

---

# 29<sup>th</sup> Annual KARGER WORKSHOP

---

## Workshop Theme

*From fossils to function:  
integrative and diverse approaches  
to vertebrate evolutionary neuroscience*

November 9th, 2017\*  
College Park Marriott  
Hyattsville, Maryland

## General Discussion Topics

- *Comparative studies of brains in a wide array of extant vertebrate taxa, with special focus on groundbreaking structural and functional neuroimaging techniques*
- *Best practices for the inference, reconstruction, and comparative investigation of endocranial soft-tissue structures in extinct vertebrate taxa*
- *Moving towards research that embraces an integrative approach (i.e., incorporating evidence from extinct and extant taxa), with an emphasis on deliberate, incremental studies of nervous system form and function within and across Vertebrata.*

*Please see the Karger Workshop schedule and talk descriptions on the following pages.*

*Have questions? Please contact the workshop organizer,  
Dr. Ashley Morhardt (email: amorhardt@wustl.edu).*

*\*Workshop will immediately precede the regular meeting of the J. B. Johnston Club (JBJC) on November 10, 2017.*



# 29<sup>th</sup> Annual KARGER WORKSHOP

## Workshop Schedule

Time	Event
7:30--8:50 AM	Breakfast
8:50--9:00 AM	Introduction and welcome
9:00--9:45 AM	Dr. Andrew Iwaniuk Department of Neuroscience, Canadian Centre for Behavioural Neuroscience, University of Lethbridge <b>"Inferring sensory ecology from brain morphology"</b>
9:45--10:30 AM	Drs. Amy Balanoff** and Gabe Bever Center for Functional Anatomy and Evolution, Johns Hopkins School of Medicine <b>"The brain to endocast relationship along the avian stem: neuroanatomy in deep time"</b>
10:30--11:00 AM	Coffee Break
11:00--11:45 AM	Dr. Emiliano Bruner Centro Nacional de Investigación sobre la Evolución Humana <b>"Human paleoneurology and the evolution of the parietal cortex"</b>
11:45 AM--12:30 PM	Dr. Haley O'Brien Department of Anatomy and Cell Biology, Oklahoma State University Center for Health Sciences <b>"Exploring the evolutionary role of neurophysiology through phylogenetic evolutionary frameworks"</b>
12:30--2:00 PM	Lunch Break
2:00--2:45 PM	Drs. Paul Gignac** and Nathan Kley Department of Anatomy and Cell Biology, Oklahoma State University Center for Health Sciences Department of Anatomical Sciences, Stony Brook School University <b>"Iodine on the brain: The utility of diceCT imaging for high-throughput comparative neuroanatomical studies"</b>
2:45--3:30 PM	Dr. James Rilling Departments of Anthropology, Psychiatry and Behavioral Sciences, Yerkes National Primate Research Center, Center for Translational Social Neuroscience, Emory University <b>"Comparative Primate Connectomics"</b>
3:30--4:00 PM	Coffee Break
4:00--5:00 PM	Special Invited Guest Speaker: Dr. David Van Essen Department of Neuroscience, Washington University School of Medicine in St. Louis <b>"Evolution of cerebral cortex in humans and non-human primates"</b>
5:00--6:00 PM	Roundtable Discussion
6:00--7:00 PM	Reception

\*\*indicates presenter



---

# 29<sup>th</sup> Annual KARGER WORKSHOP

---

## Talk Descriptions

Dr. David Van Essen – *Special Invited Guest Speaker*

Department of Neuroscience, Washington University School of Medicine in St. Louis

### **"Evolution of cerebral cortex in humans and non-human primates"**

Human cerebral cortex is 3-fold larger than in great apes and 10-fold larger than the intensively studied macaque monkey. Cortical expansion in the human lineage was highly nonuniform, as regions involved in higher cognitive function expanded preferentially. Topics to be discussed include the degree to which human cortical evolution involved increases in the number as well as size of areas and what we hope to learn about evolutionary changes in patterns of cortical connectivity.

Dr. Andrew Iwaniuk

Department of Neuroscience, Canadian Centre for Behavioural Neuroscience, University of Lethbridge

### **"Inferring sensory ecology from brain morphology"**

The morphology of the brain reflects many aspects of an animal's lifestyle, especially foraging behaviour and sensory abilities. I will argue that the anatomy of the brain and cranial nerves can provide crucial insights into the sensory ecology of intractable and extinct species and the lack of sufficient quantitative measurements in extinct species is hindering our ability to infer their sensory abilities.

Drs. Amy Balanoff\*\* and Gabe Bever

Center for Functional Anatomy and Evolution, Johns Hopkins School of Medicine

### **"The brain to endocast relationship along the avian stem: neuroanatomy in deep time"**

Understanding the degree of correspondence between brains as they appeared during life and endocasts derived from fossils is critical for studying neuroanatomy in deep time. Here we use extant taxa to provide a validation of morphological and volumetric interpretations of endocasts and their ability to inform those inferences made within stem taxa.

Dr. Emiliano Bruner

Centro Nacional de Investigación sobre la Evolución Humana

### **"Human paleoneurology and the evolution of the parietal cortex"**

The most apparent morphological changes in modern human brain form deals with the parietal surfaces. A remarkable variation among hominids and among humans suggests that some areas of the precuneus and of the intraparietal sulcus, associated with visuospatial integration, may have undergone important changes in our evolutionary lineage.

Dr. Haley O'Brien

Department of Anatomy and Cell Biology, Oklahoma State University Center for Health Sciences

### **"Exploring the evolutionary role of neurophysiology through phylogenetic evolutionary frameworks"**

Specializations in brain regions, functions, and physiologies are often thought to play influential roles in driving evolutionary mechanisms. This talk uses selective brain cooling physiology as a case study to explore multiple phylogenetically-framed methods for linking characters with diversification rates, including trait-dependent diversification rate calculations for binary, multi-state, and continuous datasets.

Drs. Paul Gignac\*\* and Nathan Kley

Department of Anatomy and Cell Biology, Oklahoma State University Center for Health Sciences

Department of Anatomical Sciences, Stony Brook School University

### **"Iodine on the brain: The utility of diceCT imaging for high-throughput comparative neuroanatomical studies"**

In this study, we discuss the utility of diffusible iodine-based contrast-enhanced computed tomography (diceCT) for rapid visualization of both external and internal brain anatomy, alongside complete peripheral nerve pathways and the structures they innervate. We demonstrate the potential for developing high-resolution, neuroanatomical datasets and describe a pipeline to image large numbers of specimens for evolutionary study across Vertebrata.

Dr. James Rilling

Departments of Anthropology, Psychiatry and Behavioral Sciences, Yerkes National Primate Research Center, Center for Translational Social Neuroscience, Emory University

### **"Comparative Primate Connectomics"**

This talk will draw on histological and neuroimaging data to compare brain connectivity across primate species, including humans. Implications for human brain evolution will be highlighted.

Workshop Organizer: Dr. Ashley Morhardt, Department of Neuroscience, Washington University School of Medicine in St. Louis

\*\*indicates presenter

