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FIRST PERSON

# First person – Harmen Koning

First Person is a series of interviews with the first authors of a selection of papers published in Biology Open, helping early-career researchers promote themselves alongside their papers. Harmen Koning is first author on 'A deep-dive into fictive locomotion – a strategy to probe cellular activity during speed transitions in fictively swimming zebrafish larvae', published in BiO. Harmen is a PhD student in the lab of Henrik Boije at the Department of Immunology, Genetics and Pathology, Uppsala University, Sweden, investigating the neuronal networks of locomotion in the zebrafish spinal cord to get a better understanding how hardwired circuits produce the flexible output needed for certain behaviours.

Harmen Koning

**What is your scientific background and the general focus of your lab?**

I got my degree in biology at the University of Leiden (Netherlands) after which I moved to Uppsala University (Sweden) to pursue a master's in evolutionary biology. During that time, I took a course discussing recently developed technologies used in neuroscience after which I made the switch to neuroscience. I completed multiple research projects as a master's student in the department of neuroscience studying retinal opsins, neuroendocrine systems in zebrafish and the pain pathway in mouse. In 2018 I started my PhD in Henrik Boije's group where my first task was to build an experimental setup where we could combine electrophysiological recordings with calcium imaging, optogenetic neuromodulation with various methods to elicit fictive behaviours in larval zebrafish. In our lab we are interested in the link between neuronal networks and behaviour with a focus on the spinal cord locomotor network. Neuronal networks represent the link between the cellular, network and behavioural scale of the nervous system and we apply a wide range of methods to attack our research questions. By using gene-editing, electrophysiology, behavioural tracking, neuromodulation and single cell transcriptomics aim to illuminate network changes at all levels and correlate it to altered behavioural output.

**How would you explain the main findings of your paper to non-scientific family and friends?**

In our lab we look at a small network of cells in the spinal cord responsible for movement. This network takes a continuous signal from the brain (saying for example 'swim slow' or 'swim fast') and translates that signal into a rhythmic sequence of signals to the muscles in order to execute the desired movement. It can be hard to get a zebrafish larva to swim when it is mounted in a microscope, so in this study we wanted to figure the best way to elicit swimming: an electric shock, a drug called NMDA or a visual stimulus that acts like a treadmill for the larva. We found that the shock and NMDA do make the larva swim, but the swims do not look like natural swims. However, the visual stimulus, called the optomotor response, made the larva swim in a way that looks very much like spontaneous swimming. We then combined that method with other techniques that can visualize or change the activity of cells in the spinal cord network to show that we can make the larva swim and simultaneously measure or manipulate the network that produces those swims.

**What are the potential implications of these results for your field of research?**

Our findings can help other researchers to pick the correct type of stimulus for their implications to use in future experiments. The article describes the type of locomotor behaviour each stimulus produces, and the potential benefits and pitfalls associated with them. This work has laid the foundation for various other projects in my PhD studies where specific neuronal populations are probed.

**"The article describes the type of locomotor behaviour each stimulus produces, and the potential benefits and pitfalls associated with them."**

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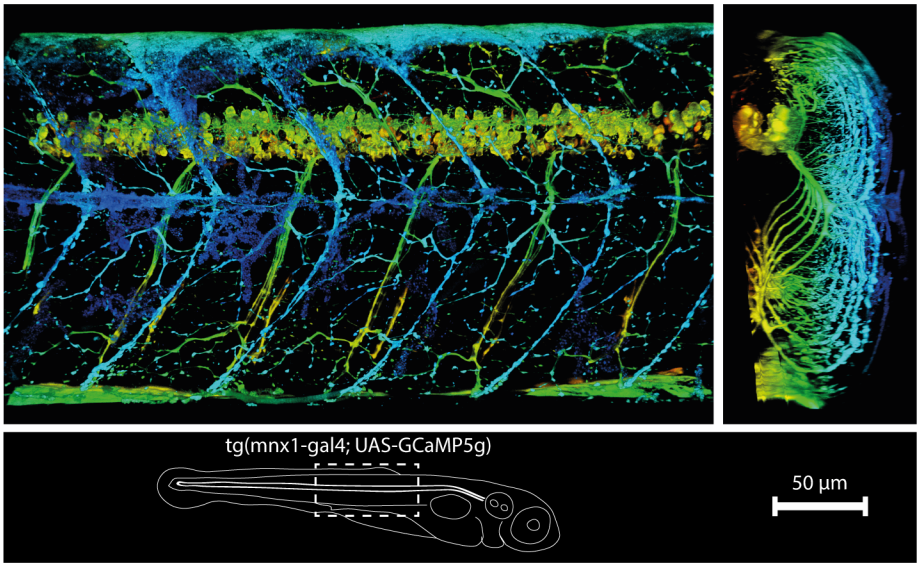


**Confocal image of motor neuron soma and axonal arborisations innervating axial musculature in 4-day-old zebrafish larva.**

**What, in your opinion, are some of the greatest achievements in your field and how has this influenced your research?**

The development of calcium indicators and optogenetic opsins made a pivotal change in the study of neuronal networks. Calcium indicators allow us to measure the activity of whole populations of neurons simultaneously and with optogenetics we can acutely modulate their activity. The fact that both methods can be applied non-invasively facilitate investigating networks in a state that is as close to 'natural' as possible.

**"The fact that both methods can be applied non-invasively facilitate investigating networks in a state that is as close to 'natural' as possible."**

**What changes do you think could improve the professional lives of early-career scientists?**

I believe that the 'zoom culture' that has developed in the past two years is of huge benefit to early-career scientists. You can now connect to peers and colleagues from the comfort of your office; you can join a seminar series held by institutes from around the world or participate digitally in conferences without needing travel grants. This development made it so much easier to communicate our science, connect with colleagues globally and share our knowledge in a more widespread manner.

**What's next for you?**

I will implement the findings from this paper to study a number of interneuron populations that are involved in the spinal locomotor network.

**Reference**

**Koning, H. K., Ahemaiti, A. and Boije, H.** (2022). A deep-dive into fictive locomotion – a strategy to probe cellular activity during speed transitions in fictively swimming zebrafish larvae. *Biol. Open*. **11**, bio059167. doi:10.1242/bio.059167