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Groningen Cognitive Systems and Materials – CogniGron

10 Professor positions

Looking for visionary young and middle-career academics

www.rug.nl/fse/cognigron

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The **University of Groningen** opens 10 professor positions in the fields of Mathematics, Computer Sciences, Artificial Intelligence and Electrical Engineering/Physics to complement research activity in the recently founded **Groningen Cognitive Systems and Materials center** (CogniGron).

1 Cognitive Devices;
2 Neuromorphic Circuit-Design;
3 Computational Neuroscience;
4 Continuous Machine Learning;
5 Innovative Computer Architectures;
6 Computer Networks;
7 Theory of Computation;
8 Topological Data Analysis and Data Science;
9 Computational Mathematics;
10 Statistics and Stochastics;

For more information and to apply, please visit www.rug.nl/fse/cognigron. You may apply for these positions until August 15th 2018. The interviews are expected to start taking place from mid September.

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Foreword

The University of Groningen is an ambitious international research university with strong roots in the north of the Netherlands. The University creates and shares knowledge through its outstanding research, scholarship and education. With an academic tradition dating back to 1614 and a rich heritage, the University is a unique academic community with a strong sense of belonging and a culture of innovative education and research. Research and teaching at the University of Groningen are curiosity driven and relate closely to global societal needs. The research is based on strong core disciplines. In Groningen, we believe that exceptional teaching and research depend on a diverse academic community with a broad range of nationalities and talents. Research, societal impact and education are closely intertwined at the University, and are set against a backdrop of academic freedom. We, thus, enable our students to become active, independent, critical and responsible global citizens who will help solve the scientific and societal challenges of tomorrow.

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Groningen Cognitive Systems and Materials – CogniGron

The face of computing is about to change forever. We are producing ever larger and more complex streams of data. In order to extract useful information, we need computers that can view, prioritize, combine, analyze and generate new suggestions. Systems that learn by doing, getting better and smarter with every task – the realm of cognitive computing. Therefore the University of Groningen has founded the research center Groningen Cognitive Systems and Materials, CogniGron in short, to seek focus and critical mass for the development of new functional materials in the design of the next generation of cognitive computers.

The main goal of Groningen Cognitive Systems and Materials is to create self-learning materials that are able to perform the tasks now assigned to thousands of transistors and complex algorithms in a more efficient and straightforward manner. They will, therefore, form the basis for a new generation of low-power computer platforms for cognitive applications, such as pattern recognition and analysis of complex data.

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CogniGron is embedded in the Faculty of Science and Engineering as a joint venture involving researchers from materials science, physics, chemistry, mathematics, computer science and artificial intelligence.

To strengthen the required multidisciplinary expertise, we have created 12 new tenure-track or tenure (depending on experience) professor positions.

We invite visionary young and middle-career academics to apply for the following positions:

1 **Cognitive Devices;**
2 **Neuromorphic Circuit-Design;**
3 **Computational Neuroscience;**
4 **Continuous Machine Learning;**
5 **Innovative Computer Architectures;**
6 **Computer Networks;**
7 **Theory of Computation;**
8 **Topological Data Analysis and Data Science;**
9 **Computational Mathematics;**
10 **Statistics and Stochastics;**

By joining us, you will complement the research activities of CogniGron. Together with the recently appointed professors in *Engineering Mathematics* (11) and *Multi-Agent Decision Making* (12), as well as existing staff from the Bernoulli Institute for Mathematics, Computer Science, and Artificial Intelligence and the Zernike Institute for Advanced Materials, you will work towards the mission and goals of CogniGron and will be involved in the teaching activities of the institutes.

For more information see: www.rug.nl/fse/cognigron or contact Prof. dr. B (Beatriz) Noheda (Director CogniGron, b.noheda@rug.nl

Position descriptions

1 Cognitive Devices

We are looking for a visionary Physicist or Engineer with expertise in device physics for the design, fabrication, characterization and testing of materials and devices for cognitive computing. You will be expected to develop materials and devices with learning capabilities that combine memory and adaptability and are used as key elements in cognitive computing. Within this position you will respond to the need for devices in information processing that work under very different concepts than the current CMOS technology does.
A strong collaboration is envisioned with other expertise within CogniGron. Most important will be the collaboration with a circuit designer with knowledge in the circuit integration of cognitive brain-inspired devices. This provides the necessary knowledge to integrate materials in working circuits that can be tested for cognitive applications. The position is embedded in the Zernike Institute for Advanced Materials with strong interactions with artificial intelligence, mathematics and computer science.

2 Neuromorphic Circuit-Design

We are looking for a visionary engineer or physicist with expertise in circuit design and integration of electronic devices in processing systems and architectures. If interested, you will be expected to develop neuromorphic/cognitive circuits using memristive devices, that is, to investigate memristors from the point of view of a circuit designer and computer architect. This includes, on the one hand, the description of key properties that are required for specific functionalities within the processor, as feedback for the materials and device scientists. On the other hand, within the research center, you will work closely with experts in memristive devices towards the development of cognitive chips/systems that are particularly designed to utilize the specific characteristics of new available materials. The position will be embedded in the Zernike Institute for Advanced Materials with strong interactions with artificial intelligence, mathematics and computer science.

3 Computational Neuroscience

We are looking for a researcher in Artificial Intelligence who will develop a highly visible line of research on spiking neural networks that simulate the human brain at a very low level of abstraction, while taking into consideration the functional requirements of cognitive systems. One requirement is that the developed networks function in real time, for which an implementation at the material level is required, for instance by using neuromorphic chips. The final aim is to construct an overall architecture of cognition by linking the spiking neural networks to other levels of abstraction. The position is embedded in the Cognitive Modelling group of the Bernoulli Institute with strong collaborations with materials science, cognitive neuroscience and computer science.

4 Continuous Machine Learning

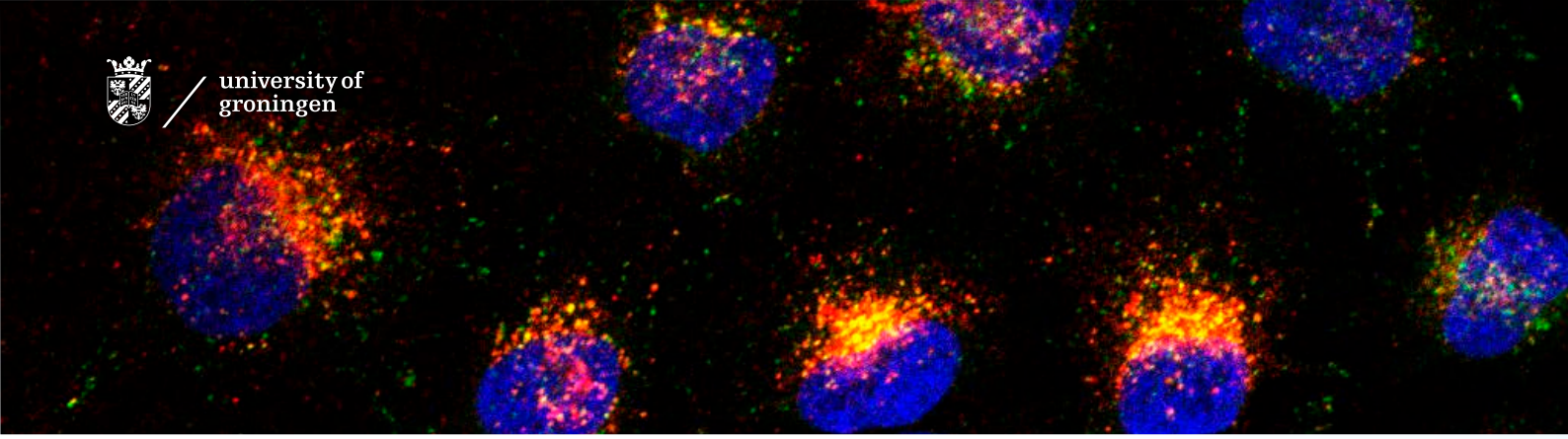
We are looking for a researcher in Artificial Intelligence who will integrate knowledge of current deep learning with what is known about continuous incremental learning in cognitive systems. You should have affinity with non-standard neuron models (e.g., spiking neurons). Rather than training single-trick models, the challenge is to develop systems that can build upon existing skills (e.g., Hinton's capsules) and adapt to new tasks in a compositional manner. New paradigms for performance evaluation and benchmarking need to be designed, with a possible translation to neuromorphic hardware platforms in mind. The position is embedded in the Autonomous Perceptive Systems group of the Bernoulli Institute, with strong collaborations with materials science, cognitive neuroscience and computer science.

5 Innovative Computer Architectures

We are looking for a researcher in Computer Science who will develop novel computing architectures that meet several challenges such as modularity, scalability, robustness, fault-tolerance, flexibility, and energy-efficiency. New computer architectures and corresponding compilers, software platforms, etc., are needed, so that a performance improvement by several orders of magnitude becomes possible. Of particular interest are cognitive/neuromorphic computing, hard-ware-software co-design, large-scale GPU computing as well as embedded systems architectures. Architectures that handle the generation, processing, storage and analysis of big data are also emphasized. The position is embedded in one of the Computer Science research units of the Bernoulli Institute, with strong collaborations with materials science and artificial intelligence.

6 Computer Networks

We are looking for a researcher in Computer Science who will focus on network design for novel cognitive computing applications, with an emphasis on efficient transmission and processing of large amounts of data. Novel computer network technologies are needed that focus on communication and networking of modular neuromorphic units. In particular, we envision you to have an interest in different research directions involving various aspects of a new computational paradigm: from new advanced network models for efficient communication between electronic “synapses” to new innovative distributed algorithms that fully utilize new computational infrastructures. There are strong connections to research on new computer architectures and neuromorphic circuit design. The position is embedded in one of the existing Computer Science research units (for example, the Distributed Systems group) of the Bernoulli Institute, with strong collaborations with materials science and artificial intelligence.



7 Theory of Computation

We are looking for a researcher in Computer Science who will perform research on fundamental computing paradigms, formal modelling of communicating systems, algorithmic and computational complexity, in relation to new (neuromorphic) computing architectures. Within theory of computation, broadly construed, novel approaches and programming models are needed to design and program neuromorphic and cognitive systems but also to rigorously certify their reliability, correctness, and efficiency. Complementary areas in the scope of this position include: programming languages, logic, dependability, automated verification, design and analysis of algorithms, security and privacy, multi-agent systems. The position will be embedded in the Fundamental Computing group of the Bernoulli Institute, with strong interactions with artificial intelligence, mathematics and materials science.

8 Topological Data Analysis and Data Science

We are looking for a researcher in Mathematics or Computer Science who will work at the interface between the mathematics of data analysis (in particular, Topological Data Analysis) and Data Science. Recent advances in computational topology have made it possible to compute topological invariants from data with the aim to reconstruct computationally the topological features of some low-dimensional set, only observed via a high-dimensional noisy point cloud. This relates to well-known approaches in Data Science, including clustering, feature extraction, manifold learning, nonlinear dimension reduction, information geometry, and distinguishing (topological) signal from (topological) noise. The position will be embedded in one of the existing Mathematics or Computer Science research units of the Bernoulli Institute, with strong collaborations with materials science and artificial intelligence.

9 Computational Mathematics

We are looking for a researcher in Mathematics who will develop computational solutions of today's highly complex problems of science and engineering, ranging from the design of suitable, computationally tractable models, to the mathematical analysis of numerical algorithms. Your contributions are to be geared towards improving the mathematical insight in this broad area of research. Diverse aspects of computational mathematics can be envisioned: algorithmic issues that are tied together by numerical mathematics, as well as challenging computational modelling issues that can be studied mathematically. Some of the most exciting challenges for applying numerical simulation as an innovative design tool are in the development of self-learning materials. The position will be embedded in the research unit Computational and Numerical Mathematics of the Bernoulli Institute, with strong collaborations with materials science, computer science and artificial intelligence.

10 Statistics and Stochastics

We are looking for a researcher in Mathematics/Statistics who will perform research on modelling and inference of complex stochastic systems in high-dimensional data settings, aimed at developing modern statistical inference strategies for high-dimensional models, among which networks and systems of differential equations. The exponential growth in computing power over the last two decades has revolutionized statistical analysis and led to rapid developments and great progress in this emerging field. The challenge to build cognitive systems from basic nanoscale components involves both modelling (for example, by random graph models) and experimental approaches that will involve generating data on complex systems. The position will be embedded in the basic unit Probability & Statistics of the Bernoulli Institute, with strong collaborations with materials science, computer science and artificial intelligence.

Candidate specification

We are recruiting at the level of Assistant (tenure-track), Associate (tenure) or Full Professor, depending on your profile (see The University of Groningen Career Paths in Science)

We encourage you to apply if you have:

- a PhD degree with at least two years of postdoctoral experience abroad (industrial experience can partially compensate for this requirement);
- excellent research qualities, as evidenced by a publication record in (inter)national peer-reviewed journals and/or in peer-reviewed books and renowned conferences.
- proof of independence and international recognition;
- successes in acquiring external funding for research projects;
- a well-founded and motivated application with an innovative research plan that matches the mission of the Groningen Cognitive Systems and Materials Center (see www.rug.nl/fse/cognigron).

And if you are:

- a great team player with organizational qualities and good interpersonal skills;
- fluent in English;
- a good teacher and willing to fulfill the requirements for the University Teaching Qualifications;
- willing to learn the Dutch language.

Please check www.rug.nl/fse/cognigron

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About the faculty

The Faculty of Science and Engineering harbours a kaleidoscope of disciplines and research strengths, ranging from nanoscience to astronomy, from mathematics to pharmacy, and from molecular to marine biology. We have world leading research programmes in new materials, artificial intelligence and cognitive systems, computer architectures and computer tools. Our faculty has a top-notch research infrastructure that has led to two Nobel and four Spinoza Laureates. Our researchers pursue fundamental questions while collaborating with partners from industry, the medical world and other realms of society, where they continuously advance the frontiers of science.

The Faculty of Science and Engineering (FSE) offers a large number of Bachelor's programmes (overseen by our Undergraduate School of Science and Engineering) and Master's programmes (overseen by our Graduate School of Science and Engineering). Most of our programmes are fully English-taught, thus allowing students from all over the world to study with us.

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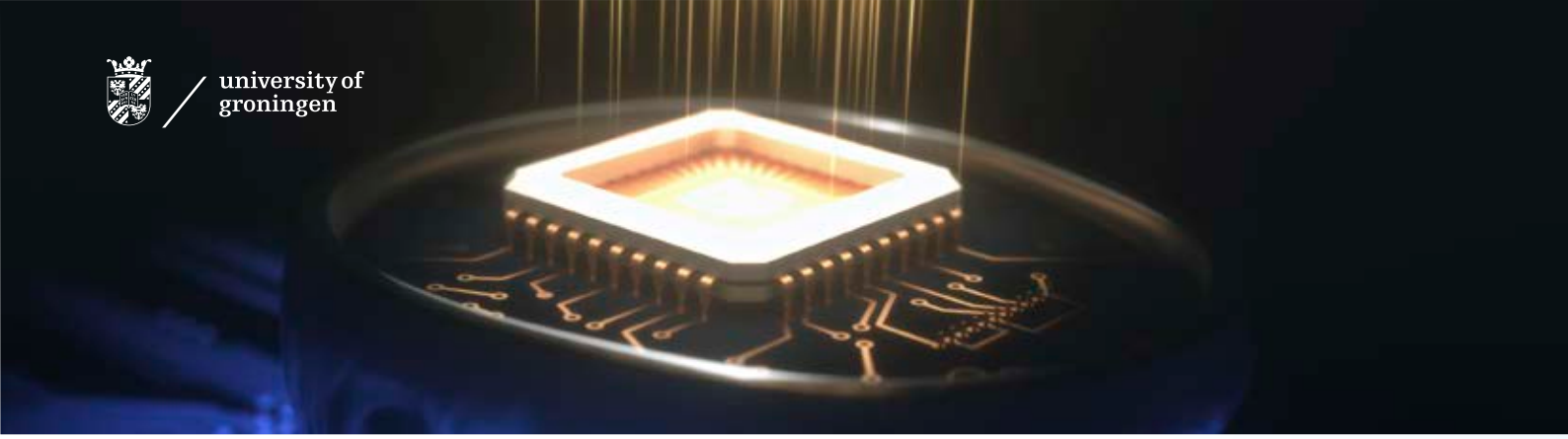
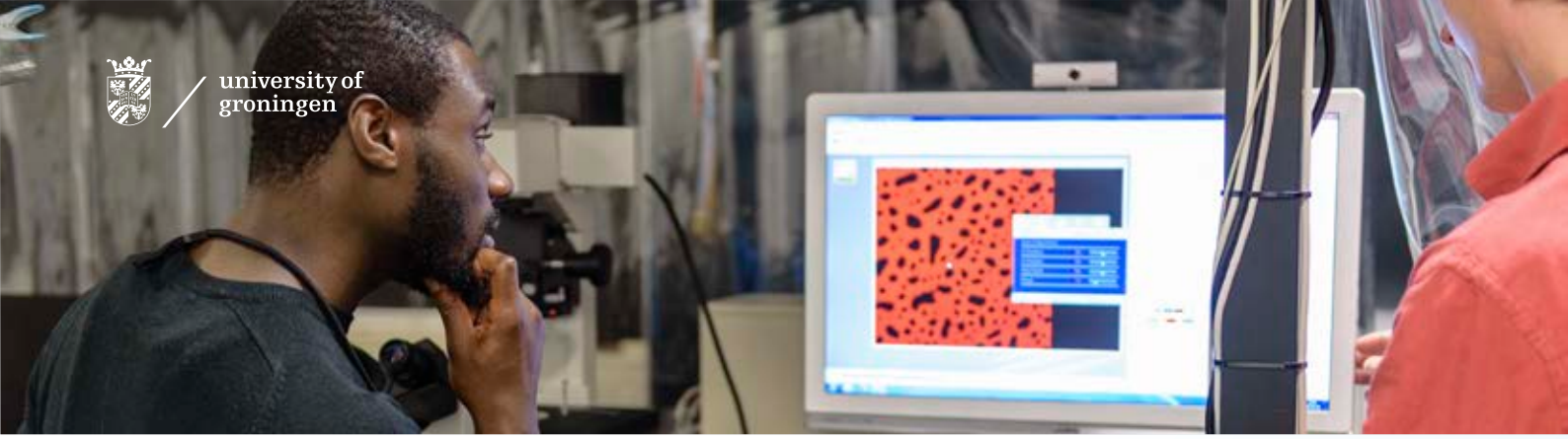


Reach Full Potential

The University of Groningen wants to make use of all academic talent and skills available. Therefore, we aim at attracting visionary and talented female and male academics from all over the world. For this, the University offers favourable employment conditions such as the tenure track system and ample development opportunities at all stages of your career. Research staff is actively encouraged and supported to develop their research and teaching skills, while the development of support staff focuses on the specific skills and versatility that they require. In order to stimulate this staff development we offer a range of programmes and staff mobility options. Moreover, we offer secondary benefits such as partner support to help us attract and retain talented staff.

We ensure an inclusive academic community by focusing on leadership, intercultural awareness and competences, social responsibility and cooperation.



Conditions of Employment

Assistant professor
The University of Groningen offers a starting salary, dependent on qualifications and relevant work experience, with a minimum of € 3,475 gross per month (salary scale 11 Dutch Universities) to a maximum of € 5,405 gross per month (salary scale 12 Dutch Universities) for a full-time position.

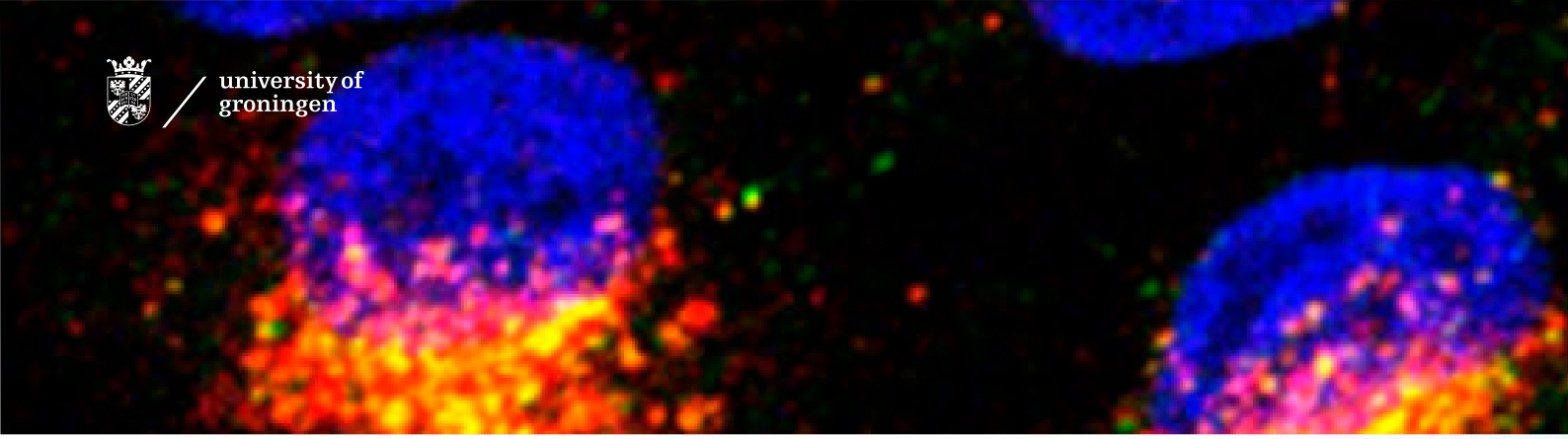
Associate professor
For the Associate professor, dependent on qualifications and work experience, from € 4,815 (salary scale 13 Dutch Universities) up to a maximum of € 6,438 (salary scale 14 Dutch Universities) gross per month for a full-time position.

Full professor
For the full professor the University of Groningen offers a salary dependent on qualifications and work experience from € 5,334 up to a maximum of € 7,776 (scale, Hoogleraar 2, Dutch Universities) gross per month for a full-time position.

The salary will show an annual increase within the scale. Additionally, the salaries include an 8% holiday allowance and 8.3% end-of-year bonus. The conditions of employment comply with the Collective Labour Agreement for the University of Groningen (Collective Labour Agreement Dutch Universities 2016-2017, available in English). The positions fall within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3', please see link for criteria and conditions).

A career advisory service for partners of new staff that move to Groningen is provided. We are an equal opportunity employer and value diversity at our institution. We do not discriminate on the basis of race, religion, color, national origin, gender, sexual orientation, age, marital status or disability status.

For information about employment conditions in Dutch universities please consult: https://www.labouragreementuniversities.nl/ For more detailed information about working conditions and working for the University of Groningen, please check: https://www.rug.nl/about-us/work-with-us/



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How to apply

Please fill the application form. For more information about CogniGron, the vacant positions, the requirements and the application procedure, please visit our website www.rug.nl/fse/cognigron.

Together with the application form, the following information needs to be submitted:

- A letter of motivation;
- A Curriculum Vitae, including teaching experience and list of publications (please do not include copy of the publications);
- A list of five selected “best papers’;
- A description of your research plans (maximum five pages);
- A statement on teaching goals and experience;
- The names of three referees, including title and contact information.

Please, include those documents as a single file in PDF format with your family name as the file name. Applications with missing credentials will not be taken into consideration.

You may apply for these positions until August 15th 2018 by means of the application form (click on “Apply” below on the advertisement on the university website). The interviews are expected to start taking place from mid September.

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Information

For more information, please consult

General information about Groningen Cognitive Systems and Materials center (CogniGron) and the selection procedure

- Prof. dr. Beatriz Noheda, Scientific Director
  b.noheda@rug.nl
- Dr. Jasper van der Velde, Scientific Coordinator
  j.h.m.van.der.velde@rug.nl

Specific information about the different institutes

Zernike Institute for Advanced Materials

- Prof. dr. ir. Caspar van der Wal, Director of the Zernike Institute for Advanced Materials
  c.h.van.der.wal@rug.nl

Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence

- Prof. dr. Jos Roerdink, Director of the Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence
  j.b.t.m.roerdink@rug.nl