Institute of Environmental Sciences

**Topic:** Ecophysiology of song learning in zebra finches

**Name of supervisor:** dr hab. Joanna Rutkowska

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**Background information:** Animals might need to express more versatile behaviours to adapt to environments that are becoming less predictable, however the physiological costs of cognition could be prohibitive. Pre-natal programming and/or developmental plasticity could reduce these costs, and facilitate enhanced cognition. Yet so far, research in the field of environmental dependency of learning performance and potential for its modulation at early life stages is scarce. In the zebra finch, song learning is restricted to the juvenile period and learning success can be assessed at adulthood. Successful song learning requires multiple types of learning (motor, perceptual and social learning and memory) and is crucial for male reproductive success. However, it could be hypothesized that harsh developmental conditions could compromise song learning.

**The main question to be addressed in the project:** The general aim of the project is to study the effects of temperature fluctuations over different time scales on song learning efficiency in a model songbird, the zebra finch *Taenipygia guttata*. More specifically, the project will answer questions such as: Does living in a highly variable ambient temperature incur physiological costs that negatively affect efficiency of learning? Can parents alleviate the effect of the ambient temperature on their offspring via pre-natal maternal effects or post-natal parental care?

**Information on the methods/description of work:** The study will be carried out at the Institute of Environmental Sciences of the Jagiellonian University, ona captive population of zebra finches that the supervisor established in 2000. It will involve breeding the birds, cross-fostering eggs, performing basic morphological measurements, and physiological tests such as analyses of blood parameters and hormone levels. The PhD student will record and analyses inging performance of fathers/tutors and all of their male offspring. To assess learning accuracy, the student will thenassess repertoire size and extract repetitions of each syllable. The PhD student will also take part in conducting behavioural tests assessing learning performance in the context of food acquisition. During their PhD the student will learn skills for the practical part of the project as well as a successful scientific career, and they will be encouraged to develop his/her own ideas.

**Additional information:** Requirements: MSc in Biology or Animal Psychology and fluency in English. Experience in **analyses of sonograms** and previous research experience will be an additional asset.

The successful candidate will work in a team, including another PhD student and technical assistants. The project is financed by the National Science Centre, which ensures the PhD student a monthly scholarship of at least 4500 PLN for three years.

**Place/name of potential foreign collaborator:** Dr. Carlos A. Botero (Washington University in Saint Louis) is a collaborator on this project and will provide training of song analyses to the PhD student.

**References:**

Botero, C.A. et al. 2009. Syllable type consistency is related to age, social status and reproductive success in the tropical mockingbird. Animal Behaviour 77:701-706.

Botero, C.A. et al. 2015. Evolutionary tipping points in the capacity to adapt to environmental change. Proceedings of the National Academy of Sciences 112:184-189.

Maille, A. and Schradin, C.2017. Ecophysiology of cognition: How do environmentally induced changes in physiology affect cognitive performance? Biological Reviews 92:1101-1112.