

## Faculty of Science and Engineering

**Profile report:** Behavioural neuroscience, Gedrag- en Neurowetenschappen

- Discipline: Behavioural Neuroscience
- Level: Tenure-track assistant professor
- Focus: Research
- Fte: 0.8 - 1.0 fte

### 1. Scientific discipline

Psychopathology with strong consequences for (social) behaviour is a major and growing problem in our rapidly changing society. A better fundamental understanding of brain-behaviour relationships and causes of individual differences in vulnerability to (early) environmental influences due to genetic predispositions is therefore urgent. Behavioural Neuroscience is a multidisciplinary science that studies how an organism, via the nervous system, orchestrates adaptive physiological and behavioural responses to its environment. These responses involve for instance alterations in social behaviour, nutrition/metabolism, biological rhythms and sleep, and often involves learning and memory processes in order to be able to anticipate future events. These mechanisms have been shaped by evolutionary (i.e., genetic/developmental) processes to maximise fitness, but can be maladaptive in rapidly changing environments, resulting in disease. Understanding these processes in an ecologically relevant context is thought to optimise the clinical relevance of findings. It requires high resolution analysis of behaviour, physiology and neuronal activity in several animal species housed under (semi)natural conditions. Additionally, targeted manipulation of cellular and molecular brain substrates, and/or using individual differences within a species allows interrogation of adaptive and maladaptive neuro-behavioural processes. This integrative biological approach opens up an innovative field of research for interdisciplinary analysis of cell biological, physiological and neurobiological mechanisms underlying complex behaviour in non-domesticated animal species under ecologically relevant conditions.

### 2. Vacancy

This position is opened by the Board of the Faculty of Science and Engineering in the context of the sector plan Biology and will be embedded in the Groningen Institute for Evolutionary Life Sciences ([GELIFES](#)). The position falls within the attractive framework of '[Career Paths in Science and Engineering](#)', which outlines the criteria and timeline for promotion, up to full professor (see link below). As the focus domain of the position is research, the criteria of the career path with a focus on research apply. Please see the link for the criteria and conditions.

### 3. Selection committee (BAC)

- Prof. dr. Rampal Etienne (Scientific Director GELIFES)
- Prof. dr. Eddy van der Zee (Education Director, GELIFES)
- Prof. dr. Jan Komdeur (Professor Evolutionary Ecology, GELIFES)
- Prof. dr. Jocelien Olivier (Professor Developmental Behavioural Neuroscience, GELIFES)
- Prof. dr. Martien Kas (Professor of Behavioural Neuroscience, GELIFES)
- Prof. dr. Sabine Spijker (Professor Molecular mechanisms of cognition in the context of neuropsychiatric disorders; external)
- student member

Advisors: Mevr. Nancy Clemencia (HR), Prof. dr. Gertjan van Dijk (Neuroendocrinology)

#### **4. Area of expertise**

The ability to adjust and adapt to varying environmental conditions is a key characteristic of living organisms. The nervous system is central to individual adjustment and evolutionary adaptation because it perceives and determines what represents a threat or an opportunity, stores past experiences, and regulates the behavioural and physiological response to these environmental challenges.

A common theme in behavioural neuroscience is understanding how brain circuits and associated genetic, cellular and molecular mechanisms integrate sensory information and experience to drive complex behaviours and endocrine/physiological processes that are necessary for adaptation. Although these integrated responses are aimed at adaptation and building to resilience, challenges can also be beyond the adaptive capacity leading to pathological disruptions in the fine-tuned molecular regulation of neural and neuroendocrine systems resulting in disease. The capacity to adapt is, however, individual. An important question is therefore why seemingly similar stressors and stressful life histories make one individual sick while leaving others unaffected. In this context, another common theme in neurosciences is the advancement of knowledge on disease processes, not only in relation to environmental stressors but also to congenital neurobiological malfunction or endogenous factors contributing to ageing disorders. What molecular/cellular changes happen in the brain before the onset and during expression of nervous system disorders and which genetic or developmental vulnerabilities underlie the expression of brain pathology? How can the neurobiological understanding of pathological processes be translated in the development of targeted therapeutic strategies for neuropsychiatric disorders and somatic diseases?

In the integrative approach to address these questions, it is important to study not only the structure, function and plasticity of the brain circuitry but also physiological and behavioural responses as readouts of neuronal activity in an ecological context. Various animal models and state-of-the-art techniques are used in the field of molecular and behavioural neuroscience to acquire knowledge on causes and consequences of disturbances in brain functionality: e.g. detailed analysis of cognitive, emotional and social behaviour, high-resolution imaging of neuronal structure and plasticity, connectomics, pharmacological, optogenetic and pharmacosynthetic intervention studies on causal relationships, studies on social interactions in semi-natural environments, studies on sleep and sleep disorders, metabolic disorders, etc.

Our education in the BSc and MSc programmes on neuroscience and behaviour, and behavioural ecology, as well as biomedical sciences, aims to teach an integrative neuroscientific approach to students in order to prepare them for the multidisciplinary approach required to address the question of how the brain controls both normal and abnormal behaviours. The integrative approach included research on and education in neuroscience combined with evolutionary and behavioural ecology. This is because, as outlined in the area of expertise above, an individual's nervous system has to evaluate the salience of a stimulus and elicit a context-appropriate behavioural response in social environments. For example, understanding the neurobiological mechanisms and functional aspects of social decision-making under variable environmental conditions is a novel research

avenue. This position will focus on developing a coherent research programme integrating ecological, neurobiological, behavioural and physiological knowledge and will contribute to coherence between courses in the relevant MSc programmes. These programmes include the Neuroscience track in the Biomedical Sciences MSc programme, the Top master programme Behavioural and Cognitive Neuroscience (BCN), the Erasmus Mundus Master Programme in Evolutionary Biology (MEME) and the majors Behaviour & Neuroscience, Biomedical Science and Ecology and Evolution in the BSc programme. The appointed new staff member's research should be complementary to the current research interests in the Groningen Institute for Evolutionary Life Sciences.

## **5. Embedding: institute (and expertise group)**

The Groningen Institute for Evolutionary Life Sciences (GELIFES) aims to enhance the understanding of adaptive processes and the maladaptive consequences of their limitations, across all levels of biological organization (from molecules and genes to individuals and ecosystems), to inform the society and contribute solutions to societal problems. The institute has close connections with the Faculty of Medical Sciences (FMS) and University Medical Centre Groningen (UMCG). It coordinates Master programmes in medical and behavioural neurobiology and in evolution and ecology.

GELIFES is organized in a non-hierarchical manner, and staff associate with one (or more) informal expertise groups. The tenure-track assistant professor is free to choose their expertise group. GELIFES currently has six expertise groups, each consisting of several principal investigators with their groups: *Genomics Research in Ecology & Evolution in Nature* (GREEN), *Theoretical Research in Evolutionary Life Sciences* (TRES), *Evolutionary Genetics, Development and Behaviour* (EGDB), *Behavioural and Physiological Ecology* (BPE), *Conservation Ecology* (CONSECO) and *Neurobiology*. GELIFES aims for an interdisciplinary integration of these expertise groups.

The new staff member will have access to GELIFES' excellent facilities for experimental research in neurobiology, including well-equipped indoor and outdoor animal facilities and laboratories, microscopy facilities, semi-isolation facility for human chronobiology, biotelemetry systems, as well as behavioural observation and quantification systems in experimental setups including semi-natural social environments. For this position, the utilisation of our natural outdoor facilities to study the neurobiology of behaviour in an ecological context will be considered a relevant component.

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

### Local:

GELIFES has strong links with the medical sciences at the UMCG and through the Research School BCN (Behavioural & Cognitive Neurosciences). A hallmark of our research profile is the integration of neurobiology, physiology and behaviour at several levels of biological organization in order to understand mechanisms involved in adaptation and maladaptation.

### National:

GELIFES has a strong reputation in research and education in behaviour, neurobiology, ecology and evolution. GELIFES is a key life science institute in the Netherlands that specifically aims at integrating the study of neurobiological mechanisms of behaviour with those of ecology and evolution. Many collaborations exist with other universities (e.g. Radboud UMC,

Amsterdam UMC (VU), Leiden University Medical Centre, Erasmus MC and University of Maastricht) and research institutes in The Netherlands on a wide variety of topics.

International:

There is no other institute in the Netherlands, and only very few in the world, that explicitly aims to integrate the neurobiology and physiology of behaviour in an evo-ecology context in the Life Sciences. Research topics that are internationally recognized and relevant for the new staff member are, among others, the evolution and physiology of animal personalities and ageing, the mechanisms and function of social interactions, neurobiology of neuropsychiatric disorders, biological and seasonal clocks, microbial genetics and ecology, maternal effects, avian flyways & population dynamics, adaptation to climate change, facilitation in plant communities, ecological community resilience, genetics and evolution of life histories, both from empirical and theoretical perspectives. GELIFES operates in a very international and diverse setting, collaborating with e.g. King's college London, Institute Pasteur (Paris), Tel Aviv University (Israel) as well as with major Pharmaceutical companies (e.g. Boehringer Ingelheim, Janssen Pharmaceuticals) and many others.

### **7. Expected contributions to teaching**

The new staff member will teach Behavioural Neuroscience courses within the Biology, Biomedical Sciences and Behavioural and Cognitive Neuroscience curricula. The new staff member will also supervise BSc and MSc Research projects and will teach advanced principles of Behavioural Neuroscience. The new staff member will coordinate a number of courses in these areas and maintain contacts with colleagues that teach related fields such as behavioural biology and behavioural genetics/neurogenetics and chronobiology.

The new staff member is further expected to evaluate the outcome of courses that they are coordinating and implement improvements across courses. Typical tasks for the new staff member are:

- Coordinating the BSc course Integrative Neuroscience (including lectures and practicals) that may include neuro-ecology
- Teaching in BSc and Msc courses and practicals in the majors Behaviour & Neuroscience and Biomedical Science such as Psychobiology, Chronobiology, and the 30 EC minor Neuroscience and Endocrinology.
- Supervising Bachelor research projects in the majors Behaviour & Neuroscience and Biomedical Sciences
- Supervising MSc research projects in the masters BCN, Biomedical Sciences and Biology
- Supervising BSc and MSc essays and MSc colloquia

### **8. Expected contributions to research**

The successful applicant is expected to develop an independent, internationally recognized line of high quality research that strengthens GELIFES profile in behavioural neuroscience in GELIFES. They will have a clear affinity with modern empirical approaches for behavioural neuroscience research that they can help introduce to GELIFES research and further strengthen the already ongoing research in that area. The specific expertise areas and skills of the successful applicant should be complementary to the current GELIFES staff. Core research tasks also entails supervision of PhD students and acquiring external funding.

Time allocation to research is expected to be at 60% during the first five years, and at 40% thereafter.

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

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