Faculty of Science and Engineering

Profile report: Behavioural neuroscience, Gedrag- en Neurowetenschappen

- Discipline: Behavioural Neuroscience
- Level: Tenure-track assistant or associate professor with research profile
- Fte: 0.8 - 1.0 fte

1. Scientific discipline

Behavioural Neuroscience is a multidisciplinary science that studies how an organism, via the nervous system, orchestrates adaptive physiological and behavioural responses to its physical and social environment. These responses involve for instance alterations in social behaviour, nutrition/metabolism, and biological rhythms, 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 maximize fitness, but can be maladaptive in rapidly changing environments, resulting in disease. Understanding these processes requires detailed analysis of the nervous system (e.g., by functional brain imaging) combined with high throughput/high resolution behavioural analysis (e.g. by use of tracking algorithms and machine learning). 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.

2. Vacancy

This position is opened by the Board of the Faculty (PT/gl/21/00867) and will be embedded in the Groningen Institute for Evolutionary Life Sciences (GELIFES). The criteria and conditions pertaining to the position are described in the document 'Assistant professor with a research profile'.

3. Selection committee (BAC)

- Prof. dr. Rampal Etienne (Scientific Director GELIFES)
- Prof. dr. Theo Elzenga (Education Director, GELIFES)
- Prof. dr. Jean-Christophe Billeter (Programme director Master programme Behavioural and cognitive Neuroscience / Professor Neurogenetics of sexual and social behaviour, GELIFES)
- Prof. dr. Jocelien Olivier (Professor Developmental Behavioural Neuroscience, GELIFES
- Prof. dr. Martien Kas (Professor of Behavioural Neuroscience, GELIFES)
- Prof. dr. Judith Homberg (Professor Translational Neuroscience, Radboud University; external member)
- Mw. Julia de Lange (student member)
  Advisors: Mevr. Nancy Clemencia (HR), Prof. dr. Simon Verhulst (Professor Evolutionary Biology of Ageing, GELIFES), dr. Peter Meerlo (Chronobiology), Prof. dr. Robbert Havekes (Neuroscience of Memory and Sleep)

4. Area of expertise

The ability to adjust and adapt to changing 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 both environmental and interoceptive information to drive complex behaviours and endocrine/physiological processes that are necessary for adaptation. Though these integrated responses underlie adaptation and contribute to resilience, challenges can also be beyond the adaptive capacity of individuals (both through genetic changes or more immediate, through phenotypic plasticity) leading to pathological disruptions in the fine-tuned molecular regulation of neural and neuroendocrine systems resulting in disease. However, responses differ between individuals. 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 aim 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. Various animal models and 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. transgenic animal models, 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 Bachelor and Master programmes on neuroscience and behaviour, as well as biomedical sciences, aims to convey an integrative neuroscientific perspective to prepare students for the multidisciplinary approach required to address the question of how the brain controls both normal and abnormal behaviours.

This position will focus on developing a coherent research programme integrating neurobiological, behavioural and physiological knowledge and will contribute to coherence between courses in the relevant Master programmes. These programmes include the Neuroscience track in the Biomedical Sciences programme and the Top master programme Behavioural and Cognitive Neuroscience (BCN). The 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*.

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.

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. The Neurobiology group is involved in several national and international consortia that also include collaborations with other national 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; for example, the Neurobiology group participates in several large international consortia, including excellent research institutes (e.g. King's college London, Institut Pasteur (Paris), and the Karolinska Institute) and other relevant stakeholders (such as major Pharmaceutical companies (e.g. Boehringer Ingelheim, Janssen Pharmaceutica)). The

Neurobiology group also works together with international companies for development of new drug targets (e.g. PsychoGenics, USA; Atlas Pharmaceuticals, Belgium).

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, with a main focus on the Master level. The new staff member will also supervise Master Research projects and will teach advanced principles of Behavioural Neuroscience. The new staff member will lead a number of courses in these areas and coordinate with colleagues that teach related fields such as behavioural biology, behavioural genetics/neurogenetics and chronobiology.

The new staff member is further expected to evaluate the outcome of courses that she/he is coordinating and implement improvements across courses. Typical courses to be taught by the new staff member are:
- A new Master course in Behavioural Neuroscience in the top Master Behavioural and Cognitive Neuroscience.
- Supporting the existing courses Neurobiology of Psychiatric Disorders and Behavioural Pharmacology in the track Neuroscience of the Biomedical Sciences Master programme.
- Supervising Bachelor and Master research projects in Behavioural Neuroscience and Psychobiology.

8. Expected contributions to research

The new staff member is expected to implement their own high-quality line of research of behavioural neuroscience in GELIFES that is internationally recognized and strengthens the international position of GELIFES. They will have a clear affinity with modern empirical approaches for behavioural neuroscience research that they can help to introduce to GELIFES research and to help further strengthen the already ongoing research in that area. The expertise areas and skills of the new staff member should be complementary to that of the other staff at the institute. The research should lead to high-quality publications and presentations at scientific conferences. Core tasks also include supervision of PhD students and postdocs in the relevant area of research and the acquisition of external funds.

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.