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Press release
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The brain of a fly in a flight simulator: New ERC project explores neural information processing

Graz, 20 February 2024: Our brain is constantly exposed to new stimuli. Every moment, countless bits of information rain down on the "control center." Many factors are important in the processing of these signals, one of which is time. Some processes are complete within a range of milliseconds, while others take days. At these two ends of the spectrum, the molecular basis of signal processing has been well explored. In a new project funded by a European Research Council (ERC) Starting Grant, Lukas Groschner of Med Uni Graz explores the area in between, which has rarely been the subject of research.

The short-term memory of a fly

The brain doesn't just work on a temporal level. It is assumed that signal processing in the brain extends over a time spectrum of at least nine orders of magnitude. In Lukas Groschner's project, the periods of time in between the two extremes are intriguing because little is known about them. It ranges from several hundredths of a second to several minutes. Lukas Groschner's object of study is the brain of a fruit fly. *Drosophila melanogaster* is the species that will be the subject of intense investigation at the Med Uni Graz Division of Molecular Biology and Biochemistry in the next few years.

The processing of visual stimuli in the animals will be examined by using a small cinema for flies. During stimulation, the reactions of the animal and the activity of individual neurons are recorded and analyzed. For example, the flies are secured in a type of flight simulator where a random number of computer-generated patterns are shown to them while their movements are analyzed.

Small brain with great computing power

The research rests on the assumption that the nervous systems of different animals are based on a limited number of common neural "circuit architectures." The results obtained from research on flies can also be transferred to other species, and under circumstances even to humans. With its nearly 150,000 nerve cells, the brain of *Drosophila melanogaster* is much simpler than a human brain, making it perfectly suited to being a research subject. We know the neural circuits of each individual nerve cell and their connections in the nervous system of the fly and can thus investigate the mechanisms of neural signal processing more closely. The research project will explore a total of three well-defined questions that are concerned with different neural processes.

The main research questions

The first question is how nerve cells in the visual system orchestrate the delay in signals in order to calculate the direction of movement of visual stimuli. The second question investigates how visual information accumulated over several seconds serves as the basis for making relevant decisions. Finally, it will be examined how the brain can create a memory that is stable over many minutes at rest yet becomes malleable as soon as the organism moves.

Project data:
Name: Temporal processing in *Drosophila melanogaster* (TemProDroMe)
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Period: 5 years
Funding: EUR 1,294,994

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Profile: Lukas Groschner
Lukas Groschner investigates how the nervous system brings forth intelligent behavior. He uses the biochemical approach to intervention followed by reconstitution and applies this to neuroscience. In his research to date, Lukas Groschner has discovered how individual neurons manage to add and multiply signals. He has received a Schilling Research Award from the German Neuroscience Society for this work.