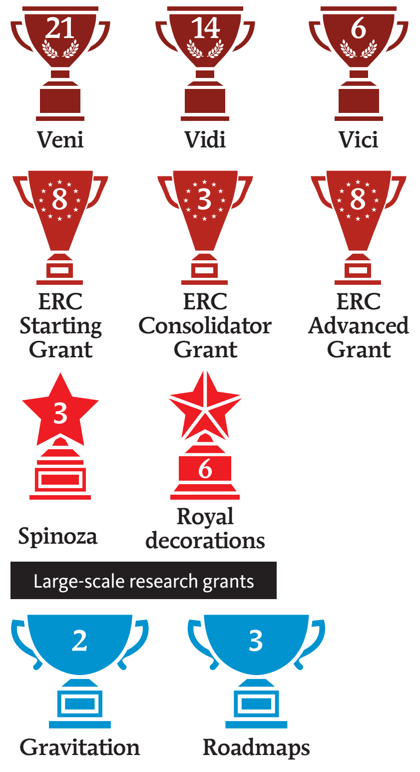
Facts & figures

Staff

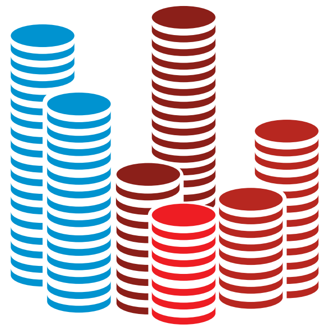
	IMM	HFML	FELIX
Staff (#)	333	55	40
Staff (fte)	268	51	33
Permanent scientific staff (fte)	43	7	6
Permanent non-scientific staff (fte)	31	12	9
Full Professors (#)	16	3	2
Associate professors (#)	3	0	0
Assistant professors (#)	21	3	2
PostDocs (#)	49	3	7
PhD students (#)	94	17	7

Reference date: January 2019
HFML and FELIX are scientifically embedded within IMM, Source: HR Faculty of Science - Radboud University

Laureates



Reference date: May 2019
Source: F&C Faculty of Science - Radboud University
Including FELIX and HFML



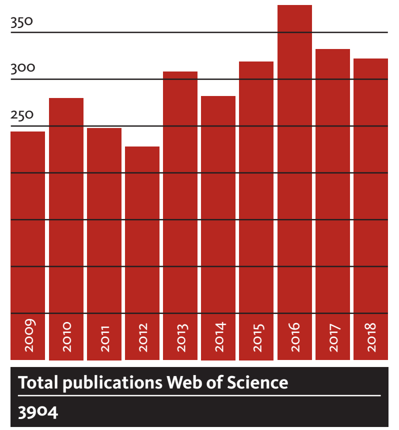
Research funding

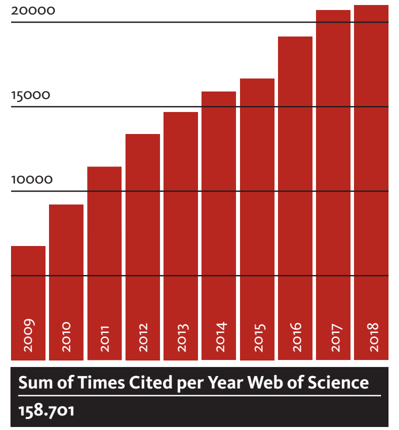
Direct funding **7,1 M€ per year**

Indirect funding: (total project portfolio):
NWO **39 M€**
European Commission **27 M€**
Other **7.5 M€**

Reference date January 2019, Source: F&C Faculty of Science - Radboud University
Excluding FELIX, HFML and NCAS

Research output





Reference date: January 2019, Source: Web of Science, Including FELIX and HFML

Reference date: January 2019, Source: Web of Science, Including FELIX and HFML

	Documents (#) 2013-2018	Documents Cited (%)	Documents in Top 1% Journals (%)	Documents in Top 10% Journals (%)
Theme 1	376	86.92	1.91	15.26
Theme 2	724	85.63	1.52	13.81
Theme 3	519	87.28	3.28	20.04
Total	**1402**	**85.78**	**2.29**	**16.73**

Numbers generated with InCites based on Web of Science
Reference date: January 2019, Including FELIX and HFML

Meet our Spinoza Prize winners

The NWO-Spinoza Prize is the highest scientific award of The Netherlands. This prize is awarded by the Netherlands Organisation for Scientific Research (NWO) to scientists for their outstanding, ground-breaking and inspiring top research. IMM is proud to have three Spinoza awardees!

Wilhelm Huck

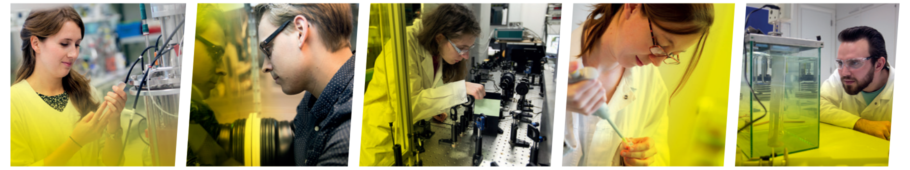
Wilhelm Huck is professor in Physical Organic Chemistry, and works on one of the main scientific questions of this time: what is life and where does it come from? Key to addressing this question is understanding how networks of chemical reactions create a functional system. The Huck group studies how such networks function in living cells, and how primitive networks can evolve in complexity to ultimately create something we would recognize as living.

Mikhail Katsnelson

Prof. Katsnelson is one of the founding fathers of research into graphene, a single layer of carbon atoms arranged in a honeycomb lattice, with unique characteristics. Graphene can potentially be used in solar cells, high frequency transistors and as a replacement for silicon computer chips. Katsnelson's theoretical research lies at the basis of almost all discoveries and predictions about graphene.

Theo Rasing

Theo Rasing is professor in Experimental Physics and is known for his pioneering research on manipulating magnetism by light. He demonstrated that short femtosecond laser pulses can generate equally short magnetic field pulses and even switch a magnet. He is also intrigued by the question how to store data in a more energy-efficient way, where the human brain is his source of inspiration.



Contact information
Institute for Molecules and Materials
Faculty of Science
Radboud University
Heyendaalseweg 135
6525 AJ Nijmegen
+31 24 365 2065
imm@ru.nl
www.ru.nl/imm

Outstanding research & unique facilities

Institute for Molecules and Materials
Radboud University

IMM

The Institute for Molecules and Materials (IMM) is an interdisciplinary research institute in chemistry and physics at Radboud University. Our mission is to perform fundamental research to understand, design and control the functioning of molecules and materials and to train the next generation of leaders in science and entrepreneurship at the highest international standards.

Our research focuses on the fundamental interactions between molecules, the chemistry of complex, life-like molecular systems and the properties of matter emerging from quantum effects. Our scientists make use of unique research facilities such as the international user facilities High Field Magnet Laboratory and the FELIX Laboratory for THz spectroscopy, and extensive NMR, Scanning Probe and Laser Facilities.

We actively explore and promote the interaction with industry and the application of our fundamental research, ranging from electronics, photonics and data storage to drug synthesis and delivery.

IMM research

IMM houses a range of extensive advanced spectroscopic facilities. Physicists and (bio) chemists, theorists and experimentalists cooperate in many research fields. Together, we work on understanding, designing and controlling the functioning of molecules and materials at the smallest length and time scales. The IMM research is organised in three research themes:

1. Structure and Dynamics of Molecules

A detailed understanding of the interactions between individual molecules is of importance to physics and chemistry. We unravel these interactions by building on a fundamental understanding of (bio) molecular structures as well as collisions between molecules and chemical reactions. Experiments are often based on advanced spectroscopic techniques such as Nuclear Magnetic Resonance and various laser techniques, including Free Electron Lasers. The specific systems under study are often of relevance to atmospheric, biophysical, analytical and astrochemical sciences. Examples are small to medium-sized (bio) molecules, non-covalently bound complexes, scattering and diffusion on ice surfaces, and collisions of molecules with atoms, molecules or surfaces. Ultimately, a full understanding of molecular interactions may allow us to actively control macroscopic systems, with applications ranging from more efficient chemical reactors to molecular quantum devices.

2. Chemistry of Complex Systems

We are inspired by chemistry in living cells and we want to master chemical processes that are found in biological environments. Unlike in traditional chemical experiments, in these environments many different compounds react in mixtures with high overall concentrations. Our challenge is to move away from isolated molecules and classical (diluted) reactions toward more realistic, complex and crowded situations. We want to design and synthesise chemical reaction networks, like those found in the cell, and study the complexity and functions that emerge in systems chemistry. Industrial and catalytic processes potentially benefit from this research as they often occur under circumstances of high concentrations and/or temperature.

3. Spectroscopy of Quantum Materials

Our goal is to understand, develop, and manipulate materials based on collective, or emergent quantum effects, envisioned toward new types of functionality. To this end, we manipulate interactions in materials at the most extreme limits, namely at the level of individual atoms, at ultra-short time scales, high pressures or in the highest magnetic fields. The focus of the research includes the understanding of magnetism at the level of single atoms and in strongly non-equilibrium conditions, as well as the robustness of superconductivity and its interplay with exotic quantum phases, and novel electronic properties that arise in lower dimensional systems due to, for example topology or electron correlations. New quantum materials may lead to much faster and more energy efficient ways of computing, transferring and storing of data, to mention some of the potential important applications. The strong collaboration between different experimental and theoretical groups as well as the ability to characterise and manipulate materials with the most advanced methods worldwide, both experimentally and theoretically, are unique features of this research at IMM.

IMM education

IMM is directly involved in Bachelor and Master education in physics and (bio)chemistry and we employ and educate more than 120 PhD candidates. Our students work side by side with the top scientists at our institute and make use of our state-of-the-art facilities.

Unique facilities

IMM houses a multitude of advanced spectroscopic tools that allow for a detailed characterisation of matter in the nano-femto-domain, including the world-wide unique coupling of the free electron lasers laboratory FELIX to the high magnetic field laboratory (HFML), enabling far infrared experiments in high magnetic fields.

Our facilities include:

FELIX Laboratory for free electron lasers
The FELIX Laboratory is an international user facility, exploiting several free electron lasers that can be precisely tuned in wavelength, energy and pulse time. The facility provides the world's most complete coverage of the (far) infrared (THz) spectrum and is used in a broad range of fundamental research, from exploring the limits of fibre optics networks to determining the interactions of biological molecules.

High Field Magnet Laboratory (HFML)
The international user facility HFML is one of the few facilities with continuous high magnetic fields up to 37.5 Tesla worldwide. In these magnets surprising material properties come to light, from crystal growth in gravitation-free environments to exotic quantum phases in topological materials. In 2020 the new 45 Tesla hybrid magnet will become operational.

Magnetic Resonance Research Center
The NMR Laboratory is a large-scale facility for high-resolution liquid and solid state NMR. The laboratory houses eight NMR spectrometers, including a sensitive 850 MHz instrument. Here, new techniques are developed to optimise sensitivity and information content of NMR spectra. The NMR Laboratory is part of the national uNMR-NL consortium.

Moreover, we house a broad range of other world-class research equipment including lasers, mass spectrometers, microscopes and analytical instruments. The Laser Laboratory includes various tunable femtosecond lasers for studies of matter in extremely non-equilibrium conditions, and high resolution CW lasers for single molecule spectroscopy as well as trace gas detection. The SPiN Laboratories has a broad range of scanning probe microscopes for studies of structural, electronic and magnetic properties at the single atom level. For a full list of instruments available at IMM, *please contact us at imm@ru.nl.*

From Science to Application

Fundamental knowledge is the driving force of innovation. We actively explore the interaction with the private sector and non-profit organisations by offering our expertise, infrastructure and support. Examples of successful collaborations include AkzoNobel, DSM, Philips, Teijin, LG Electronics, Nouryon, NXP and Shell, as well as various SME's.

Public Private Partnerships
IMM takes part in various public-private partnerships, both in large research consortia, as well as on a one-by-one basis. These collaborations enable us to involve the private sector in our research, resulting in a direct pathway from science to market. Interested in working with us? *Please contact us at imm@ru.nl.*

Research equipment
High-quality research requires state-of the-art research facilities and equipment. IMM has a broad range of analytical as well as spectroscopic instruments. SME's and companies are welcome to use these. Interested to find out what we can do for you? *Please contact us at imm@ru.nl.*

Societal Challenges
Although fundamentally oriented, IMM contributes to urgent societal problems:

- *Green IT:* Predictions are that by 2025, the ICT industry will use 20% of all electricity and emit up to 5.5% of the world's carbon emission. Working together with industry, we explore fundamentally new ways of data processing and storage, such as single atom data storage and brain-inspired computing, which will hopefully lead to enormous reductions in energy usage and carbon footprint.
- *Data analyses:* New measuring techniques enable the collection of enormous datasets. Our researchers help to analyse results and draw conclusions from these. Examples are efficiency studies in process technology, health and environmental studies. Our researchers can help decide on more effective interventions.
- *Personalised healthcare:* Prescriptions are not always effective; they may not reach the right place or might not be the best drug to tackle a problem. We work on the development of early-stage drug development and delivery methods, as well as diagnosis. An example is a precise method to identify biomarkers using a unique combination of mass spectrometry and infrared spectroscopy.