald Cramer published the first book ever on information-theoretically secure multiparty computation (MPC). MPC is a subfield of cryptography that describes security systems that cannot even be broken by quantum computers or unlimited computing power. The MPC research involves shared computations on mutually secret data between parties who do not trust each other, while the privacy of one's own data in regard to the others' is maintained. For this reason, the parties involved simulate the functionality of a trusted third party, without the need for a real one.

The authors present basic feasibility results from the last 30 years, generalizations to arbitrary access structures using linear secret sharing, some recent techniques for efficiency improvements, and a general treatment of the theory of secret sharing. The fundamental research on MPC has interesting applications. For instance, it offers a mechanism for auctions where bidding strategies are to be kept secret and applications for safe electronic voting.

Mathematical Institute
Secure Multiparty Computation and Secret Sharing
Ronald Cramer, Ivan Bjerre Damgård, Jesper Buus Nielsen
Cambridge University Press:
http://www.cambridge.org/9781107043053

Genes that affect spread of breast cancer

A team of toxicologists lead by professor Bob van de Water and colleagues studied 1500 individual genes and mapped genes that cause breast cancer cells to migrate. They found eight, including the SRPK1 gene, that regulate the migration of tumour cells and correlate with disease outcome of breast cancer patients.

These eight genes were shown to control cell migration, one of the causes of metastasis. Aggressive tumour cells have the capacity to invade the tumour environment and target other parts of the body. Aggressive tumour cells are very motile and have so-called dynamic 'feet'. These little feet allow them to be motile and spread to other parts of the body. Inhibiting the SRPK1 kinase makes the 'feet' less motile, and reduces the migration of the tumour cells. In principle, every cell has these genes, albeit with a different degree of expression, some being more strongly present in tumour cells than others. SRPK1 is closely linked to the potential of breast tumour cells to migrate. This finding offers a starting point for developing cancer medications that can prevent cells from invading their surroundings and ultimately spreading to distant organs.
'The genes identified encode druggable molecules known as kinases,' Van de Water explains. We are hoping to develop new compounds that can inhibit these kinases, and reduce the chance of metastasis. Preventing metastases and killing tumour cells at the secondary sites is crucial for treating cancer.'

Leiden Academic Centre for Drug Research

- Publication in the Journal of Clinical Investigation Bob van de Water and Sylvia Le Dévédec: www.jci.org/articles/view/74440?key=8dbf68971ee3f5a5a28c

Fat-free mayonnaise

Mixtures of proteins and carbohydrates are relevant for applications in the food industry. Aqueous solutions of proteins and carbohydrates separate into two parts with an extremely 'soft' boundary surface.

The surface tension between these two parts can be manipulated, for example by adjusting the pH balance. This can be used to develop emulsions of a water-based solution in another aqueous solution, such as fat-free mayonnaise. For a joint research project with researchers from Utrecht University, the theoretical foundation was provided by researchers from the Colloid and Interface Science research group. Edgar Blokhuis explains: "Both parts of the emulsion consist of 90% water. As a result, small molecules such as ions have no trouble moving through the water-water boundary. Thanks to their electric charge, the ions are attracted to protein molecules and will therefore primarily move towards the protein part, which is not ideal from a statistical perspective. We developed a theory to map this conflict." Many studies of these kinds of systems are purely empirical: researchers try out different things to see what works. This study provides a theoretical framework that makes it possible to specifically define the circumstances required to create the desired emulsion.

Leiden Institute of Chemistry

- Publication in Physical Review Letters http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.115.078303

Antibiotics as weapons in nature

Bacteria use antibiotics as a weapon and produce more antibiotics if there are competing strains nearby. Antibiotics are important in combating diseases, but pathogens are becoming increasingly resistant to existing antibiotics. The research, which is aimed at developing new drugs, shows how bacteria can be stimulated to produce antibiotics by growing them in the presence of competing strains.

In nature, antibiotics act as a weapon against rival bacteria. This seems logical, but remains controversial, because the concentrations in the soil appear to be far too low to act as a weapon against other bacteria. Leiden scientists Daniel Rozen and Gilles van Wezel found that in soil with few nutrients and competing bacteria nearby, the Streptomycetes start to produce more antibiotics in order to protect the food sources available. Computer simulations showed how the strains enter into a lot of 'social interaction' in a nutrient-rich environment, allowing the exchange of genetic material and the creation of new bacterial variants.
This discovery also offers important new insights into the search for new antibiotics. The Streptomyces bacteria are able to produce the antibiotics we seek, but they will not do this automatically. You have to, as it were, awaken the antibiotics in the bacteria by stimulating them in the right way.
The team published their research results in the authoritative Proceedings of the National Academy of Sciences USA on 28 July 2015.

Institute of Biology Leiden

Publication in PNAS by Daniel Rozen and Gilles van Wezel
www.pnas.org/content/112/35/11054.abstract

Family of footprints for better sustainability insights

An environmental footprint, a measure that indicates for instance how much land and water surface is utilised by a population group, can serve as an important instrument for making a country or region more environmentally friendly.

The world abounds with different footprints that calculate human impact on the environment; there is no uniform method for doing this. There are at least twenty different systems, each of which looks at a limited area of activity and has its own methodology. Environmental specialist Kai Fang now has developed a family of footprints that allow better measurement of environmental damage and the depletion of natural sources.
Fang designed a system that allows the various footprints to be brought together into an integrated index. In the family of footprints ecological, energy, carbon and water footprints are combined. This creates a better overview of the total human impact on the environment. Fang also took the so-called planetary boundaries into account, limits within which people need to operate in order to ensure that natural resources are used in a sustainable way. He formulated planetary boundaries on the basis of population size for carbon emissions, and on the basis of the availability of natural resources for water and land use. The combined analysis will serve to better equip countries to adapt their sustainability policy to reduce human impact on our planet.

Institute of Environmental Sciences

Science Research in 2015

Prizes and Honours

Ton Bakker received a Royal decoration "Member in the Order of Oranje Nassau".

Paul Kessler received the Leiden "Universiteitspenning" and the "World Tulip Summit Award" for Tulip Garden of the Year 2015.

Leiden Observatory

Prof. Koen Kuijken received the Humboldt Research Award.

Prof. Ewine van Dishoeck received the Einstein World Award of Science and the Lodewijk Woltjer Lecture Award.

Dr. Shabaz Sultan and prof. Simon Portegies Zwart won a Surf Innovation Challange Awards for Interactive high-performance laboratory for Chaos.

Leiden Institute of Physics

Dr. Jaap Kautz and dr. Johannes Jobst received the NeVac prize.

Prof. Carlo Beenakker received a Royal decoration "Knight in the Order of the Lion of the Netherlands".

Prof. Michel Orrit received the Grand Prix SFO Léon Brillouin.

Dr. Bernard van Heck was chosen for the Lindau Nobel Laureate meetings.

Dr. Tri Astraatmadja was one of 3 PhDs who received the 2015 Dissertation Prize of the Global Neutrino Network.

Mathematical Institute

Prof. Aad van der Vaart received a Spinoza prize.

Dr. Ziyang Gao won the Stieltjes Prize for best PhD thesis.

Djordjo Milovic has won the Dutch Royal Mathematical Society award for PhD students.

Leiden Institute for Advanced Computer Science

Prof. Grzegorz Rozenberg received an honorary doctorate from the Warsaw University of Technology.

Leiden Institute of Chemistry

Freek Janssen MSc received the 'Farmacochemie' prize of the Royal Netherlands Chemical Society for best presentationat the FIGON Dutch Medicine Days.

Dr. Tatu S. Kumpulainen received the 'Dick Stufkens Prijs' for the best PhD thesis of the Holland Research School of Molecular Chemistry (HRSMC).

Dr. Lianne Willems received the 'Backerprijs' of the Royal Netherlands Chemical Society for her PhD thesis.

Leiden Academic Centre for Drug Research

Prof. Gerard Mulder was appointed honorary member of The Health Council of the Netherlands.

Drs. Bart Lenselink won the oral presentation at the LACDR Spring Symposium with his presentation "Predicting Drug Potency".

Institute of Environmental Sciences

PhD researcher David Font Vivanco, together with dr. Ester van der Voet, dr. Reinout Heijungs and dr. Renée Kemp (Maastricht university) won the Graedel Prize 2014 for best paper published by a junior author in the Journal of Industrial Ecology.

Dr. Merlijn van Weerd won the Parker / Gentry Award 2015 for Conservation Biology at the Field Museum Chicago.

Appointments

Marieke Vinkenoog was appointed assessor to the faculty board.

Leiden Observatory

Prof. Carlos Frenk was appointed on the honorary Oort chair 2015.

Prof. Ewine van Dishoeck was appointed president of the International Astronomical Union (IAU).

Leiden Institute of Physics

Prof. John Pendry was appointed on the honorary Lorentz chair 2015.

Dr. Martin van Exter was appointed Professor in Optics.

Dr. Vincenzo Vitelli was appointed professor Theory of Condensed Matter.

Dr. Niels Laurens was appointed Institute Manager.

Mathematical Institute

Prof. Yakov G. Sinai was appointed on the honorary Kloosterman chair 2015.

Prof. Jaqueline Meulman was appointed as member of the Royal Holland Society of Sciences and Humanities.

Dr. Bart de Smit was appointed professor of Algebra and number theory.

Prof. Aad van der Vaart was appointed scientific director of the Mathematical Institute.

Leiden Institute for Advanced Computer Science

Prof. Natašja Jonoska was appointed on the honorary Pascal chair 2015.

Prof. Jaap van den Herik was appointed director of education Mediatechnology.

Spinoza Prize for statistician Aad van der Vaart

Aad van der Vaart was awarded the Spinoza Prize for his ground-breaking research in statistics. Van der Vaart conducts fundamental research on models that can help, for instance, to identify genes that play a role in cancer.

Van der Vaart received the prestigious prize because he is an international leading authority in the research field of mathematical statistics. His books on estimation theories are highly influential works, while his applied statistics make an important contribution to areas such as medical imaging and statistical genetics. Fifteen years ago, he drew wide attention in the Netherlands to nonparametric Bayesian statistics, and it is partly thanks to his efforts that this branch of statistics has developed into a key research field. Van der Vaart not only works with applied mathematics. The core is pure mathematics.
“I formulate the necessary concepts and develop theories. These can then be applied to all kinds of situations. But the aim is to formulate a theory that is universal.”

www.math.leidenuniv.nl/~avdvaart

Leiden Institute of Chemistry

Dr. Sylvestre Bonnet was elected as member of the Young Academy of Europe.

Prof. Marc Koper was elected Fellow of the International Society of Electrochemistry.

Leiden Academic Centre for Drug Research

Prof. Ad IJzerman was appointed secretary of the Royal Holland Society of Sciences and Humanities (KHMW).

Leiden Institute of Biology

Prof. Vera van Noort was appointed on the honorary Van der Klaauw chair 2015.

Dr. Ionica Smeets was appointed professor of Science communication.

Dr. Tinde van Andel was appointed by the Clusius foundation as professor of the History of Botany and Gardens.

Dr. Ariane Briegel was appointed professor of Ultrastructural biology.

Prof. Bram Koster was appointed director of the Netherlands Centre for Elektron Nanoscopy (NeCEN).

Institute of Environmental Sciences

Prof. Hai-Xiang Lin was appointed professor on Data Analytics for Environmental Modelling.

Honorary Chairs

Each year, a number of eminent scientists are appointed to occupy an "honorary chair" in the Faculty. The Lorentz chair has an illustrious history; 13 occupants of the chair later received a Nobel prize in physics. In general, the honorary professors spend two months in the institute and give both advanced lectures for PhD students and staff and a public lecture for a broad audience.

Honorary Oort chair 2015: professor Carlos Frenk

Professor Frenk is a Mexican-British cosmologist. He is Director of the Institute for Computational Cosmology at Durham University. Along with collaborators from all over the world, he builds model universes in state-of-the-art supercomputers, trying to understand how the structures in our Universe evolved from simple beginnings to the complex structures composed of stars and galaxies that we see today. Frenk's research interests span cosmology, large-scale structure, galaxy formation and supercomputer simulations of the formation of cosmic structures. He is PI of the Virgo consortium, an international collaboration involved in cosmological supercomputer simulations and a member of the Anglo-Australian '2dF' galaxy redshift survey project and coordinator of an EC Alfa programme for collaboration with researchers in Latin America.

http://star-www.dur.ac.uk/~csf/

Carlos Frenk

John Pendry

Natašja Jonoska

Honorary Lorentz chair 2015: professor John Pendry

Sir John Brian Pendry is an English theoretical physicist known for his research into refractive indices and creation of the first practical "Invisibility Cloak". He is a professor of theoretical solid state physics at Imperial College London where he was head of the department of physics (1998–2001) and principal of the faculty of physical sciences (2001–2002). He is an honorary fellow of Downing College, Cambridge, (where he was an undergraduate) and an IEEE fellow. He received the Kavli Prize in Nanoscience "for transformative contributions to the field of nano-optics that have broken long-held beliefs about the limitations of the resolution limits of optical microscopy and imaging" together with Stefan Hell and Thomas Ebbesen, in 2014.

http://www.imperial.ac.uk/people/j.pendry

Honorary Pascal chair 2015: professor Natašja Jonoska

Natašja Jonoska is a professor at the department of Mathematics and Statistics at the University of South Florida in Tampa. Her research interests are in theoretical and computational models of molecular self-assembly and molecular biology. For the last fifteen years she has had extensive research collaborations with experimentalists in molecular biology and structural DNA nanotechnology. She is a Fellow of the American Association for the Advancement of Science and has been awarded the 'Rozenberg Tulip Award' in DNA Computing an Molecular Programming by the International Society for Nanoscale Science and Computing. Natašja serves on editorial boards of several journals, including Theoretical Computer Science and the International Journal of Foundations of Computer Science.

http://shell.cas.usf.edu/~jonoska/index.html

Grants

Leiden Observatory

Dr. Alessandra Candian received a VENI grant for The Inventory of Large Molecules in Protoplanetary Disks.

Dr. Francesco de Gasperin received a VENI grant for Observing the Universe at the longest wavelengths.

Prof. Christof Keller and dr. Frans Snik received an STW Demonstrator grant.

Dr. Sebastiaan Krijt received a Rubicon grant.

Prof. Joop Schaye received a VICI grant for How do galaxies regulate their growth?

Dr. Frans Snik received an ERC Starting Grant.

Leiden Institute of Physics

Dr. Milan Allan received a VIDI grant for A new view on a mysterious quantumsoup.

Dr. Johannes Jobst received a VENI grant for Taking Pictures of Free-flying Electrons.

Prof. Michel Orrit received a FOM "projectruimte" grant for An optical GPS for single electrons.

Dr. Dorothea Samtleben received a grant from the Netherlands eScience Center.

Prof. Jan Zaanen and prof. Koenraad Schalm received a FOM "projectruimte" grant for The strange metals: when quantum entanglement reaches its extreme.

Leiden Institute for Advanced Computer Science

Prof. Jaap van den Herik and collegues received an NWO Creative Industry grant.

Leiden Institute of Chemistry

Dr. Aimee Boyle received a VENI grant for A Novel Supramolecular System for Membrane Fusion and Biosensing.

Dr. Jeroen Codee is one of the participant in an EU Marie Curie Training network that received 3.5 M€ for the rational design of the next generation of well-defined glycoconjugate vaccines.

Prof. Marc Koper received a grant from STW and Tata Steel.

Dr. Alexander Kros received a VICI grant for Understanding membrane fusion at the molecular level using a biomimetic model system.

Dr. Jorg Meijer received a VIDI grant for Chemical reactions - hot or not?

Prof. Hermen Overkleeft received an EU Proof of Concept grant for Sphingolead, Development of a potent dual GCS/GBA2 inhibitor as a best in class Gaucher therapeutic.

Dr. Francesco Buda received an NWO supercomputing grant of 1 million core hours on Cartesius for his research on photo-induced charge separation processes and catalytic water oxidation reactions relevant for converting solar energy into fuel.

Leiden Academic Centre for Drug Research

Prof. Thomas Hankemeijer received EU Horizon 2020 grants out of the Personalising Health Care programme for CoStream and for SysKMedPD.

Prof. Bob van de Water is coordinator of an international consortium that received a 30 M€ EU Horizon 2020 grant.

Dr. Gerard van Westen received a VENI grant for the project New role for receptors in cancer.

Leiden Institute of Biology

Dr. Wouter Halfwerk received a VENI grant for Influence of noise on the processing of visual and spatial information.

Prof. Peter Punt and dr. Erik Vijgeboom obtained an NWO grant for FILAZYME to develop filamentous micro-organisms for enzyme production to degrade biomass.

Dr. Hans Slabbekorn leads an internaional research team that received a grant form the Joint Industry Programme (JIP) to study the potential negative effects of sound on fish.

Dr. Ewa Snaar received a EU Horizon 2020 eHealth grant for UM cure 2020.

Institute of Environmental Sciences

Prof. Peter van Bodegom received a EU Horizon 2020 grant for MULTIPLY.

Dr. Ester van der Voet received a EU Horizon 2020 grant for MICA.

Lorentz Center

The Lorentz Center received a 3 M€ grant from NWO.

Honorary Kloosterman chair 2015: professor Yakov Sinai

Yakov Grigorevich Sinai is a mathematician known for his work on dynamical systems. He contributed to the modern metric theory of dynamical systems and connected the world of deterministic (dynamical) systems with the world of probabilistic (stochastic) systems. He has also worked on mathematical physics and probability theory. His efforts have provided the groundwork for advances in the physical sciences. Sinai has won several awards, including the Nemmers Prize, the Wolf Prize in Mathematics and the Abel Prize. He is a (honorary) member of various prestigious Academies. Sinai has authored more than 250 papers and books. Concepts in mathematics named after him include Sinai's random walk, Sinai–Ruelle–Bowen measures, and Pirogov–Sinai theory.

https://www.math.princeton.edu/directory/yakov-sinai

Yakov Sinai

Honorary Van der Klaauw chair 2015: professor Vera van Noort

Vera van Noort is professor in Computational Systems Biology at the KU Leuven in Belgium. Her research focus is in understanding biological systems as a whole, using computational analysis of large-scale data generated by the ever-growing number of new technologies that can systematically measure the behaviour of multiple cellular components. Within her group new methods are developed to integrate, visualize and query the large amounts of information available to come to new biological discoveries. In October 2013, Van Noort started her own group within the Centre of Microbial and Plant Genetics at the KU Leuven. Van Noort has published over 35 articles in major scientific journals and has ample experience in teaching bioinformatics and genomics.

www.kuleuven.be/wieiswie/nl/person/00089822

Vera van Noort















Raar

Awards & Prizes 2015

Gang Chen, Lin Jiang, Feng Jiang, Li Kong, Can Cui and Weiwen Zhong from the Leiden China Community won the 'Van Bergen' prize 2015 for their proposal 'Strengthen Academic and Career Communications between Dutch and Chinese Students'.

Leiden Observatory

Sebastiaan Haffert MSc won the 'De Zeeuw-Van Dishoeck' prize in Astronomy from the Royal Holland Society of Sciences and Humanities (KHMW) for the discovery of wavefront sensors for telescopes.

Universe in a Box received the Scientix Resources Award for Science Technology Enginering and Math (STEM) Teaching Material Addressed to Teachers.

Leiden Institute of Physics

Fedde Fagginger won a Young Talent support prize from the Royal Holland Society of Sciences and Humanities (KHMW).

Jacob Bakermans received the Physica prize for best Bachelor thesis.

Mathematical Institute

Onno Berrevoets received the silver medal in the International Mathematics Competition (IMC).

Michel Zoeteman won a Young Talent support prize from the Royal Holland Society of Sciences and Humanities (KHMW).

The Bachelor and Master programmes Mathematics were chosen as best programmes by the Duth professors in Elsevier.

Leiden Institute for Advanced Computer Science

The Master programme Computer Science was chosen as best programme by the Dutch students in Elsevier.

Four Leiden teams made it to the finals of the Benelux Algorithm Programming Contest (BAPC).

Roy van Hal won a Young Talent support prize from the Royal Holland Society of Sciences and Humanities (KHMW).

Prof. Bas Haring and colleagues received an OCW grant for the development of a SPOC on Scientific integrity.

Dr. Harmen Jousma received the Leiden University "Teaching award" and became member of the Leiden University Teachers Academy.

The Master programme Mediatechnology received a Gratama grant for the development of an elective course 'Virtual Reality for Research and Education'.

Leiden Institute of Chemistry

Tes Apeldoorn, Philippe Carter and David Klein received a Top sector chemistry scholarship.

Rafaël Vos won a Young Talent support prize from the Royal Holland Society of Sciences and Humanities (KHMW).

Roos Groenewoud won a Young Talent support prize from the Royal Holland Society of Sciences and Humanities (KHMW).

Hans de Bruijn was awarded a PhD scholarship by the Holland Research School of Molecular Chemistry.

Leiden Academic Centre for Drug Research

Bio Pharmaceutical Sciences is at 9th place in the QS world university rankings.

Marjo de Graauw, adviser Educational Innovation and Academic Teacher at Bio-Pharmaceutical Sciences won the Turnitin GLobal Innovator Award for Europe.

Leiden Institute of Biology

Former student Wouter Bruins was chosen by Vrij Nederland as Nerd of the year.

Institute of Environmental Sciences

Myrthe Fonck MSc received the Stans prize for best Master thesis.

Honours College

Our Honours College *'Bèta en Life Science'* offers excellent students with a broad academic interest an extra challenging study programme. Students follow an interdisciplinary Honours Track comprising a coherent package of extra subjects and activities on top of their regular academic course programme. This track enables them to further develop themselves, both in academic and in personal skills.

This year 23 bachelor students received an Honours College certificate '*Bèta en Life Science*' at their graduation. The Honours College Track has become increasingly popular: 64 new students were admitted. Students choose to interview researchers about their work and career, perform their own research project, attend summer schools, follow Honours Classes, do a case study at the Bioscience Park, have debates about sustainability in a circular economy, assist in developing teaching material, and/or follow lecture series by national and international researchers.

An illustrious example is the guest lecture module 'Mathematics a cultural phenomenon'. Students followed a series of lectures given by professor Van Bendegem, full professor and director of the Centre for Logic and Philosophy of Science (CLWF) at the *Vrije Universiteit Brussel* (VUB). Students also had to read his book '*de vrolijke atheist*' (the happy atheist). Furthermore students were given the opportunity to have a pizza dinner with the professor at the end of the lecture series.
Following statements in their reflection reports, our students were very impressed: "The encounter between two research fields is of such beauty that I would like to rephrase the course title in "When Mathematics is being kissed by Philosophy". Another student wrote: "Although for my study I work on proofing mathematical theorems on a daily basis, I had never before looked at theoretical proof in this way. I find it a very intriguing way of thinking."

Science Career Service

In collaboration with the Leiden University Student Career Services we have effectuated career services for science students on location in the Gorlaeus Science Lounge starting January this year. Every Monday and Thursday during lunch hours from 12 to 2 pm, students can visit the Science Lounge for a walk-in-hour. The career counsellors of Science Career Services offer assistance to students who are seeking advice concerning their career planning and their personal profile. They also offer support with (writing) CV's, building up a LinkedIn profile, job seeking strategies and applying for a job. In addition to those walk-in-hours, the Science Career Service maintain their services at the location Plexus in the city centre of Leiden for one-to-one appointments and career assessments.

www.students.leiden.edu/career/science

Leiden Science Summer Schools

The Faculty of Science offers international students various annual summer courses, organised as the Leiden Science Summer Schools. In 2015 about 80 students from 22 different countries, from the United States and the United Kingdom to Indonesia and Uganda, came to Leiden to attend one of four Summer Schools.

The Leiden Science Summer Schools originally started with the Leiden/ESA Astrophysics Programme for Summer Students (LEAPS). With this programme, the Leiden Observatory and the European Space Agency (ESA) offer students with an interest in astronomy and astrophysics an opportunity to perform a 10-12 week summer research project. Projects range from analysis of data from world-class telescopes and large computer simulations to hands-on work in the astrochemistry laboratories.

In 2015, the Leiden Institute of Physics (LION) organised 'The quantum revolution summer school', highlighting various aspects concerning the evolution of the universe, the physics of biological processes and condensed matter. With this programme, participants were offered a chance to discover the experimental and theoretical Physics research opportunities offered within the institute.

The focus of the summer school 'Energy & Sustainability', organised by the Leiden Institute of Chemistry (LIC), was on Artificial Photosynthesis. Undergraduate students were given the opportunity to familiarise themselves with this burgeoning field. The programme covered topics ranging from electrochemistry and molecular water-oxidation catalysts to bio solar fuel cells inspired by design principles of natural photosynthesis.

The aim of the 'Bio-Pharmaceutical Summer School', organised by the Leiden Academic Centre for Drug Research (LACDR), was to provide an opportunity to obtain hands-on experience with the competitive level of research that is performed within the institute. During the course, participants were provided with a comprehensive overview of the institute's Master programme and of the research performed within the three research clusters, Drug & Target Discovery, Systems Pharmacology, and BioTherapeutics.

The Leiden Summer Schools 2015 were a success. Some quotes of the 2015 students:
Theresa from Sweden: "This is a great opportunity to get experience in research. And it's a great way to meet a lot of people from different backgrounds".
Juan-Francesco from Spain: "I didn't know the university before and I must admit that it is much better than I expected it to be. The available technology allows you to do high level research". Joseph from Uganda: "I'm a pharmacist involved with medical chemistry and it was nice to do the things I already knew in a lab that has all the facilities needed".

- www.leidenscience-summerschools.com
- http://sciencesummerschools.tumblr.com

Science Campus

Building for the Future

Following the festive launch of the construction of our new Science Campus in 2013, the building activities have progressed rapidly. The first phase of new building is clearly visible within the surroundings of the existing Science buildings and expected to be ready by the end of February 2016. The new campus will offer a high-tech environment to put our research and education activities on an international level.

The design of the new Faculty housing is based on grouping together related activities. This for example means that where possible, all chemistry-related activities are located within the same area. The same applies to biochemical activities, heavy equipment, low vibration, imaging, nano microscopy, etc. This will create a more efficient working environment for our staff and students, equipped with high-level facilities for interdisciplinary cooperation. The central axis running through the building from front to back will serve as a meeting place, enabling staff and students to connect. Lecture rooms, practical laboratories and meeting rooms are located adjacent to this public area.

Following handover of the building by the engineering contractors to the university, a period of extensive furnishing and a complex moving operation from the old premises to the new building is planned. This phase will take about six months and will result in an operational building before the start of the new academic year.

In the meantime we have initiated the design of the second phase of the new Science Campus. A programme of requirements for this second phase has been developed together with the users. This programme of requirements will serve as a basis for the project team to develop a preliminary design.

www.science.leidenuniv.nl/index.php.betacampusfwn
@BetaCampusFWN
Beta Campus FWN

Some interesting facts about the first phase of construction:

- About 45,000 m² of gross floor area, including a car parking facility underneath the complex, systems and storage in the basement
- 12,200 m² of land surface
- 12% of the new building will house offices, 38% laboratories, 24% laboratory space and room for other users, 4% meeting rooms and storage and 22% will comprise building-related areas
- Sustainability: the new Science Campus will be one of the first buildings in the Netherlands with laboratories that are certified by the Dutch Green Building Council Breeam
- Expected energy consumption: 194,1 kWh/m² (gross)
- Expected consumption of fossil fuels: natural gas 0,69m³/m² (gross)
- Expected water consumption is 2 to 4 m³/year/person

200 Years of Leiden Science

On 2 August 2015 our Faculty celebrated her two-hundredth anniversary. A milestone that we will celebrate throughout the academic year 2015-2016 with a variety of events.

In 1815, King Willem the First signed the new law for higher education, also known as 'het organiek besluit'. In this declaration it was stated that our country should have three universities: Leiden, Utrecht and Groningen. Within the universities the traditional faculty of 'Artes Liberales' was split, and the faculty for Natural Science and Mathematics was created.

The Faculty of Science started small. During the first decades the number of professors was restricted by law to only four and there was a small group of supporting staff and students. Today, we are larger than ever before, with more than 100 full professors, seven hundred PhD students, a solid group of supporting staff and over 3,500 students.

To mark the celebration of our lustrum year, the history of the faculty was included in a special lustrum book 'Van kabinet naar science park'. Professor Otterspeer, professor Dirk van Delft and professor Frans van Lunteren contributed a large part. Together they have drawn up the history of our faculty containing the most important events in the past two hundred years and a series of forty portraits of prominent professors. The book furthermore comprises an overview of all professors and faculty boards appointed at the faculty in the past two hundred years.

The motto of our lustrum year is 'we are science'. It is about science and education, about celebrating our staff and students and the joined capacity of our community and about the impact of science on society.

Lustrum year programme

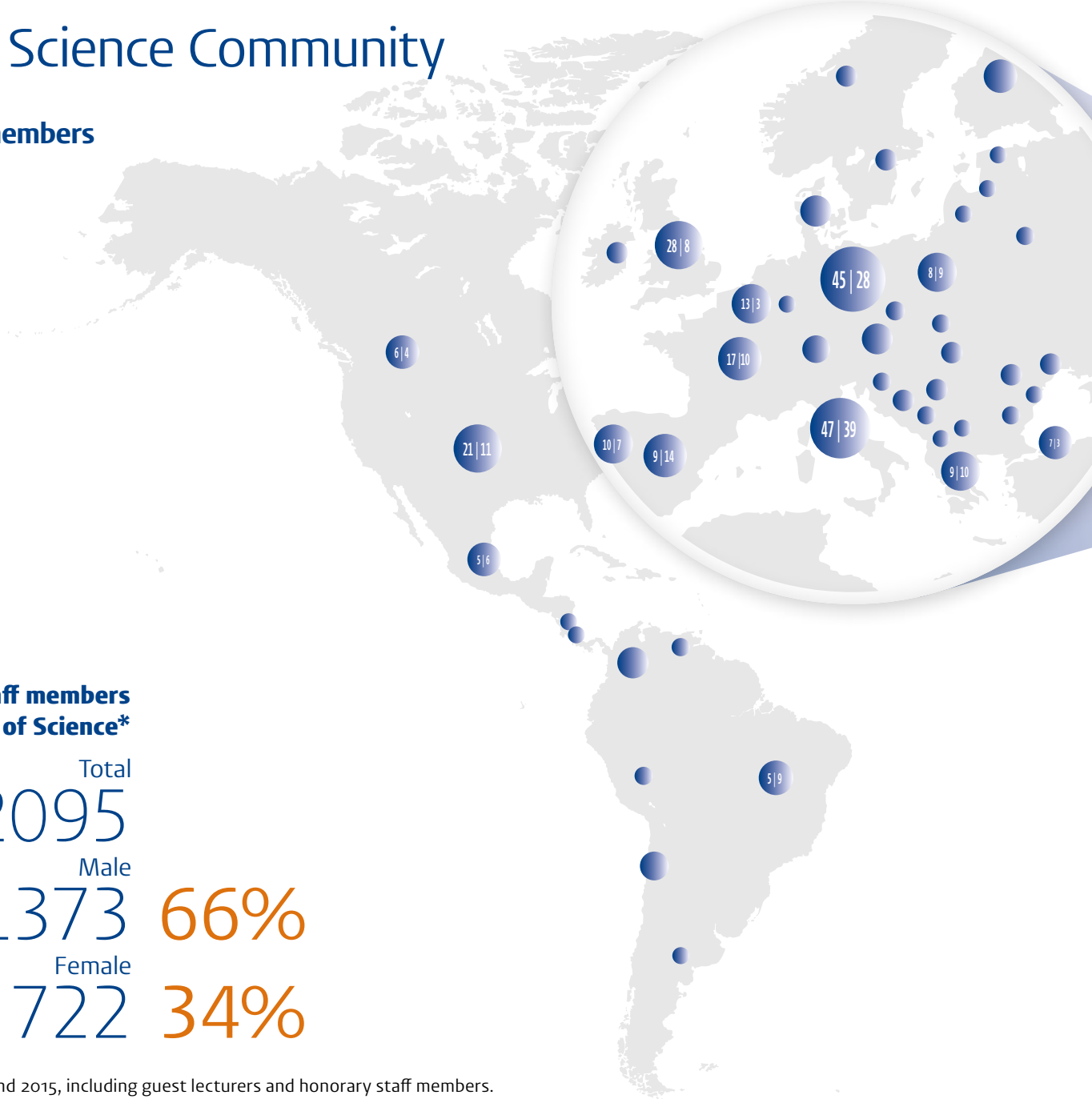
The festive launch of the lustrum year took place on 1 September 2015. On October 10th, we organised the Science Run in order to collect money for the UAF to help refugee students. The running teams and their supporters collected 4,545 euros to help refugees with their study and the start of their careers in the Netherlands. We will support the UAF throughout the lustrum year to keep raising awareness for refugee students.

11 December 2015
Pubquiz 'Can you outsmart your Professor?'
5 January 2016
New Year Reception
12 February 2016
Science Gala
18 March 2016
Lustrum Congress
17 April 2016
Science Family Festival
1 July 2016
Closing event Lustrum Year Faculty of Science

www.leidenscience-200.nl
#leidenscience200

Our Science Community

Staff members



Staff members
Faculty of Science*

Total
2095

Male
1373 66%

Female
722 34%

* End 2015, including guest lecturers and honorary staff members.

Dutch vs other nationalities

Dutch

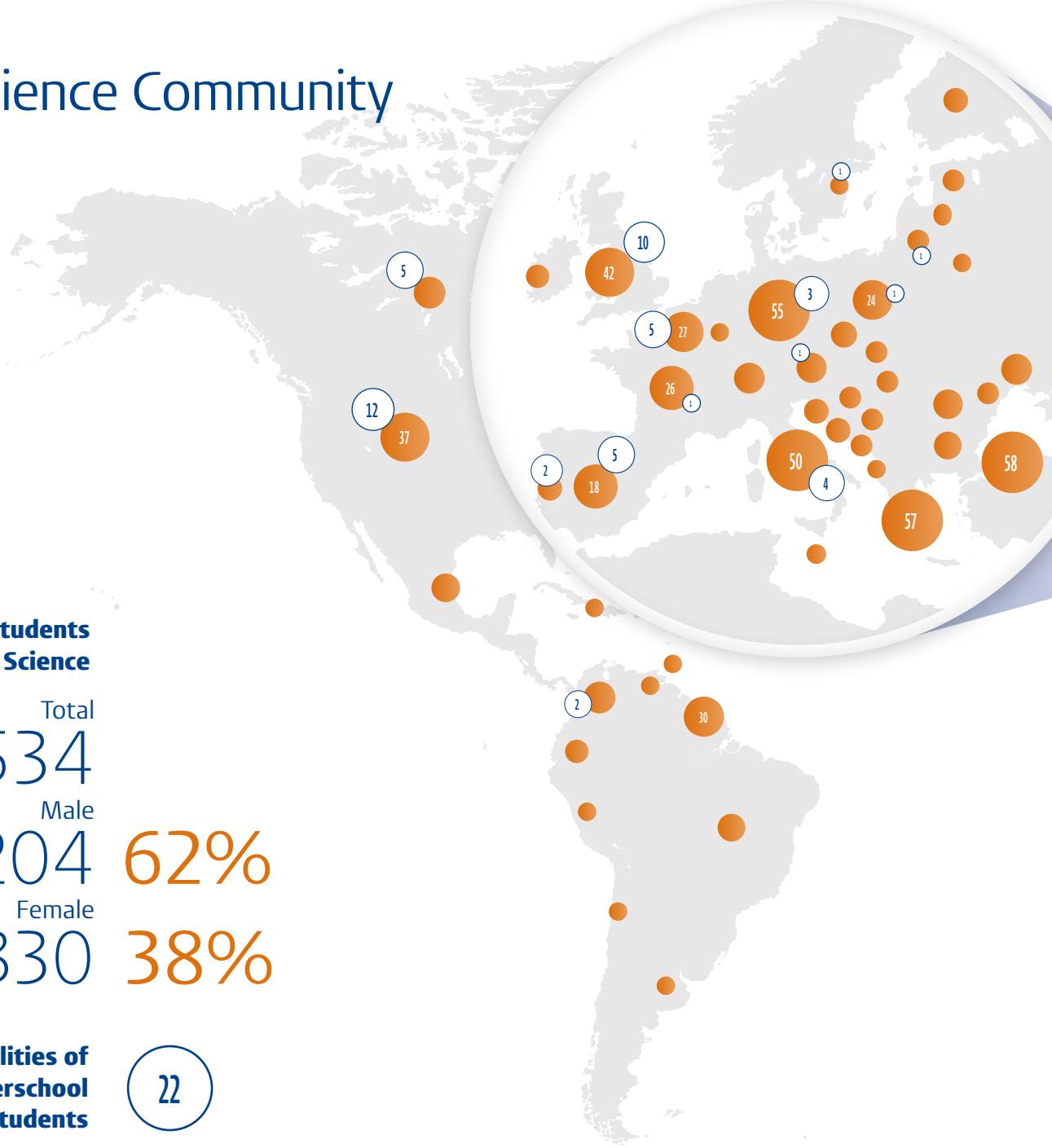
1303 62%

Other nationalities

792 38%

Our Science Community

Students



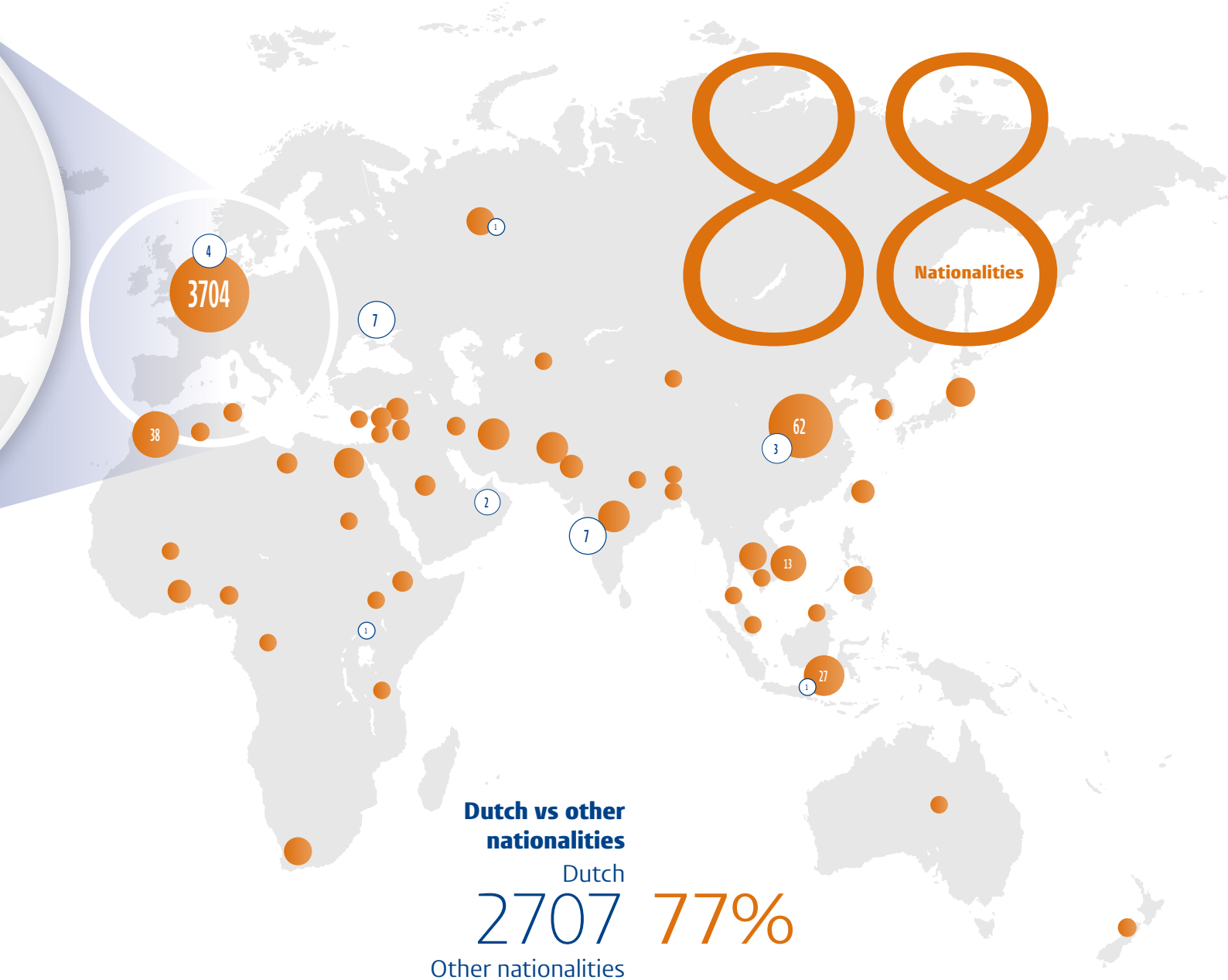
Students Faculty of Science

Total
3534

Male
2204 62%

Female
1330 38%

Nationalities of Summerschool students 22



Dutch vs other nationalities

Dutch

2707 77%

Other nationalities

827 23%

C.J. Kok Awards and Faculty Award for Teaching 2015

C.J. Kok Fund

The C.J. Kok fund was raised from the assets of Mr C.J. Kok, biology tutor from The Hague, who was strongly committed to the natural sciences. Upon his death in 1965 he left his entire estate to Leiden University. The C.J. Kok fund was established with this inheritance. In his will Mr Kok estated that both the Faculty of Science and the Leiden University Medical Center would annually be given the opportunity to use the fund's revenues to award outstanding performance to those demonstrating 'a pronounced, significant talent for mathematics or solving medical problems'. The will also states that the assessment of performance should be on purely scientific grounds and that no distinction should be made regarding 'rank, status, race, national character, origin, relationship and so on'.

C.J. Kok Awards

The Faculty of Science grants two C.J. Kok awards each year: the C.J. Kok Public Award, also known as the award for the "Discoverer of the Year", and the C.J. Kok Jury Award, i.e. the award for the best PhD thesis from the past year. All institutes within the Faculty are given the opportunity to nominate candidates for both awards.

Education Award

Education and Research are closely interwoven in our Faculty. Mono-disciplinary education and multi-disciplinary cooperation give our students the competences they need to become the scientists of tomorrow. Excellent education is of inestimable value in this respect. Being able to successfully translate research findings into high-quality educational programmes on a bachelor's and master's level is of great importance to stimulate and enthuse students for science, and to developt a new generation of successful and motivated (natural) scientists.

For this reason, in addition to the C.J. Kok Award, the Faculty also confers an annual Award for Education. Students from the education committees nominate tutors for this award. The jury, comprising the chairpersons of the study associations and the assessor from the Faculty Board, assess each of the nominated lecturers. The students from the education committees advocate their nominee by giving a short presentation to the jury. In many instances, the assessments are a close call. In this case, the jury will attend one or more lectures in order to reach a final decision.

Both the C.J. Kok Awards and the Faculty Award for Education are presented at the Faculty's annual New Year's reception.

C.J. Kok Public Award

'Discoverer of the year 2015'

Matthew Kenworthy
Leiden Observatory

Vincenzo Vitelli
Leiden Institute of Physics

Thomas Bäck
Leiden Institute of Advanced Computer Science

Martina Chirilus-Bruckner
Mathematical Institute

Gerjan de Bruin
Leiden Institute of Chemistry

Vanessa Froderman
Leiden Academic Centre for Drug Research

Daniël Rozen
Institute of Biology Leiden

David Font Vivanco
Institute of Environmental Sciences

Winner 2014

Annelien Zweemer
Leiden Academic Centre for Drug Research

Annelien Zweemer won the award for her research on how small molecules affect receptors. The CCR2 receptor is a transmembrane protein that plays an important role in many immune-related diseases. Annelien studied how small molecules can alter the functioning of this receptor, thus paving the way for pharmaceutical interventions. She made an important discovery: some molecules affect the receptor from the inside of the cell. Staff and students decide who will be awarded the title of 'Discoverer of the year' by casting their votes for their favourite researcher. Annelien defeated the other nominees with 23% of the votes.

MATTHEW KENWORTHY
Leiden Observatory

‘Crazy’ discovery of an exoplanet with Saturn-like rings

‘It’s something you see in every science fiction movie’, says exoplanet hunter Matthew Kenworthy: planets with Saturn-like rings. And while he’d never thought he would find something similar, that’s still what 2015 brought him. He discovered dozens of dust rings around an exoplanet. ‘It’s absolutely spectacular. And it’s real.’

By George van Hal

Matthew Kenworthy was born in Epsom, near London. He graduated from Cambridge University, and worked on giant telescopes in Arizona, US. He came to Leiden as an assistant professor in 2010.

The first evidence of the existence of an exoring system had been sitting unnoticed in a public database for five years, until Kenworthy and his colleague Eric Mamajek stumbled across the strangest piece of data both of them had ever seen. “People had probably seen this before, but I guess they figured the cameras had broken down”, says Kenworthy.

What the astronomers found was so “crazy” that even after they had analysed and discarded every possible alternative, Kenworthy still sat on his findings for a few months before publishing them. “I was terrified I’d made a mistake”, he says.

Kenworthy discovered how to analyse certain dimming events in the light curve of distant star J1407. These are usually a sign that a planet or other star is passing in front, blocking the star’s light. “These transits normally last a few hours”, says Kenworthy, but in this case the dimming lasted a mind-boggling two months. Even stranger was that they contained daily rapid changes over a period of 30 minutes.

Kenworthy searched for alternative explanations, like the presence of a brown dwarf companion or a disc of circumstellar material, but he discarded these on the basis of two years of additional observations. Finally, only one explanation remained: a planet with huge rings. “These rings were like those around Saturn, but 200 times bigger”, Kenworthy says. He even discovered evidence of a possible exomoon which “might be as big as Mars”.

He suspects the planet has an orbit of about 20 years, making 2027 the most likely year for follow-up observations.

But Kenworthy and others are also on the look-out for new exoring systems. ‘People are starting to find more and more incredible phenomena. We’re discovering the universe is a very dynamic place. I suspect that in five more years, we’ll have found another ten exoring systems like this one.’ But ‘his’ planet, J1407b, will always remain the first.

VINCENZO VITELLI
Leiden Institute of Physics

Lego brick physics

Vincenzo Vitelli is a pioneer. His work is part of a completely new field of research that combines concepts from classical mechanics and quantum theory and ties them together in unexpected ways, using even more unexpected tools. How Lego brick construction can lead to breakthroughs in everything from quantum physics to engineering.

By George van Hal

Vincenzo Vitelli was born in Italy. He studied and worked at universities like Harvard and MIT and came to Leiden in 2010, where he's currently professor of condensed matter theory.

'My work is mainly about mathematical models', says Vincento Vitelli. As a theorist, his world is filled with equations and computer simulations. But even theorists need a bit of physical reality from time to time. Being able to, literally, grasp something can give one completely new insights into difficult topics. That's why Vitelli translates some of his models from theory to physical reality – using Lego blocks.

It's those Lego blocks that paved his entry into a completely new field of research. In 2014 Vitelli came across a paper by Tom Lubensky and Charles Kane in Nature Physics. In it, they described an analogy between topological insulators, quantum systems that allow currents to run on their surface, but not on the inside, and mechanical lattices that move at the edge while remaining stationary on the inside. It was the first time anyone showed that classical and quantum topological materials could be described by the same mathematics. Reading the paper, Vitelli felt he could construct real-world versions of their models using Lego, and promptly published his own papers, in PNAS and Nature Physics, describing his results. To him, his models are tools that illustrate, but are also useful for discovery. 'Being able to hold something, manipulate it, gives you insights that are less obvious from just the equations.'

This also proved the case with the insulator. Using his Lego, Vitelli showed that it was possible to 'push' the moveable edge to the inside, which was not at all evident from the mathematics, but clearly visible in the real-world model.

Vitelli is now working on topological control of material failure and sound propagation. A practical application of the new material has not yet surfaced. 'But this is a new field', says Vitelli. 'We've now shown we can make these materials.' The race is on for someone to change the world using these brand new ideas.

MARTINA CHIRILUS-BRUCKNER
Mathematical Institute

Solving the equation to trap light

Keeping light trapped in a nanostructure. If we achieve that, we are an important step closer to building an optical computer. Martina Chirilus-Bruckner devotes herself to the analysis of partial differential equations and focuses, in particular, on solving one such equation that models light waves in a nanostructure.

By Arnout Jaspers

Mathematician **Martina Chirilus-Bruckner** came to the Netherlands in 2009, as a post-doc at the CWI. After working in the US and Australia, she returned in 2014 to become assistant professor at the Mathematical Institute in Leiden.

Light never stops. Even in glass, it travels at 200.000 km/h. So, in a hypothetical all-optical computer, how would you store information? It was already anticipated on that periodic nanostructures could act as 'semi-conductors for light'. Chirilus-Bruckner's research indicates that even fully localized standing light waves - so-called breathers - could 'live' inside specifically designed nanostructures. This would mean that photons, bits of light, can be trapped in tiny glass 'cages', like bits on a computer chip.

"Doing research feels like a journey through the equations," she says. To her, the mathematical world has a reality of its own. "I'm inspired, but not confined by worries about 'Is this physical or not?' I just play with the equations, hoping to find what turns out to be physical."

'Her' equation is related to the famous Maxwell's Equations. These describe electric and magnetic fields in time and space, including light, which is an electromagnetic wave. Although discovered more than 150 years ago, these equations still have not revealed all their secrets.

In some sense, a 'breather' wave is like the vibration in a guitar string; a wave that 'waves' but does not go anywhere. However, in a guitar, the ends of the string don't move because they are fixed. But can you tie down light? In mathematical terms: a certain partial differential equation must be found, such that breather solutions exist. Chirilus-Bruckner and her collaborators used a novel combination of two fields of mathematics - invariant manifold and inverse spectral theory - to solve such a problem.

"I get ideas and inspiration for my mathematical research from people who are involved in the physical realization of such structures," she says. She keeps in touch with the Karlsruhe Institute of Technology and Boston University and with a group at the ETH Zürich who builds similar structures. She also hopes to find research partners in photonics in Leiden.

THOMAS BÄCK
Leiden Institute of Advanced Computer Science

Software that quickly adapts to a problem - and then solves it.

Some computer scientists take their inspiration from nature, and let their software evolve through a combination of random and directed mutations. Thomas Bäck helped make this 'evolutionary computing' fit for the real world. For partners like Tata Steel and BMW, evolutionary computing now goes to work, producing better steel and safer cars.

By Arnout Jaspers

Prof. Thomas Bäck has been working part-time at the Leiden Institute of Advanced Computer Science (LIACS) since 1996, and became a full professor in 2002. He is now head of the Natural Computing Group at LIACS.

Despite the enormous increase in computing power in the past decades, many problems still require hours of computing time. For instance, a crash test can be simulated with a virtual car, but it takes a full day of computation. To improve safety, one could use common sense to modify ('mutate') the car, but it would take thousands of virtual crashes to achieve improvement. Modify it with an evolutionary algorithm, and the results improve much faster.

"Nature evolved very complex DNA molecules and organisms in a relatively short period of time. That is our inspiration. For our research, we use principles called 'mutation', 'recombination' and 'selection', but unlike in nature, our mutations are not pure random, but very smart," says computer scientist Thomas Bäck. "The algorithm learns very quickly in which direction, and how fast, its mutations should go."
Bäck never wanted to spend all his time in the ivory tower of academia. His research involves teleconferences with engineers from BMW and visits to steel factories. His evolutionary algorithms will also help to improve the quality of the steel that rolls out of the Tata factories by carefully adjusting the many parameters - like temperature or rolling speed - that can be controlled during the production process. Recently, in a NWO supported project, Bäck and his group have taken evolutionary computing one step further, by combining it with data-mining. Industrial processes produce huge amounts of data from a multitude of sensors. In many cases, the full potential of these data is not used because they are not combined. Using these data as input for an evolutionary algorithm may lead to predictions for improving production processes in completely unexpected ways.

Bäck's point on the horizon is software that doesn't even care anymore which optimization problem it is given: "A completely self-adaptive algorithm which learns the characteristics of the problem very quickly, and then comes up with an optimized solution.".

GERJAN DE BRUIN
Leiden Institute of Chemistry

Insight into cellular waste management

In drug innovation, chemical knowledge and experience are of great value, as the research of Gerjan de Bruin shows. He developed a suite of chemical tools to visualize and control the activity of the waste treatment plants of human cells, the proteasomes. These large protein complexes are therapeutic targets in the treatment of various cancers and autoimmune diseases.
By Willy van Strien

Gerjan de Bruin is fascinated by drug innovation. He got his master's degree at Utrecht University and is currently conducting his PhD research in Leiden.

Just like households, cells have to get rid of their garbage. They contain proteasomes that degrade proteins that are damaged or have become useless. When proteasomes are inhibited, proteins accumulate leading to cell death, especially in cancer cells. That is why they are a target for anti-cancer therapies.
"To develop safe and effective drugs, one must be able to measure proteasome activity and monitor the effect of candidate drugs", Gerjan de Bruin explains. He developed a suite of tools to do this.
A proteasome is a cylindrical complex where waste proteins are led into. Inside, bonds between constituting amino acids are broken at active sites. These sites come in three types that break bonds with different characteristics.
In addition to the active sites that all cells have in common, immune cells, such as white blood cells, have an extra set of sites that are slightly different variants of the common sites.
Firstly, to visualize the activity of proteasomes, De Bruin constructed three probes. Each probe binds to one active site and carries a green, blue or red fluorescent colour. After labelling with these probes, proteasomes are denaturated and the active sites are separated by gel electrophoresis, giving either three (for non-immune cells) or six (for immune cells) bands on the gel. The intensity of the bands is proportional to the relative amount of the active sites. "This enables us to measure the activity of all six active sites simultaneously", De Bruin states.
Secondly, he designed proteasome inhibitors that only inhibit one of the active sites. Thirdly, he showed that tumour cells of patients with one of several white blood cell malignancies harbour proteasomes with a high amount of immune type active sites. These tumour cells could be killed by selective inhibition of the immune type active sites. "This opens the possibility to develop drugs that attack immune-cell derived tumours but are not destructive for non-immune cells. Such drugs will have less side effects than proteasome inhibitor drugs currently used."

VANESSA FRODERMAN
Leiden Academic Centre for Drug Research

Personalised medicine for atherosclerosis

Dying cells within atherosclerotic plaques are usually associated with inflammation and plaque progression. But in early stages of atherosclerosis, these dying cells can actually suppress inflammation. Vanessa Frodermann is using this principle to develop a new type of immune therapy.

By Nienke Beintema

Cardiovascular disease is the main cause of death in industrialised countries. Every day, it claims more than 100 lives in the Netherlands alone – with atherosclerosis as the main underlying cause. Atherosclerosis is characterised by formation of plaques in the arterial wall due to continuous accumulation of cholesterol and immune cells. A large fraction of these immune cells eventually dies. This ultimately results in occlusion of arteries or plaque rupture, causing myocardial infarction or stroke.

"In advanced plaques, the accumulation of dying cells and the associated inflammation generally lead to plaque growth", explains Vanessa Frodermann. "If you suppress this inflammatory response, you can stop plaque progression."
A recent discovery opened up some interesting possibilities. Clearance of dead immune cells in early plaques was found to suppress – rather than promote – inflammation. "Our research aims to use this principle to develop a novel treatment", Frodermann says. "We experimented with human immune cells that were given an 'overdose' of oxidised LDL cholesterol causing them to die. We then introduced them back into the blood stream, where they were cleared by other immune cells. This clearance process actually induced an anti-inflammatory response that reduced plaque progression."
The challenge, as Frodermann points out, is to discover which element of the dying immune cells was evoking the anti-inflammatory response by the healthy immune cells – in other words, exactly which antigen was triggering the immune system. If you know that, you can mimic this effect by producing an antigen encapsulated in a liposome, which mimics dead cells. That would save the effort of isolating a patient's own immune cells, growing them in a lab, and loading them with LDL cholesterol – and it would facilitate wide application in the clinic.
Frodermann is optimistic that this approach may lead to a new immune treatment. "We have proven the principle to be effective", she says, "and once we discover the underlying mechanism, it has great pharmaceutical potential."

Vanessa Frodermann studied Bio-Pharmaceutical Sciences in Leiden and obtained her PhD at the LACDR in 2015. She is currently a postdoctoral researcher at the Massachusetts General Hospital in Boston, USA.

DANIËL ROZEN
Institute of Biology Leiden

Bacteria have their own wars

With an extensive series of tests, published in PNAS, Daniel Rozen proved that bacteria produce antibiotics to beat their competitors. An alternative view, namely that bacteria use these compounds in communication and cooperation, is not tenable anymore. His research has clinical importance, as it reveals how bacteria may be induced to produce new antibiotics in the lab.

By Willy van Strien

After finishing his PhD on bacterial evolution at Michigan State University, Daniel Rozen had a few post doc positions and a tenure track in Manchester (England). In 2012, he settled at Leiden University.

To fight infectious disease, we successfully use antibiotics that are produced by bacteria. But these organisms do not produce these compounds to help us. They fight their own war against their bacterial competitors, and antibiotics are their weapons. Most biologists agree on this. "But I was surprised to learn that some did not", Daniel Rozen says. "They argued that the amounts of antibiotics in nature are too low to kill organisms. Instead, they suggested that antibiotics are signals for microbial cooperation."

Rozen designed an experiment to settle the issue. From a handful of soil sampled close to his lab, he grew ten strains of Streptomyces and added three lab strains. All these bacterial strains live on organic material and are considered to be competitors. He first tested the ability of each strain to inhibit each other strain (a challenger) when cultured alone (13x13=169 combinations), and then how this aggressiveness was altered when one of the other strains grew in close proximity (169x13=2197 combinations).

When two strains grew together, one of the strains induced its neighbour to produce antibiotics in many cases. In other couples, one strain suppressed the production of antibiotics in the other. But in only few cases did the strains stimulate each other to upregulate the production of antibiotics, fighting the challenger together. So it is war, not communication that the antibiotics are used for.

It makes sense that antibiotics occur in low amounts in nature, according to Rozen. "A strain only kills another strain when it is in close proximity. So it is sufficient if local concentrations are high, on a micro-scale."

From a medical point of view, the findings are interesting as Streptomyces are important producers of antibiotics for human use. But in the lab the bacteria only synthesize part of the many different antibiotics they are able to produce; many synthetic pathways remain silent. Rozen: "Now we know that silent pathways may be activated by growing different strains together."

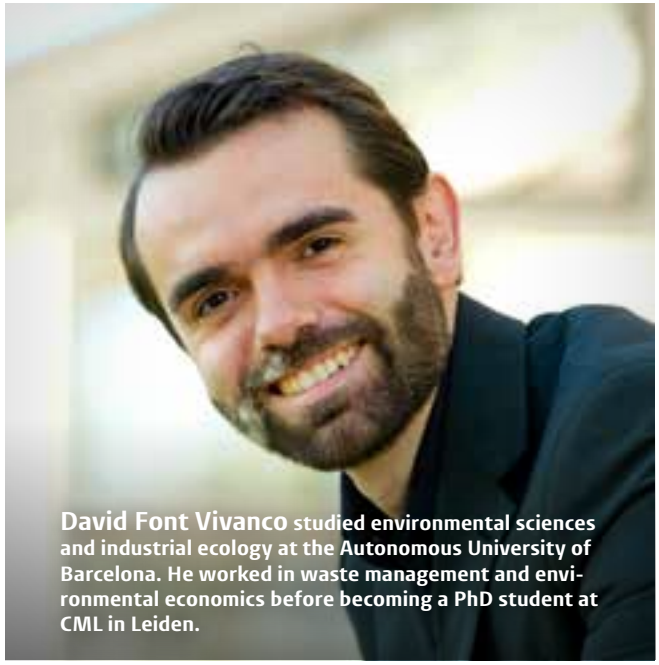
The paradox of eco-innovations

Some 'environmentally friendly' innovations do not achieve their objectives – on the contrary. David Font Vivanco is designing a theoretical framework that deals with this 'rebound effect'. He is applying it to several case studies, making concrete recommendations on how to create the right conditions for eco-innovations to succeed.
By Nienke Beintema

What if an innovation has an effect that is opposite to what was intended? Imagine a new type of fuel efficient car. The fuel efficiency is meant to reduce fuel consumption and thus greenhouse gas emissions. But the owner saves money by driving this car. And he spends this money on… goods or behaviour that can actually increase his total emissions. Behold the 'rebound effect' – the object of David Font Vivanco's research.

"The rebound effect has traditionally been defined in energy economics", he explains, "and could not be applied to specific cases in other areas. We are striving to make this concept applicable for environmental assessment. While there have been a few attempts, no one has brought all of this together yet in one consistent framework that is both feasible and valuable to apply."

Working out this conceptual framework is the theoretical component of Font Vivanco's research. He is also elaborating an empirical part. "We applied this framework to a number of different so-called 'eco-innovations'", he says, "such as hybrid and electric cars, diesel cars, high-speed trains and shared transport systems. Many of those do not actually lead to environmental improvement. Diesel cars definitely fall into this category. Their use actually leads to increased emissions."
In one of his papers, Font Vivanco analysed different policy options and associated trade-offs, making concrete recommendations.
"Policy really needs to take this effect more seriously", he concludes. "I don't think change will come from the customer side, nor from the technical innovation side. We do need eco-innovations, but policy needs to set the right incentives so they can achieve their environmental aims. For instance through pricing and tax incentives."



David Font Vivanco studied environmental sciences and industrial ecology at the Autonomous University of Barcelona. He worked in waste management and environmental economics before becoming a PhD student at CML in Leiden.

C.J. Kok Jury Award
'PhD Thesis of the year 2015'

JURY CRITERIA FOR THE BEST THESIS OF THE YEAR

What makes a thesis a winning one? The jury makes her selection principally based on the thesis itself and the corresponding recommendation, which is usually written by the (co)promotor or the scientific director. Main criteria for assessment are:

- The scientific quality such as innovative content for its field of research, other disciplines and science in general.
- Do the research results bear direct relevance for society?
- Is the thesis easy accessible and clearly written?
- Career prospects after being promoted are also considered in the jury's assessment if this information is available.

Members of the 2015 jury are:
- Professor Carel ten Cate
- Professor Miranda van Eck
- Professor Bas Edixhoven
- Professor Koen Kuijken
- Professor Marcellus Ubbink

CUM LAUDE PHD

Leiden Observatory
Nienke van der Marel
Mind the Gap, gas and dust in planet-forming disks

Leiden Institute of Physics
Jelmer Renema
The physics of nanowire superconducting single-photon detectors

Leiden Institute of Advanced Computer Science
Jurriaan Rot
Enhanced coinduction

All theses of the Faculty of Science can be found in the Leiden Repository https://openaccess.leidenuniv.nl

Winner 2014

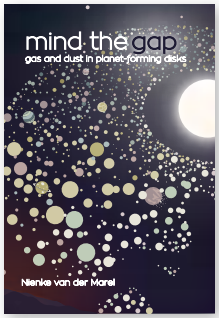
Matteo Brogi
Leiden Observatory

Winner C.J. Kok Jury Award 2014

Matteo wrote the best dissertation of the year 2014 with his 'Atmospheres of hot alien worlds'. This thesis presents observations of exoplanets orbiting very close to their parent star, with a particular focus on a novel technique for characterizing their atmospheres. This technique is based on the use of high-resolution spectroscopy from the ground. Brogi obtained his PhD with distinction in June 2014. Matteo now works as Post-Doctoral Fellow at the Center for Astrophysics and Space Astronomy at the University of Colorado Boulder.

C.J. Kok Jury Award

Nominees best PhD Thesis of 2015

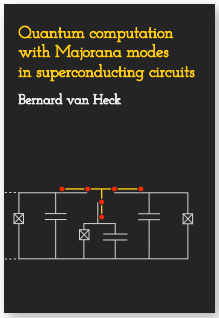


Mind the gap, gas and dust in planet-forming disks

Nienke van der Marel
Leiden Observatory

Keywords: Protoplanetary disks, Astrochemistry, Dust evolution, Planet formation

This thesis discusses the structure of gas and dust in protoplanetary disks around young stars in which the planets are formed, using ALMA (Atacama Large Millimeter/submillimeter Array) observations. Primary targets of this study are the so-called 'transition disks', with a central cavity in the dust disk. A possible explanation for the presence of this cavity is the recent formation of a young planet which has cleared its own orbit. ALMA can for the first time zoom in on the structure of both gas and dust and answer this question. The thesis presents the first ALMA observations of cold molecular gas and dust in transition disks. These data show that millimeter-dust grains are concentrated in a 'dust trap', allowing the dust particles to grow to larger sizes, an important step in the planet formation process. Also, it turns out that gas is still present in the dust cavity of the disks in this study, its structure indeed pointing towards the planet clearing mechanism. These discoveries form a giant leap in our understanding of planet formation.



Quantum computation with Majorana modes in superconducting circuits

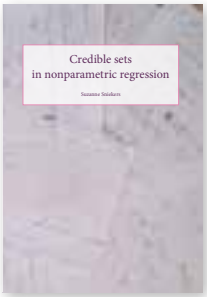
Bernard van Heck
Leiden Institute of Physics

Keywords: Quantum information, Majorana modes, Topological

The research contained in this thesis lies at the interface between quantum physics, nanotechnology and the theory of computation. Its goal is to design electronic circuits to realize computations that follow the laws of quantum mechanics, and which would allow to execute some algorithms faster than their classical counterparts – for instance, algorithms to solve chemical problems. In particular, these circuits use Majorana modes, very special states which appear in superconductors and are theoretically predicted to protect information from the environment, so that the computation can be executed without errors. The role of this research was to design electronic circuits able to use this fascinating property. Hence, this work is a bridge between some very abstract mathematical ideas and the very concrete world of electronic circuits, made out of inductors and capacitors.

C.J. Kok Jury Award

Nominees best PhD Thesis of 2015



Credible sets in nonparametric regression

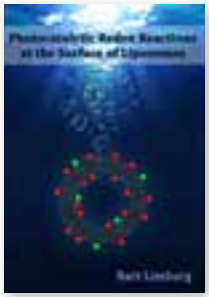
Suzanne Sniekers
Mathematical Institute
Keywords: Bayesian inference, Nonparametric regression, Fixed design, Credible sets, Polished tail

A common problem in Bayesian statistics is to determine whether a quantity obtained from a Bayesian posterior distribution is also meaningful in a frequentist context. In this thesis, we try to answer this question for credible sets in the so-called fixed design model. Taking a specific prior distribution, we study whether credible sets based on this prior can also be used as confidence intervals. In particular, our aim is to construct a credible set for a parameter function. Under certain assumptions on the smoothness of the function, it turns out that we can obtain meaningful results about both the frequentist coverage and the width of the credible set. We consider several different classes of functions in this thesis, each with a different set of assumptions.

Enhanced coinduction

Juriaan Rot
Leiden Institute of Advanced Computer Science
Keywords: Coalgebra, Bisimulation, Coinduction

Coinduction, the dual of induction, is a fundamental principle for defining infinite objects and proving properties about them. The broad applicability and rapidly increasing interest in coinductive techniques is based on the theory of coalgebras, which allows one to understand and prove properties of state-based models of computation at a high level of abstraction. In this thesis we develop methods that simplify and enhance coinductive reasoning, with coalgebra as the framework of choice to obtain generally applicable techniques. In the first part, we introduce a coalgebraic framework of enhanced coinductive proof methods, which is applicable to a wide range of coinductive predicates and a wide range of state-based systems.
In the second part, we propose enhancements to coinductive definition techniques based on the theory of mathematical operational semantics.

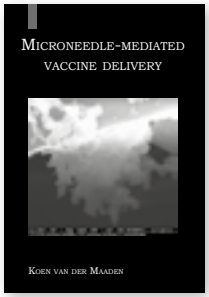


Photocatalytic redox reactions at the surface of liposomes

Bart Limburg
Leiden Institute of Chemistry

Keywords: Photocatalysis, Solar fuels, Photosynthesis, Liposomes, Water oxidation

Current energy sources in the form of fossil fuels are quickly being depleted, while the demand of energy by society is increasing. In order to sustain this growth in energy demand, alternatives for the production of energy in a usable form are needed. One of such alternatives is to employ photocatalysis in order to use sunlight for the production of chemical fuels such as for example H2 or methanol. For the production of fuels, electrons are required that can be obtained by oxidizing water, as done by nature in a process called photosynthesis. The work in this thesis was inspired by this natural process; photosensitizers and water oxidation catalysts were bound to lipid bilayers and their ability to photocatalytically oxidize water was studied in different conditions. In general, detailed experiments are described that fully characterize photocatalytic systems, because the mechanism of a reaction involving two different catalytic species is not straightforward, and cannot be described by a single set of turn-over numbers.



Microneedle-mediated vaccine delivery

Koen van der Maaden
Leiden Academic Centre for Drug Research

Keywords: Microneedles, (Trans)dermal drug delivery, Dermal vaccination, Surface modification, Functional coatings

Conventional vaccines are administered intramuscularly or subcutaneously via hypodermic needles, causing pain and stress. Since the skin is a powerful immune organ, intradermal injections can result in potent immune responses. Microneedles, micron-sized structures with a length of less than 1 mm that are used to deliver drugs, including vaccines, into the skin are a viable alternative to traditional injections. The minimally-invasive, potentially pain free nature and ease of drug delivery can reduce the risk of infections and alleviate the need for trained personnel. This thesis describes several fundamental parameters that influence skin penetration by microneedles and factors that affect antigen-specific immune responses in animals following microneedle-based vaccination. The importance of using a microneedle insertion device for self-administration of microneedles is highlighted. Ultrathin pH-sensitive surface modifications for microneedles were developed to improve the coating of antigens and the efficiency of microneedle-mediated vaccine delivery. Finally, a method was developed to fabricate hollow microneedles, which were successfully used for polio vaccination. This study provides important new insights for enabling pain free vaccination via the skin.

C.J. Kok Jury Award

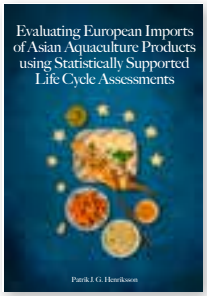
Nominees best PhD Thesis of 2015

The innate immune response against mycobacterial infection. Analysis by a combination of light and electron microscopy

Rohola Hosseini
Institute of Biology Leiden

Keywords: Tail fin, Cell death, Autophagy, Autophagosome, MyD88, Correlative microscopy

In this thesis the zebrafish tail fin infection model is presented, which enables the study of a complex immune response towards (myco)bacterial infection using a combination of light and electron microscopy. The induction of autophagy upon a mycobacterial infection as an important innate immune response was visualized using correlative light and electron microscopy. Studying the role of leukocyte dynamics and function during the course of infection provided new insights into the complex host-pathogen interactions. Using a myd88 mutant zebrafish line it was shown that the recruitment of leukocytes towards the site of infection and subsequent phagocytosis of bacteria is dependent on MyD88-mediated signaling. With the advancement of medical translational studies using zebrafish disease models, the tail fin infection model may '104 5' provide new opportunities to develop novel therapies against pathogenic infections such as tuberculosis.



Evaluating European imports of Asian aquaculture products using statistically supported Life Cycle Assessments

Patrik Henriksson
Institute of Environmental Sciences

Keywords: LCA, Aquaculture, Seafood, Uncertainty, Monte Carlo, Dispersions, Statistics, Significance

This thesis aims to evaluate the environmental sustainability of European imports of farmed aquatic food products from Asia, using life cycle assessment (LCA). Farming of Asian tiger prawn, whiteleg shrimp, freshwater prawn, tilapia and pangasius catfish in Bangladesh, China, Thailand and Vietnam were chosen as representatives. Initial research revealed large discrepancies among LCA results driven by methodological choices and data sourcing. A protocol for quantifying dispersions around unit process data was therefore developed, characterising inherent uncertainty, spread and unrepresentativeness. Results highlighted that the uncertainty related to LCA results could range over an order of magnitude. For comparative purposes only relative uncertainties are of relevance. Defining a hypothesis and using dependent sampling therefore allowed for several significant conclusions to be identified. Among these were significantly lower environmental impacts of Asian tiger shrimp farming in western Bangladesh, tilapia in Guangdong and pangasius in large-scale farms. Common environmental hotspots included aquafeeds, eutrophying effluents from farms, the use of benzalkonium chloride and other chlorine releasing compounds as disinfectants, and extensive use of paddle-wheels on shrimp farms.

Faculty Award for Teaching 2015

Nine of our teaching staff members were nominated by their students for the Faculty Award for Teaching in 2015. The nominees have some qualities in common: inspirational teaching methods, a personal approach and passion for their field of research.

The jury, consisting of the presidents of the student associations and the assessor of the Faculty Board, this year assessed each of the nominees on the following three criteria:

- The nominated teacher's didactic skills
- The ways in which the teacher establishes connections between the course and recent developments in relevant research disciplines
- The ways in which the teacher establishes connections between his own discipline and other beta disciplines.

The Jury has the final decision on who will be granted the award. The assessor presents the winner at the Faculty's New Year's reception.

Winner 2014

Dennis Claessen
Institute of Biology Leiden

Dennis has been awarded the Faculty Award for Teaching 2014 for his close involvement with his students. Students call his lab the 'Dennis Lab', where it is always busy. Students from all levels, from bachelor to master and PhD candidates, are actively involved with the research as part of their degree programme. Dennis also focuses on improving research and teaching methods using the most up-to-date technology and software. He is known for his active use of social media in his teaching and in his research.

CDL

LIFE

De Leidsche Flesch

Jarle Brinchmann
Leiden Observatory
Nominated for: Astronomy Lab and Observing Project

Jarle is a very enthusiastic teacher. During his lectures he was able to share his enthusiasm with his students. Part of this was due to his concern for each student's personal development; for example, by the second lecture he knew all of their names. He motivated students to see the observing trip to La Palma not as a vacation, but as a serious possibility to develop research skills. He was very successful at teaching them to carry out research properly and always willing to help with their data processing. He also put a lot of effort in studying subjects in which he was not specialized himself, in order to be able to help all of the students as much as possible.
His efforts payed off; many of his students became very interested and found some remarkable astronomical results, such as an Einstein ring formed by dark matter through gravitational lensing. The students learned useful skills which are applicable to all kinds of scientific research.

Vincenzo Vitelli
Leiden Institute of Physics
Nominated for: Relativistic Electro-dynamics, Statistical Physics a + b

Vincenzo Vitelli is well-known for his inspirational teaching style. He combines mathematical rigorousness with intuitive examples and fundamental arguments. He shows his familiarity with every aspect of his subject, yet he realizes what his students do and do not know. Employing a dynamic lecture speed based on the current ability of his students to grasp his explanations ensures that the entire group passionately follows along. Using examples from both the course content and beyond, he merges the abstract effortlessly with the concrete. All students loved to listen. It was a rarity for the entire group to pay attention, but not with his course. His personal style clearly displays his personal fascination and adoration for his field, which inspires students greatly. Vincenzo Vitelli makes his students love (studying) physics.

Onno van Gaans
Mathematical Institute

Nominated for: 'Analyse 1', 'Bachelorseminarum Analyse/Stochastiek/Besliskunde', Functional Analysis (Mastermath), 'Functionaal Analyse Seminar (Leiden)'

Onno is a very engaged teacher for all students of maths. He is involved with a broad range of different activities. Teaching Analysis 1 for the first year students is one of his main activities. Onno also (co-) organises the Bachelor seminar on Analysis, Stochastics and Decision Theory, and the master seminar. During this seminar, bachelor-, master- and even PhD-students meet with teachers and tutor each other on selected subjects. As an example of his teaching skills, nobody will forget how Onno draws the sine function of 1/x on the blackboard with passion. It is just one example of how he makes his lectures spontaneous and casual, while simultaneously making sure that every student is still keeping track of the theory. Therefore, Onno is a popular choice as a thesis supervisor. As Onno is also the supervisor of the first year students, he really gets to know all his students and will help them to pass their first year.

Hendrik-Jan Hoogeboom
Leiden Institute of Advanced Computer Science

Nominated for: 'Fundamentele Informatica 1', 'Datastructuren' (Bachelor Informatica), Seminar Algorithms (Master Computer Science)

Hendrik-Jan Hoogeboom's lectures are experienced by the students as very clear. He is a very enthusiastic teacher who is capable to grab the attention of all his students. He is able to explain the important basic concepts of Computer Science like no other, even those topics that at first sight may seem dry and complex. With the right questions in place, Hendrik-Jan Hoogeboom makes clear to the students that no research field is fully closed. He knows how to stimulate students to come up with possible open research questions on the topic created in class. With Hendrik-Jan Hoogeboom there is no question that is not important enough to be answered, no result that is too small to be interesting, and no mathematical proof that is too elegant not to be improved. Students look forward to his lectures to come, not in the least because every single lecture is larded with a great deal of humour and fun, whether intentional or not!

Navraj Pannu

Leiden Institute of Chemistry
(Life Science & Technology)

Nominated for: Biomolecular Structures

Navraj ensures teaching to be not about the teacher and what most suits him, but about the students: how can they be motivated and perform at their very best? He tackles crystallographic matrices as a team: student and expert are challenged alike. Cavities in facts and understanding do not pose a problem in teacher-student communication, but are noticed and confronted head-on and effectively. Navraj is open for questions and for discussion and he is innovative, as less successful approaches in teaching are reexamined on the go. In addition, all available material used in the process of explaining the science of crystallography comes together in solving a recently obtained crystal structure by computer since Navraj is also actively exploring crystal structures at the European Synchrotron in Grenoble. Novel connections to the fields of NMR and (cryo-)EM are exemplified by a smart choice of supporting literature. In general, crystallography at the Leiden Institute of Chemistry sets an example as a supporting network of expertise.

Ludo Juurlink

Leiden Institute of Chemistry
(Molecular Science & Technology and Chemistry)

Nominated for: Algemene & Anorganische Chemie (AAC), Fysische Chemie & Kintetiek (FCK) – 2014-2015 final year, Surface Science (SCS)

Ludo Juurlink is a passionate and enthusiastic researcher with fine didactic skills. He knows how to keep the students' minds on the job and combines the lectures with workshops and demo's related to the topics covered. With the first-year course, "Algemene & Anorganische Chemie", Ludo discusses many aspects within, and connected with chemistry. During the breaks and after college, Ludo helps out the students who didn't understand certain subjects. You can always contact him when you are lost in an assignment or theory. Furthermore, he always tries to improve his courses by listening to the students' feedback. He also is a member of the education committee of which he became the chairman this year.

Jeroen van Smeden
Leiden Academic Centre for Drug Research

Nominated for: 'Thema Geneesmiddeltoediening en -afgifte'

Jeroen has a very youthful and enthusiastic mindset, which makes it possible for him to easily connect with students. Engaging with your students on their level is an aspect that is often underrated, however it is known to have a positive influence on their learning curve. With interactive lectures students keep paying attention, a method he uses in just the right way. Besides being able to quickly transfer knowledge to others, he also uses his social skills to easily blend in, which is how he became involved in for example the study association of Bio-Pharmaceutical Sciences. This is one of the aspects that has lead to the fact that he is a popular teacher among Bio-Pharmaceutical Sciences students. Jeroen is also very passionate about his research, which has resulted in numerous publications. He uses the knowledge he gains during his research to continuously improve his lectures, and therefore the students always get the most recent information.

Michiel Hooykaas
Institute of Biology Leiden

Nominated for: 'Biodiversiteit Dier' and 'Biologie van het Organisme: Dier'

For every student the first bachelor year is a tough year to adapt and learn the academic way of thinking and handling. Michiel understands this and gives the students the opportunity to improve themselves during their practical work. The students are guided by well-instructed assistants, and are encouraged to work independently as well as collaborate with other students to solve problems. His courses with clear, structured and to-the-point lectures are easy to follow by students and are experienced as fun and interesting to attend. The practical work is accompanied with small "demo's" giving the students additional information about the subjects, which involve published articles about recent developments, extinct species, and the application of different species into society. Not only is Michiel Hooykaas an excellent lecturer and practical guide, he is also socially involved with every student, providing them with support when necessary, and understanding their feelings.

Jeroen Guinée
Institute of Environmental Sciences
(Industrial Ecology)

Nominated for: Life Cycle Assessment Practice and Reporting

Professor Guinée has a very structured and organised course. He is a front-runner in the field of life cycle assessment (LCA), collaborating to write one of the main handbooks on the field of LCA and co-creating CMLCA software, an open-source software for inventory analysis and impact assessment in the life cycle of product/service systems. His vast experience and passion for the field are a motivation for his students, which he encourages and effectively leads throughout his course. He focuses on learning by doing, giving his students the freedom to choose and develop their own case study, being more than students but real LCA practitioners. His experience reaches out much further than the classroom - he is an accomplished researcher and is widely recognized for his work on the field of LCA, particularly in the development of LCA standardization practice.

Leiden Science 'Our Talents and Discoveries in 2015'

Editorial team
Marjolein van Schoonhoven, Geert de Snoo, Ron van Veen, Han de Winde

Contributing writers
Nienke Beintema, George van Hal, Arnout Jaspers, Marjolein van Schoonhoven, Willy van Strien. With a warm thank you for their input: all chairs of our student associations (nominations Faculty Award for Teaching 2015) and Tom Westerhof (Science Campus).

Photo credits

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	Sir John Pendry: Imperial College London/Mike Finn-Kelcey
	Natašja Jonoska: University of South Florida
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Page 27	Photo of the exterior of the Science Campus: Maikel Samuels, all other photos Faculty of Science

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