

## Faculty of Science and Engineering

### Profile report: Geometry (Meetkunde)

- Discipline: Geometry
- Level: Associate/Full professor
- Fte: 1.0

#### 1. Scientific discipline

This profile report concerns an associate or full professorship in (Algebraic or Differential) Geometry.

#### 2. Vacancy

This position is opened by the Board of the Faculty (FB ref: JPT/dja/18/00039) and will be embedded in the Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence. The research group (basic unit) will be chosen with respect to the expertise of the candidate. The position falls within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3'). Please see link for [criteria and conditions](#).

#### 3. Selection committee (BAC)

Prof.dr. J.B.T.M. Roerdink	Scientific director Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence (Chair) and professor Scientific Visualization and Computer Graphics
Prof.dr. ir. R.W.C.P Verstappen	Program director Mathematics and professor Computational and Numerical Mathematics
Prof.dr. J. Top	Professor Algebra
Dr. A.M.S. Waters	Tenure track Assistant professor Analysis
Prof.dr. E. Pallante	Professor Theoretical Physics
R.R. Westerbeek	Student member
Prof.dr. G. Heckman	Professor Geometry, Radboud University

#### Advisors:

Prof.dr. G. Vegter	Professor Geometry
Prof.dr. H. Waalkens	Associate professor Mathematical Physics

#### HR advisor:

L.A. Boomsma, Human Resources Department

#### 4. Research area

We are looking for a leader in an area within Algebraic Geometry or Differential Geometry. These fields are central areas of Geometry, and they have strong and continuously developing connections to subjects like Algebraic Topology, Mathematical Physics, Harmonic Analysis, (discrete and continuous) Optimization, Computational Geometry, Number Theory, Coding Theory and Cryptography.

As one of the core areas of Mathematics, Geometry and in particular Algebraic as well as Differential Geometry besides being central research areas of mathematics, offer many opportunities for joint research with adjacent fields. Ideally, the expertise of the candidate should both reinforce and complement our research lines in Algebra, Geometry and Mathematical Physics, for instance in one of the areas of Riemann surfaces, symplectic geometry, algebro-geometric aspects of string theory, and geometric mechanics.

The core position of Geometry in several research lines of the Bernoulli Institute also implies its central role in our BSc- and MSc-programs in Mathematics. For these reasons, and also in view of recent and upcoming retirements, it is of paramount importance to ensure a good coverage of this field at a senior level.

### **5. Embedding: institute (and base unit)**

The Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence is part of the Faculty of Science and Engineering (FSE). The profile of the institute centers around modelling, computation, and cognition with a focus on science and technology, keeping a balanced mix of fundamental and applied aspects. The Bernoulli Institute comprises five mathematics programmes, six computer science programmes, and four artificial intelligence programmes. The constituting programmes participate in various national research schools and most of the PhD students are enrolled in an educational programme and take part in other activities offered by these schools. The Bernoulli Institute aims to strengthen the current research portfolio in Mathematics, Computer Science and Artificial Intelligence by expanding both in fundamental areas that have a prominent role in education as well as in directions that are essential for new technological and societal developments. The institute has a leading role in the recently established cross-disciplinary research theme on Data Science and Systems Complexity (DSSC), and in the Center “Groningen Cognitive Systems and Materials” (CogniGron) within the Faculty of Science and Engineering. It is also involved in the FSE Research Priority “Fundamentals of the Universe”, in which we collaborate with colleagues from Theoretical Physics and Cosmology.

### **6. Local and (inter)national position**

Within the Netherlands mathematics and geometry in particular has a high degree of national organization. This is illustrated by a long tradition of regular national seminars, in which Groningen plays an active role. Geometry is embedded in the national NWO clusters DIAMANT and GQT; the fact that two of the in total four NWO clusters have Geometry as one of their main themes, exemplifies the importance of the subject. Also, internationally there is a strong participation in joint activities, such as the North German (Algebraic) Geometry seminars (NoGAGs) and the Dutch-Belgian Geometry Days. The candidate is expected to become active in these national and international activities, and in this way strengthen the position of Groningen within the relevant clusters.

At the national level the Bernoulli Institute participates in the Dutch mathematics Research Schools for Fluid Mechanics (J.M. Burgerscentrum) and the National

Graduate School for Systems and Control (DISC), as well as in all four NWO research clusters: “Discrete, Interactive and Algorithmic Mathematics, Algebra and Number Theory” (DIAMANT), “Geometry and Quantum Theory” (GQT), “Nonlinear Dynamics of Natural Systems” (NDNS+), and “Stochastics – Theoretical and Applied Research” (STAR). Locally, the Systems, Control and Applied Analysis basic unit is part of the Jan C. Willems Center for Systems and Control, that furthermore consists of the control engineers in the Engineering institute ENTEG, also part of the Faculty of Science and Engineering.

At the international level the Bernoulli Institute is involved in several EU research projects (e.g., Statistical Network Science), has established collaborations with major companies (Philips Research, IBM) and technological institutes (Astron, TNO, NLR, ECN), and has cooperation and exchange programmes with many universities (e.g., Rome, Leipzig, Birmingham, Barcelona, Ghent, ESIEE-Paris, Tampere). The Bernoulli Institute has a strong position in national and international mathematics, as evidenced by participation in NWO and EU projects (e.g. HYCON2, Cosmic Web, CA15109), publications in renowned journals and conferences, memberships of editorial boards (e.g. EJC, *Indagationes Mathematicae*, *J Stat Phys*, Newsletter of the European Math. Soc.), boards of mathematical societies (e.g. IBS, Bernoulli, Foundation *Compositio Math.*) and program committees, conference chairing (e.g. MTNS 2014, IWSM 2017), etc. Mathematics research in Groningen is strongly focused on mathematical systems, in particular, Nonlinear Dynamical Systems, Mathematical Physics and Systems & Control.

## **7. Expected contributions to research**

The successful candidate is expected to develop an internationally leading research track record in Algebraic or Differential Geometry, leading to an autonomous research programme within the Bernoulli Institute. The research should lead to publications in high impact scientific journals and to contributions to major conferences in the field of expertise. Supervision of PhD students and postdocs is an important part of the research activities. Obtaining substantial external funding for PhD and postdoc projects is crucial. A strong involvement in the research theme Data Science and Systems Complexity or Cognitive Systems is expected. Interaction with other domains that require support from engineering mathematics (e.g., engineering, chemistry, smart energy systems, data security), or provide relevant complementary expertise (computer science, artificial intelligence) is very important.

## **8. Expected contributions to teaching**

The successful candidate is expected to contribute to the teaching programmes of the bachelor and master programmes of Mathematics in the Undergraduate and Graduate Schools of Science of the FSE. He/she will contribute both to teaching existing courses, and to the development of new courses in mathematics engineering. This includes the supervision of bachelor and master theses. Teaching and supervision tasks amount to 40% of the appointment.

## **9. Expected contributions to the organization**

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of the FSE, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations.