

## SFB Transregio 212

### **A Novel Synthesis of Individualisation across Behaviour, Ecology and Evolution: Niche Choice, Niche Conformance, Niche Construction (NC<sup>3</sup>)**

A collaborative research centre (SFB) has recently been funded by the German Research Foundation for the period 2018 to 2021 to produce a conceptual and empirical synthesis of individualisation across behaviour, ecology and evolution. As part of this collaborative research centre, a total of **9 Postdoc positions** (E13), **16 PhD positions** (E13/65%) and **2 half-time technician positions** (E8 or E9/50%) are available at Bielefeld University, the University of Münster and the University of Jena from 1<sup>st</sup> of February 2018 or as soon as possible thereafter across **19 Projects** (see below for more details). The SFB will provide exceptional opportunities for interdisciplinary collaboration and academic networking, together with structured training, scientific exchange and early career support programmes. Full details of the SFB can be found at [www.uni-bielefeld.de/biologie/crc212](http://www.uni-bielefeld.de/biologie/crc212).

#### **Thematic background**

Individuals differ. This seemingly trivial statement has nevertheless led to paradigm shifts, as three different fields of organismal biology have seen a marked change in key concepts over the last years. In behavioural biology, it has been realised that there are profound differences between individuals and that these can be stable over time and across contexts, giving rise to the concept of animal personalities. In ecology, an increasing focus is likewise on the considerable variation in the ecological niche realised by species, populations, and even individuals. In evolutionary biology, where individual variation has always been central, there is an increasing awareness of the complexity with which genotypes interact with the environment to produce unique phenotypes. Therefore, a concept of an individualised niche is needed, rather than focusing only on a mean value for a given population.

The central research goal of the collaborative research centre is to redefine the niche concept on the individual level. In pursuing this conceptual goal, the CRC relies on a collaboration of empirical biologists, theoreticians, and philosophers of science. We want to gain a comprehensive, empirically adequate and philosophically reflected understanding of how individual phenotypes interact with their environment and what the ensuing consequences for ecological and evolutionary processes are. We hypothesise that, across taxa, the interaction between the individualised phenotype and the environment results in individualised niches via three mechanisms of adjustment and adaptation: niche choice, niche conformance and niche construction.

#### **Profile**

We seek bright and highly motivated postdoctoral researchers, biological technicians and students with very good Master (or equivalent) degrees who ideally have ample experience in relevant topics (e.g. animal behaviour, behavioural ecology, chemical ecology, population ecology, evolutionary ecology, evolutionary genomics, theoretical ecology, philosophy of science). Ideal candidates will be able to work both independently and as part of a multidisciplinary team.

To apply for any of the positions, please provide: (i) a letter of motivation including a statement of your research interests, how you would contribute to the particular project, relevant skills and experience; (ii) a CV including publication list; (iii) names and contact details of two referees willing to write confidential letters of recommendation. **All materials should be emailed as a single PDF file to the respective PI of the project.**

The application deadline is 07<sup>th</sup> of January 2018 or as otherwise specified for specific projects. Interviews will take place in January 2018. The preferred start date is 1<sup>st</sup> of February 2018 but is flexible and will depend on the timeframe of the most qualified applicant. The SFB-webpage ([www.uni-bielefeld.de/biologie/crc212](http://www.uni-bielefeld.de/biologie/crc212)), or Oliver Krüger ([oliver.krueger@uni-bielefeld.de](mailto:oliver.krueger@uni-bielefeld.de)) provide further details. PhD programmes exist in Münster ([www.uni-muenster.de/Evolution/mgse](http://www.uni-muenster.de/Evolution/mgse)) and Bielefeld ([www.uni-bielefeld.de/\(en\)/biologie/phd](http://www.uni-bielefeld.de/(en)/biologie/phd)).

The Universities of Bielefeld, Münster and Jena are equal opportunity employers. We particularly welcome applications from women and disabled people. Given equal suitability, qualifications and professional achievement, women or disabled people will be given preference, unless particular circumstances apply.

**Project A01: Fitness consequences of niche choice and conformance in a marine mammal**

What are fitness consequences of breeding under high vs. low social density? Can pups adaptively conform to their social environment? Is a pup's ability to conform constrained by its genetic quality or mediated by transgenerational epigenetic effects? This project will exploit a unique natural experiment across two Antarctic Fur Seal colonies. It will combine fieldwork with behavioural, endocrinological, immunological and genomic approaches, including SNP genotyping, transcriptomics and epigenetics.

Position offered: 1 Postdoc (PI: [joseph.hoffman@uni-bielefeld.de](mailto:joseph.hoffman@uni-bielefeld.de))

**Project A02: Optimistic and pessimistic decision-making under ambiguity**

Humans differ in the way they perceive the world with some being more optimistic and some being more pessimistic. Using laboratory mice as a model organism, the project aims to apply the concept of optimism/pessimism to behavioural ecology for the first time. Two main research questions will be addressed: How does one become an optimist/pessimist and what are the fitness consequences?

Positions offered: 2 PhD (PIs: [richterh@uni-muenster.de](mailto:richterh@uni-muenster.de); [sachser@uni-muenster.de](mailto:sachser@uni-muenster.de))

**Project A03: Behavioural niche choice: personalities and unpredictability in escape behaviour**

Individuals differ in behaviour and this includes variation in predictability: Some individuals perform stereotyped behaviour, while others are more flexible. We will focus on escape behaviour in grasshoppers, a context in which flexibility and unpredictability is particularly advantageous. Using cutting edge data analytic methods, we will study the evolutionary ecology of unpredictability, from behavioural ecology to quantitative genetics to local adaptation in the field.

Position offered: 1 PhD (PI: [holger.schielzeth@uni-jena.de](mailto:holger.schielzeth@uni-jena.de))

**Project A04: Niche choice and conformance across different life stages in the Fire Salamander**

Individual niches change over lifetime due to developmental, social or environmental changes. For example, the Fire Salamander (*Salamandra salamandra*) with its biphasic life cycle switches its habitat from completely aquatic to terrestrial once being metamorphosed. This project aims to investigate the impact of the larval habitat on individual performance, prior and after metamorphosis, by investigating behavioural, chemical as well as morphological differences in adult phenotypes.

Position offered: 1 PhD (PI: [barbara.caspers@uni-bielefeld.de](mailto:barbara.caspers@uni-bielefeld.de))

**Project B01: Social niche conformance during adolescence and beyond**

How are behavioural phenotypes shaped by social experiences during adolescence and beyond? Are these phenotypes adjusted to the environmental conditions? Do males and females differ? What are underlying hormonal mechanisms? We will study these questions in a social rodent, the guinea pig.

Positions offered: 2 PhD (PIs: [kaisesy@uni-munester.de](mailto:kaisesy@uni-munester.de); [sachser@uni-muenster.de](mailto:sachser@uni-muenster.de))

**Project B02: Niche conformance in a holometabolous invertebrate**

How does the behavioural, physiological and chemical phenotype conform to the individual niche under certain environmental conditions? What are the fitness consequences of these adjustments? These questions will be studied in a sawfly species producing several generations a year.

Position offered: 1 Postdoc (PI: [caroline.mueller@uni-bielefeld.de](mailto:caroline.mueller@uni-bielefeld.de))

**Project B04: Male social niche conformance to sexual competition**

The risk of sperm competition is a fundamental dimension of a male's social niche. How do males adjust their competitive phenotype to conform to variation in sperm competition risk? How do males trade off competitive behavioural and ejaculate traits vs investment in parental care? What are the underlying mechanisms in terms of gene expression and hormonal profiles? We will investigate these questions in the zebra finch, a songbird with biparental care.

Positions offered: 2 PhD (PIs [peter.korsten@uni-bielefeld.de](mailto:peter.korsten@uni-bielefeld.de); [tim.schmoll@uni-bielefeld.de](mailto:tim.schmoll@uni-bielefeld.de))

**Project B05: Social niche-mediated reproductive phenotypes**

What are evolutionary outcomes of social interaction during ontogeny on sexual trait expression in fruit flies? We will study the effects of the social niche on male and female reproductive phenotypes combining behavioural, evolutionary and molecular techniques. The developmental social environment can provide an individual with cues about the reproductive environment to anticipate during adulthood.

Positions offered: 1 PhD, 1 Technician (50%), (PI: [Claudia.Fricke@uni-munester.de](mailto:Claudia.Fricke@uni-munester.de))

**Project C01: Niche construction and evolvability in the Red Flour Beetle, *Tribolium castaneum***

Niche construction and evolutionary capacitance share that they modify the genotype-phenotype-environment relationship and are thus challenging any simple view of the ecological niche. Importantly, both processes are assumed to enhance evolvability. We will test this assumption in red flour beetles, which secrete antimicrobial substances into the flour and thereby construct their niche.

Positions offered: 2 PhD (PI: [joachim.kurtz@uni-muenster.de](mailto:joachim.kurtz@uni-muenster.de))

**Project C03: Niche choice and niche construction in Common Buzzard**

How do individuals choose their site for reproduction? What are the fitness consequences of these choices? Does nest architecture affect nest parasites and thereby gene expression in hosts? We will use a bird of prey model system and use field experiments, endocrinology and transcriptomics.

Positions offered: 1 Postdoc and 1 PhD (PI: [oliver.krueger@uni-bielefeld.de](mailto:oliver.krueger@uni-bielefeld.de))

#### **Project C04: Genetic and epigenetic architecture of colony founding in an ant species**

Ants live in societies and interactions between members of these societies determine its social organisation. Individual and population differences in founding behaviour of queens of *Pogonomyrmex californicus* will be used to understand underlying molecular mechanisms and evolution of aggression and social organisation. Studying DNA modifications, genotypes, transcription, translation, physiology, behaviour and societies will explain social organization at the individual and colony level.

Position offered: 1 Postdoc (PI: [gadauj@uni-muenster.de](mailto:gadauj@uni-muenster.de))

#### **Project D01: Function and fitness – conceptual issues**

Adequate explications of the concepts of function and of fitness are still a matter of vivid philosophical debate. The project aims at sharpening the explications by considering the use of the concepts in the new explanatory context of an individualised niche. We will analyse their explanatory roles in theories of niche choice, niche conformance, and niche construction. Besides the in principle-roles, we will also look at explanations resulting from empirical research in the CRC.

Position offered: 1 PhD (PI: [ulrich.krohs@uni-muenster.de](mailto:ulrich.krohs@uni-muenster.de))

#### **Project D02: The ontological status of individualised niches**

The central goal is to explicate what individualised ecological niches are (i.e., what their ontological status is) and how they relate to mechanisms of niche choice, conformance, and construction. This project thus analyses three concepts that play a central role in the CRC. The aim is to specify the meaning of these concepts, their ontological presuppositions, and how they relate to each other.

Position offered: 1 PhD ([kaiser.m@uni-bielefeld.de](mailto:kaiser.m@uni-bielefeld.de))

#### **Project D03: Individual responses to variation in population density: A modelling approach**

For most species, population density varies on multiple spatial and temporal scales. How do individuals and populations respond to this variation? Is there scope for specialised genotypes or will the response be plastic? What are the consequences for population dynamics and population persistence in a deteriorating environment?

Position offered: 1 Postdoc (PI: [meike.wittmann@uni-bielefeld.de](mailto:meike.wittmann@uni-bielefeld.de))

#### **Project D04: Modelling adaptive individualised niches in behaviour**

This project will explore the theoretical conditions that favour the evolution of between-individual variation in behavioural niches. The aim is to focus on mate choice and exploration and examine to which extent phenotypic variation can be maintained based on genetic differences and variation in adaptive phenotypic plasticity.

Positions offered: 1 Postdoc (PI: [Klaus.Reinhold@uni-bielefeld.de](mailto:Klaus.Reinhold@uni-bielefeld.de))

#### **Project D05: Individualized niches in light of meta-analyses**

Meta-analysis offers an advanced statistical framework for synthesising research findings and has grown in importance in all areas of empirical sciences. The project will be integral to the SFB in reviewing a range of topics regarding individualised niches. Candidates will gain profound insights into the published literature and will develop significant skills in state-of-the-art data analysis.

Positions offered: 1 PhD in Jena (PI: [holger.schielzeth@uni-jena.de](mailto:holger.schielzeth@uni-jena.de)), 1 PhD in Bielefeld (PI: [Klaus.Reinhold@uni-bielefeld.de](mailto:Klaus.Reinhold@uni-bielefeld.de))

#### **Project D06: Statistical inference on niche choices based on behavioural time series data**

How can we make statistical inference on niche choice from behavioural time series data? What is the optimal trade-off between biological realism and statistical feasibility, particularly when taking into account the increasing complexity of behavioural data? We aim to develop new statistical frameworks that address these issues.

Position offered: 1 Postdoc (2/3 funded by CRC; PI: [roland.langrock@uni-bielefeld.de](mailto:roland.langrock@uni-bielefeld.de))

#### **Paternity platform**

Microsatellite genotyping and molecular sexing will be used to determine parentage, to assign individuals to their populations of origin, and for sex determination. Experience with DNA extraction, PCR and microsatellite genotyping (and familiarity with the software GeneMarker) are highly desirable.

Position offered: 0.5 Technician (PI: [joseph.hoffman@uni-bielefeld.de](mailto:joseph.hoffman@uni-bielefeld.de))

#### **Metabolomics platform**

Which metabolites are involved in species and habitat recognition? Experience in GC-MS and LC-QTOF-MS are required for method establishment and maintenance of analytical instruments.

Position offered: 0.5 Postdoc (PI: [caroline.mueller@uni-bielefeld.de](mailto:caroline.mueller@uni-bielefeld.de))

#### **Central coordination of the CRC**

Provide assistance to the speaker of the CRC in all matters related to the coordination and outreach activities of the CRC. Experience with science coordination and public outreach activities required.

Position offered: 0.5 Postdoc (PI: [oliver.krueger@uni-bielefeld.de](mailto:oliver.krueger@uni-bielefeld.de))