

3 Postdoc and 2 PhD positions in theoretical biology, systems biology & experimental evolution At the Theoretical Research in Evolutionary Life Sciences group (TRÆS, formerly known as Theoretical Biology) at the University of Groningen in the Netherlands, we have the following 5 positions **immediately available:** (1)

Postdoc (2.5-3yr): Towards a quantitative evolutionary theory of caste-specific senescence in social insects. The reproductive casts of eusocial insect species typically far outlive their genetically nearly identical worker casts. This makes them uniquely suitable for developing and testing evolutionary theories of ageing. In this project, quantitative evolutionary models will be developed to predict cast-specific senescence profiles and how they vary with species-specific social structure, ecology and life history characteristics of social insects. Both relatively simple analytical life history models and more complex systems biological simulation models will be developed. In close collaboration with several experimental social insect groups in Germany, models will be parameterized with life history data and experimental data from other projects in order to test predictions and guide further experimental research. Contact: Ido Pen (i.r.pen@rug.nl)

(2) Postdoc (2yr): The evolution of self-organized division of labour in social insects. Division of labour (DOL) is characterized by the coordinated interaction of individuals that collectively achieve a common goal with high efficiency by specializing on certain tasks. DOL plays a crucial role for life on this planet; yet its evolution is not well-understood. Natural selection on DOL is indirect, since DOL is not a heritable property in itself but the result of self-organisation. The challenge is to understand how selection acting on individual behaviour results in the evolution of well-organized collective behaviour. To meet this challenge, we will develop and analyse models for the evolution of self-organized division of labour in social insects. In the project we will study how evolved division of labour is shaped by the interplay of internal factors (such as genetic system, mating structure, behavioural architecture) and external conditions (such as the spatial and temporal distribution of resources or between-colony conflicts). Contact: Franjo Weissing (f.j.weissing@rug.nl)

(3) Postdoc (1yr): The evolution of dispersal syndromes. The study of 'behavioural syndromes' or 'animal personalities' is currently a hot topic in the behavioural sciences. In organisms ranging from squids to chimpanzees it has been shown that individuals differ systematically in their behavioural tendencies, that these differences are stable in time, and that behavioural differences in quite different domains (like dispersal and parental behaviour) are correlated with each other. Over the years, our group has developed many models for explaining the evolutionary emergence and stability of such syndromes. In this project, we will develop evolutionary models for dispersal syndromes. In hundreds of species it has been shown that genetically similar individuals differ strongly in their dispersal and migration tendencies, and that these differences are correlated with other behavioural and physiological differences. A general explanation for the emergence and structure of these syndromes is, however, still lacking. This is a joint project with empirical behavioural ecologists (Prof. Dr. Jan Komdeur, Dr. Hannah Dugdale). It is an ideal stepping-stone for writing a grant proposal for a longer stay at the University of Groningen. Contact: Franjo Weissing (f.j.weissing@rug.nl)

(4) PhD (4yr): Molecular evolution of the bacterial chemotaxis network. The molecular network underlying chemotaxis in bacteria has emerged as a prototype for studying the molecular basis of behavior and evolutionary adaptation. This small signal-transduction

network has been extensively studied in *Escherichia coli*, but has also been characterized in other bacteria, such as *Bacillus subtilis*. Surprisingly, many components of the chemotaxis network are shared across species, while striking interspecific differences exist in the topology and complexity of the network. In this project, we will combine systems-biology modelling, evolutionary analyses and bio-informatic approaches to explain these patterns, and also aim to develop broader insights into the evolution of molecular networks. Contact: Sander van Doorn (g.s.van.doorn@rug.nl)

) (5) PhD (4yr): Genome architecture and adaptation Evolutionary models typically assume that traits have a simple genetic basis, but in reality genes occur in a complex genomic context. In this project, we focus on the architecture of the genome, and how it affects mutation, recombination and, eventually, phenotypic adaptation. Also, we will investigate how selection and non-adaptive processes shape the genomic architecture and evolvability of traits. The project will integrate proximate and ultimate research approaches, using a combination of microbial evolution experiments, computational modelling and bio-informatics. Contact: Sander van Doorn (g.s.van.doorn@rug.nl)

) To apply for a specific position, please send a letter of motivation and an extensive CV (including the names and email addresses of three referees) to the contact person indicated for the position.