Max-Planck-Institut für Ornithologie

Max Planck Institute for Ornithology

Seewiesen Colloquia

Speaker invited by: Department Gahr

Thursday, 03 April 2014, 13:00 h, in House 4, Lecture Room

Cellular Correlates of Corvid Cognition

Andreas Nieder

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Corvids (jays, jackdaws, crows and ravens)- even though they lack a layered neocortex- possess high-level cognitive capabilities that match primates in many respects. The nidopallium caudolaterale (NCL) of the avian telencephalon is a key brain area to enable corvids' remarkable behavioral flexibility and is considered to be a functional equivalent of primate prefrontal cortex.. We explore the neuronal foundation of corvid cognition by recording single-unit activity from the NCL of behaving carrion crows. Crows were trained to temporarily retain information in working memory and make flexible rule-guided decisions, both hallmarks of executive control functions. Sustained activity of NCL neurons serves to bridge temporal gaps, thereby offering a workspace for retaining immediately passed information, processing it according to abstract behavioural principles, and preparing for future actions. These findings emphasize that intelligence in vertebrates does not necessarily rely on a neocortex, but can be realized in endbrain circuitries that developed independently via convergent evolution.

Who is Andreas Nieder ?

1999	Dr. rer. nat., Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen, Germany
2000-2003	Postdoctoral associate at the Massachusetts Institute of Technology (MIT), Picower Center for Learning and Memory, Dept. of Brain and Cognitive Sciences, Massachusetts, USA
2003-2008	Independent Junior research group leader at the Dept. of Cognitive Neurology, Hertie-Institute for Clinical Brain Research, Faculty of Medicine, University of Tübingen, Germany
2008-	Professor of Animal Physiology, Institute of Neurobiology, Department of Biology, Faculty of Science, University of Tübingen, Germany

Selected publications:

- Veit L, Nieder A. (2013) Abstract rule neurons in the endbrain support intelligent behaviour in corvid songbirds. Nature Communications 4:2878. doi: 10.1038/ncomms3878.
- Hoffmann A., Rüttler V., Nieder A. (2011) Ontogeny of object permanence and object tracking in the Carrion crow (Corvus corone). Animal Behaviour 82: 359-367.
- Bongard S., Nieder A. (2010) Basic mathematical rules are encoded by primate prefrontal cortex neurons. Proceedings of the National Academy of Sciences of the USA 107: 2277-2282.
- Nieder A., Diester I., Tudusciuc O. (2006) Temporal and spatial enumeration processes in the primate parietal cortex. Science 313: 1431-5.
- Nieder A., Wagner H. (1999) Perception and neuronal coding of subjective contours in the owl. Nature Neuroscience 2: 660-663.

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