



Introductory Remarks to Symposium 25

Go with the flow? Processing of sensory flows across modalities

Aristides Arrenberg, Jan Benda, Annette Denzinger and Hanspeter Mallot, Tübingen

Animals, including humans, act in complex and dynamic environments. Both, moving objects and/or ego-motion within the environment evoke specific spatio-temporal activation patterns on sensory arrays. In the visual system optic flows and their role in behavioral control have been extensively investigated. Do similar principles apply to flows in non-visual modalities? Like the retina, electrosensory systems have a 2D sensory surface that provides spatially resolved information about close-by objects and conspecifics. We therefore expect similar neuronal mechanisms for the processing of electrosensory flow. On the other hand, auditory systems do not have spatially extended sensory arrays. Flying, echolocating bats may compensate for the lack of direct spatial acquisition by temporally integrating actively acquired information about space. How the concepts developed for ego-motion and optic flows apply to such non-spatial modalities is an open question. Neural information processing likely exploits statistical stimulus regularities and is expected to be adapted to the specific environments and behaviors of each species. A comparative approach that quantifies these adaptations is essential also for uncovering similarities that underlie the design of sensory systems.

This symposium highlights various aspects of sensory flow and evolutionary adaptations in different modalities. Douglas Wylie (University of Alberta) compares optic flow processing and the underlying brain anatomy across bird species. Karen Carleton (University of Maryland) compares adaptations in color vision in many species of cichlid fish. Combining behavioral and neurophysiological experiments, Michaela Warnecke explores neural representations of echo flow in echolocating bats in the Cynthia Moss laboratory (Johns Hopkins University). How weakly electric fish use their electric sense and combine it with information from the visual systems for controlling swimming movements is addressed by Eric Fortune (New Jersey Institute of Technology). Finally, Kun Wang and Dimokratis Karamanlis will present their PhD work on zebrafish optic flow processing and retinal natural stimuli processing, respectively.

Symposium 25

Friday, March 22, 2019
14:30 - 16:30, Lecture Hall 105

Chairs: Aristides Arrenberg, Jan Benda,
Annette Denzinger and Hanspeter Mallot, Tübingen

- 14:30 **Opening Remarks**
- 14:40 Douglas Wylie, Edmonton, Canada
AN EYE TOWARDS HOVERING: SPECIES
DIFFERENCES IN THE PROCESSING OF OPTIC
FLOW IN BIRDS IN RELATION TO FLIGHT
BEHAVIOUR (S25-1)
- 15:00 Karen Carleton, College Park, USA
OPTIMAL VISUAL SENSITIVITIES: WHAT THE
CICHLID EYE NEEDS TO TELL THE CICHLID
BRAIN (S25-2)
- 15:20 Michaela Warnecke, Baltimore, USA
ECHO FLOW PATTERNS INFLUENCE BAT
FLIGHT BEHAVIOR AND NEURAL ACTIVITY
(S25-3)
- 15:40 Eric Fortune, Newark, USA
CLOSE-LOOP CONTROL OF ACTIVE-SENSING
MOVEMENTS (S25-4)
- 16:00 Kun Wang, Tübingen
BINOCULAR PROCESSING AND RECEPTIVE
FIELDS OF MOTION-SENSITIVE NEURONS IN
THE ZEBRAFISH PRETECTUM AND TECTUM
(S25-5)
- 16:10 Dimokratis Karamanlis, Göttingen
NATURAL STIMULI REVEAL A SPECTRUM OF
SPATIAL ENCODING ACROSS THE OUTPUT
CHANNELS OF THE RETINA (S25-6)
- 16:20 **Concluding Remarks**