

## Faculty of Science and Engineering

**Profile report:** Tenure track assistant professor in Biomolecular Chemistry, (Biomoleculaire Chemie)

- Discipline: *Organic Chemistry, Molecular Chemistry*
- Level: tenure-track Assistant professor
- Fte: Full time

### 1. Scientific discipline

Biomolecular chemistry is the discipline that involves the chemical modification of biomolecules and the exploitation of biomolecular processes. The field is at the interface of molecular (in)organic chemistry and biochemistry. Contemporary research areas include novel bio-hybrid systems, smart biomolecular materials, and biomolecular tools for the study and manipulation of biological processes. Topics that are within the focus area Molecular Life & Health of the Faculty of Science and Engineering.

### 2. Vacancy

This position is opened by the Board of the Faculty (JK/gf/17/00254) and will be embedded in the Stratingh Institute of Chemistry, basic unit Biomolecular Chemistry & Catalysis. 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. A.J. Minnaard, director of the Stratingh Institute of Chemistry, chair  
Prof. Dr. J.G. Roelfes, Stratingh Institute for Chemistry  
Prof. Dr. S. Harutyunyan, Stratingh Institute for Chemistry  
Prof. Dr. K. Barta, Stratingh Institute for Chemistry  
Prof. Dr. F. Picchioni, ENTEG, (special attention for teaching)  
Prof. Dr. M. Merkx, Eindhoven University of Technology, cluster Chemical Biology  
H.S. Siebe, master student Chemistry

HR Advisor: M. Beuving

Advisors to the selection committee: Prof. Dr. B.L. Feringa, Stratingh Institute for Chemistry, Prof. D.J. Slotboom, GBB

### 4. Research area

Over the last decades, molecular chemistry has had an overwhelming impact on the study of the living cell. The established disciplines in this field are biochemistry (enzymology, membrane studies), bio-organic chemistry (focusing on carbohydrates and secondary metabolites), molecular biology (studying the genome) and biotechnology (the production of compounds by enzymes and cells). The field has seen the advent of

several new (sub)disciplines that, although heavily intertwined, approach the cell in new ways. The most pronounced are systems biology (a more holistic, often mathematically underpinned, approach to the study of the cell), and chemical biology (the use of chemical techniques to study the function of the cell and its interactions with other cells). Except for biotechnology, all these disciplines mainly study (in fact aim to describe) how the cell functions in health and disease. There is more and more interest to manipulate, and exploit, processes going on in the cell in a precise chemical way. These evolving approaches are indicated as Biomolecular Chemistry and comprise the study of bio-hybrid systems, involving the integration of chemical molecular components in biological systems, functional biomolecular materials, and chemistry-in-a-cell. These studies require very sophisticated organic chemistry and exquisite control over chemical reactivity as the reactions have to take place in aqueous environment with complex biomolecules. In addition, the analysis of the reaction products requires top-of-the-bill analytical and spectroscopic techniques. It is this field in which the position is projected, as important knowledge and insight is expected to be gained. With the disciplines mentioned earlier firmly embedded either within Stratingh or within GBB, the novel position is well in place both in terms of expertise as in terms of infrastructure.

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

The Stratingh Institute for Chemistry focuses on research in molecular and supramolecular chemistry, with overarching impact on biology and physics based on fundamental organic and inorganic chemistry. It covers three research areas:

- **Chemistry of Life:** This area concentrates on a molecular approach to the study of biological phenomena and medically relevant problems, including the synthesis of complex natural products, the design and synthesis of small molecules to study and steer biochemical and cellular processes, and emerging properties like self-organisation and catalysis, including life itself.
- **Chemical Conversion:** This area investigates new synthesis and catalysis methods, including asymmetric catalysis and oxidation catalysis, designing artificial enzymes for new-to-nature reactions, the use of bio-based feedstocks and development of sustainable processes, and homogeneous catalysis methods using earth-abundant metals.
- **Chemistry of Materials:** This area covers various topics in nanoscience with a focus on advanced functional materials, such as molecular switches and motors, photovoltaics, functional polymers, molecular electronics, supramolecular materials, functional surfaces and artificial membrane components.

The base unit Biomolecular Chemistry, active in the research area Chemistry of Life, is a highly interdisciplinary research group that is active in the field of biomolecular chemistry, which is at the interface between organic, bio-inorganic and biochemistry. Currently, there are two main research themes in the group: bio-inspired catalysis and chemical biology.

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

The Stratingh Institute has built over the years an extensive collaboration network nationally and worldwide. More specifically within the research area “Chemistry of Life”, there are intensive collaborations with the neighboring research institutes GBB and GRIP and with the academic hospital UMCG. Research groups within the Stratingh Institute take part in national research consortia, e.g. the Gravitation Program Functional Molecular Systems, ARC-CBBC – Advanced Research Center Chemical Building Blocks Consortium, the Origins Center and in local research networks such as the CoFund program ALERT. The Biomolecular Chemistry and Catalysis unit collaborates with the group of Prof. Marechal at the Autonomous University of Barcelona on computational enzyme design, the group of Meijer/Palmans at the TU Eindhoven on hybrid systems and in vivo catalysis, the group of Baldus in Utrecht on in vivo NMR studies, and locally with the X-ray crystallography (Thunnissen) and spectroscopy (Browne) groups, the Kuipers group on peptide antimicrobials and the group of M. G. Rots (UMCG) on chemical probes for study and manipulation of oxidative stress in cancer cells. Related research in bio-inspired catalysis is performed at the University of Basel (Ward), CalTech (Arnold), Rochester (Fasan), Princeton (Hyster), Osaka (Hayashi), TU Eindhoven (Van Hest). Related research on Chemical Biology, which has a special focus on bio-orthogonal modification of peptide antibiotics, is performed at the Universities of Oxford (Davis), Illinois (van der Donk), Yale (Miller), Leiden (Martin).

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

The candidate is expected to perform original research within the field of biomolecular chemistry, interpreted broadly. Research topics that can be envisioned are the design of bio-hybrid systems, which involves the integration of chemical molecular components in biological systems, the construction of smart biomolecular materials or novel biomolecular-based tools and the development of concepts for the study and control of biological processes. Regarding specialized research tools, high-end mass spectrometry and imaging techniques are of particular interest and can be further developed. The candidate should be able to obtain substantial external funding from NWO and EU.

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

The candidate is expected to contribute to lecturing, project supervision and practical courses in the Bachelor Chemistry and the Master Chemistry education. A bridging role to the adjacent bachelor and master programs in Biology is foreseen. These educational duties are embedded in the Undergraduate and Graduate School of Science and

Engineering. The appointee will act as the supervisor of PhD students, which are embedded in the Groningen Graduate School of Science and Engineering.

### **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.