



Thursday, November 08, 2012, 13h, House 4, Lecture Room

FAST AND FOCUSED: SPATIO-TEMPORAL PROCESSING IN BAT SONAR

Lutz Wiegrebe

Division of Neurobiology, Biocenter, LMU Munich

Echo-imaging has opened the rich habitat of nocturnal air space for bats. However echo imaging is governed by quite different physiological constraints than visual imaging. I will present results from psychophysical experiments both from the field and from the lab, and electrophysiological data delineating these constraints in an attempt to explain how bats can achieve such exceptional sensory skills based on classical mammalian sensory-motor systems. Specifically, we have addressed how fast echolocation can get in terms of a reaction time, and how well a sonar system can be focussed on a point in space. The data show that reaction times of wild, hunting bats are below 100 ms, which is noteworthy given the discontinuous, stroboscopic nature of echolocation. The psychophysical and electrophysiological data show how bad mammalian auditory spatial resolution is in principle, and how bats have evolved complex and dynamic accessory elements to overcome these limitations.

Who is Lutz Wiegrebe?

- 1996 PhD, University of Munich, Prof. Neuweiler
- 1997 DFG funded postdoc at MRC Applied Psychology Unit, Cambridge UK
- 1998 DFG funded postdoc at Physiological Laboratories, Cambridge University, UK
- 1999 Assistant Professor, Lehrstuhl für Zoologie, Prof. Neuweiler
- 2003 Habilitation
- 2010 außerplanmäßiger Professor, Division of Neurobiology, LMU Munich

Selected publications:

- Genzel D, Geberl C, Dera T, Wiegrebe L (2012) Coordination of bat sonar activity and flight for the exploration of three-dimensional objects. *J Exp Biol* 215:2226-2235.
- Schornich S, Nagy A, Wiegrebe L (2012) Discovering your inner bat: echo-acoustic target ranging in humans. *J Assoc Res Otolaryngol* 13:673-682.
- Heinrich M, Warmbold A, Hoffmann S, Firzlaff U, Wiegrebe L (2011) The sonar aperture and its neural representation in bats. *J Neurosci* 31:15618-15627.
- Goerlitz HR, Geberl C, Wiegrebe L (2010) Sonar detection of jittering real targets in a free-flying bat. *J Acoust Soc Am* 128:1467-1475.
- Firzlaff U, Schuchmann M, Grunwald JE, Schuller G, Wiegrebe L (2007) Object-oriented Echo Perception and Cortical Representation in Echolocating Bats. *PLoS Biol* 5:e100.
- Grunwald JE, Schornich S, Wiegrebe L (2004) Classification of natural textures in echolocation. *Proc Natl Acad Sci U S A* 101:5670-5674.