

## Faculty of Science and Engineering

### Profile report: Molecular Genetics

- Discipline: Genetics
- Level: tenure-track Assistant Professor – Associate Professor
- Fte: Full time (1,0)

#### 1. Scientific discipline

Molecular genetics is a broad research field in which the structure, function and activity of genes or complete genomes are studied at the molecular level, typically in the cellular context. Using biomolecular approaches and modern molecular genetics tools, detailed insight has been obtained into heredity, genetic variation, mutations and the functioning of genomes. These studies have provided answers to some of the very fundamental questions of life, ranging from the understanding of bacterial pathogenesis, to the intricacies of developmental biology and differentiation of cells and comprehending and treating genetic diseases. Moreover, novel technologies have been developed for effective and targeted genome editing, enabling a plethora of biotechnological and wide-ranging medical applications.

#### 2. Vacancy

This position for an assistant or associate professor is opened by the Board of the Faculty of Science and Engineering (FSE; with reference EMK/gl/16/00968) of the University of Groningen and will be embedded in the Groningen Biomolecular Sciences and Biotechnology Institute (GBB), an institute with 12 vibrant research groups, targeting challenging biological questions in the focal areas 'Molecular Mechanisms of Biological Processes' and 'Physiology and Systems Biology'. The position falls within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3'). Please use link for [criteria and conditions](#).

#### 3. Selection committee (BAC)

- Prof. dr. B. Poolman (Scientific Director GBB), chair
- Prof. dr. O.P. Kuipers (Head research group Molecular Genetics)
- Prof. dr. M. Heinemann (Head research group Molecular Systems Biology)
- Prof. dr. I.J. van der Klei (Head research group Molecular Cell Biology)
- Prof. dr. P. Knipscheer (Head research group Molecular Mechanisms and Regulation of DNA Repair; Hubrecht Institute)
- Prof. dr. J. van der Oost (WUR, Department of Agrotechnology and Food Sciences)
- Prof. dr. R.G.E. Timmermans (Director Undergraduate School Science and Engineering)
- Ms. M. van der Been (Student member)

#### *Additional advisors:*

#### External consultants:

- Prof. dr. J. Lebbink (Erasmus University)

- Prof. dr. L. S. Churchman (Harvard Medical School)

Local consultants:

- Prof. dr. J. Kok (staff member Molecular Genetics)
- Prof. dr. P. Lansdorp (Head research group Genetic Instability and Ageing; ERIBA)
- Dr. M.H.K. Linskens (staff member Cell Biochemistry)
  
- HR advisor: Mrs. Y. Folkers (FSE)
- Secretary: Dr. E.G. Vrieling (GBB)

#### **4. Research area**

Molecular genetics offers a multitude of different research possibilities, as all life on earth, apart from RNA viruses, is DNA based. Consequently, many fundamental questions on the role and functioning of biological entities, be it 'simple' microbes or higher (eukaryotic) organisms, including man, will need to be tackled with molecular genetic technology.

Consequently, with the advent of large-scale genome sequencing, genome-editing technologies, single-molecule studies of nucleic acid-protein interactions and the possibility to study single cells and cell ensembles it is now possible to unravel the intricacies of the code script and gene regulation in virtually any organism. The heterogeneity of clonal populations and genetic polymorphisms in ageing or compromised cells can be determined or even observed with high precision and temporal resolution. While single-nucleotide-precision genome editing is already practiced for several decades in bacteria, CRISPR-Cas technology now also allows editing, regulating and targeting genomes of higher eukaryotes, which already has impact in molecular therapeutics. It is nowadays possible to redesign genomes or even to design entirely new genomes and to create orthogonal functions in living cells. Other exciting developments are in the field of laboratory evolution combined with next-generation sequencing to understand basic scientific questions.

GBB is an institute where fundamental biomolecular questions and biotechnological and biomedical applications go hand in hand. The institute is looking for a candidate who will make a major contribution to the field of molecular genetics. The new faculty member is expected to develop an independent research line in molecular genetics addressing one or more important biological topic(s), and to develop or exploit the rapid developments in methodology and technology (CRISPR-Cas, genome profiling, (super-resolution) microscopy/microfluidics).

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

If the position is filled at the assistant professor level, the new faculty member will - until tenured - be embedded in the GBB research unit Molecular Genetics, which currently consists of two full professors (Oscar Kuipers and Jan Kok) and 3 support staff members. If the successful candidate is appointed at the associate professor level, embedding can happen in the same group, but also a new research unit can be

formed. Well-equipped laboratories (biosafety levels ML-I and ML-II), culture facilities for microbial and mammalian cells, and dedicated infrastructure for cellular analyses (a.o. advanced optical microscopes, life-time imaging, flow cytometry) and modern tools (e.g. RT-QPCR, RNA sequencing, proteomics, bioinformatics) for molecular and genetic research are available; if required, animal models can be studied. Challenging biological questions of today can be addressed adequately at GBB, while ample opportunities exist to strengthen the pursued research activities via local (interdisciplinary) collaborations.

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

The research institute GBB is both pioneering the development of new methodology and addressing fundamental biological questions in bacterial and eukaryotic model organisms. The groups of Kuipers and Kok focus on molecular genetics of Lactic Acid Bacteria and Bacilli and develop and implement genetic technology for studying industrially and medically important microorganisms. The group is recognized, among others, by its vanguard transcriptomics research, in-depth single-cell analyses, and the development of novel peptide antibiotics using synthetic biology approaches. Molecular biology and genetic tools are key in the studies of protein trafficking (Driessen, van der Klei, van den Bogaart), signal transduction (van Haastert, Kortholt), cell cycle control (Heinemann, van Haastert, Scheffers), and membrane transport (Driessen, Poolman, Slotboom). Other groups in the institute use genetic tools for enzyme engineering (Fraaije, Janssen) and protein production (Guskov, Paulino).

Excellent (molecular) genetics groups are present at e.g. the European Research Institute for the Biology of Ageing in Groningen, the Erasmus University (focus on DNA damage response), the Netherlands Cancer Institute (focus on genetics of cancer), and Hubrecht Laboratory (focus on developmental biology and stem cells), while excellent microbial genetics groups are located in the Universities of Wageningen and Amsterdam. Leading international groups are at Harvard Medical School, MIT Department of Biology, Centre for Bacterial Cell Biology (Newcastle, United Kingdom) and Institute Pasteur (Paris, France).

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

The research activities should result in the further strengthening of the international position of GBB in molecular genetics. The research line should become independent and be centred on solving challenging biological topics. The research should lead to international recognition, as demonstrated by publications in prominent international journals and contributions to major international scientific conferences in the field. External fund raising is essential to accomplishing the aforementioned tasks.

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

Development of excellent teaching skills and a strong commitment to participating in the teaching programmes of the Undergraduate and Graduate School of Science and Engineering are expected. Particularly, teaching is affiliated to Life Sciences (e.g.

the BSc Biology, BSc Life Science and Technology, MSc Molecular Biology and Biotechnology) and Biomedical Sciences (BSc and MSc levels). Supervision of (under)graduate students during BSc/MSc/PhD research and thesis projects should also be undertaken. Generally, the tasks comprise developing and implementing courses and teaching in genetics and microbiology.

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

An active input is expected in order to provide a valuable contribution to the management and organizational tasks of the GBB. 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, and establishing overarching activities within FSE themes (i.e. Molecular Life and Health, Adaptive Life and Advanced Materials). The candidate will participate in relevant national and international organizations.