



Georgia State University/Georgia Tech  
Center for Advanced Brain Imaging

# CABI NEWSLETTER

VOLUME 4, ISSUE 1

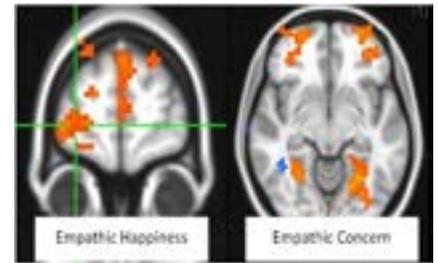
## CABI FEATURED RESEARCH

### Fronto-Striatal Correlates of Empathy Subtypes in Healthy Adults

Dr. Sharee Light, Zinat Taiwo, and Matt Bezdek utilized a 2015 CABI Neuroimaging seed grant to investigate the functional brain correlates of two types of empathy (the ability to share in the affective experiences of others while maintaining a self- Specifically, “empathic concern” and “empathic happiness,” defined as negative and positive vicarious emotion respectively, were elicited in ten healthy adults who watched video clips extracted from the television show “Extreme Makeover: Home Edition” while fMRI data was collected. The show moves the viewer from experiencing empathic concern to experiencing empathic happiness as it depicts a family in despair and in need of a remodeled home, followed by their positive affective reactions to the tailored renovations to their home. The main hypothesis tested was: is empathic happiness dissociable from empathic concern on a functional neurobiological level? Specifically, they predicted that the positive affect/reward system in the brain would play a particularly strong role in empathic happiness, whereas negative affect centers in the brain would relate more strongly to

empathic concern. Consistent with this framework, fMRI results revealed that empathic happiness produced significant activity in left superior frontal gyrus (Figure 1: Left) and left amygdala. Whereas empathic concern produced significant activity in bilateral superior frontal gyrus (Figure 1: Right). Overall, these results confirm that empathic happiness and empathic concern are dissociable on a functional neurobiological level. Empathic concern for emotional pain is mediated by bilateral frontopolar prefrontal regions, whereas empathic happiness is mediated by a combination of frontopolar, orbitofrontal, and subcortical regions. Empathic happiness circuitry may represent a “hedonic hotspot” in the brain at the human level.

Figure 1: Neural Response to Empathy



### Quantifying Cerebrospinal Fluid Circulation Real Time MRI

Selda Yildiz, Karim Sabra, and John Oshinski conducted an experiment using a 2015 CABI seed grant investigating cerebrospinal fluid (CSF) motion. CSF, a clear colorless fluid surrounding the spinal cord and the brain, serves many functions in the central nervous system. CSF motion is driven by arterial pulsation, respiration, and other factors (e.g., coughing, sneezing, etc). While cardiac modulation of CSF has been investigated using a variety of MRI techniques, the influence of respiratory mechanisms in human CSF dynamics is not well understood. To address this limitation, they employed a real-time phase contrast magnetic resonance (RT-PCMRI) technique to measure instantaneous CSF flow continuously at the level of the Foramen Magnum (FM) for twelve healthy subjects. Subjects performed a variety of breathing patterns including natural breathing, deep abdominal breathing, breath-holding and coughing during one minute RT-PCMRI measurements. Conventional cardiac-gated PCMRI measurements were also obtained for comparison with RT-PCMRI measurements. Results demonstrated RT-PCMRI identifies the influence of cardiac force, respiration and transient events such as coughing while conventional cardiac-gated PCMRI measures only the cardiac component of CSF velocity. RT-PCMRI measurements at the FM indicate that there is a comparable contribution of respiration and cardiac pulsations. The study results also suggest that there is an immediate influence of voluntarily controlled breathing on the amplitude and directionality of CSF velocities, which vary across the subjects.

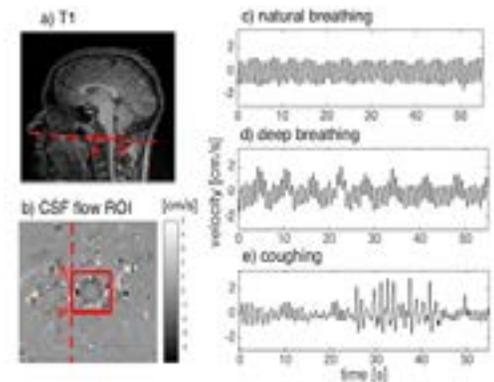


Figure 2: The results for a 22 year-old male. (a) Sagittal anatomical MRI image showing the measurement slice at FM (red line with Anterior-Posterior). (b) ROI containing the CSF flow. One minute RT-PCMRI measurement of CSF velocity at the level of the FM during (c) natural breathing, (d) deep abdominal breathing- performed by expanding the lower abdomen with inhalation and releasing with exhalation-, (e) consecutive coughing during 20s preceded and followed by deep breathing. Subject's CSF flow velocities increase when performing deep breathing (~2cm/s) compared to natural breathing (~1cm/s), while coughing causes large and sudden peak CSF velocities (~3cm/s) during 20 sec time window between t=25-45s.

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## Seed Grant Recipients

### **SAVE THE DATE**

Neuroscience Research Lecture

UC Berkeley, Neurologist

Mark D'Esposito

September 9, 2016

11:00am

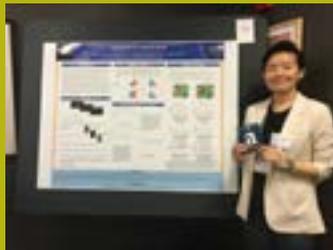
Ga Tech Student Center Ballroom

CABI initiated seed grants for fiscal year 2017. These seed grants will allow researchers from across both campuses access to the CABI MRI scanner.

1. Heather Offutt, PhD (GSU) - "The neural correlates of reality distortions"
2. Jessica Turner, PhD (GSU) - "Neural Markers of Auditory Verbal Hallucinations in Schizophrenia: How do Brain Structure and Function Shape the Hallucinatory Experience"
3. Lewis Wheaton, PhD (GT) - "Understanding the interaction of action semantics and internal models through motor control in human augmentation"
4. Michelle La Placa, PhD (GT) - "Characterization of Post-concussive Vestibular Impairment Brain Structural and Functional Connectivity Dysfunction and the impact of Vestibular Rehabilitation"
5. Lena Ting, PhD (GSU) - "Neuroimaging to predict gait rehabilitation outcomes post-stroke"

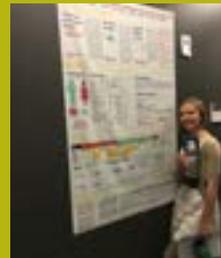
Congratulations to the recipients this fiscal year!

## Spring 2016 Callosum Poster Session



Yiran Zhao, Undergraduate Student

Yiran Zhao won the award for having the best undergraduate student poster at CABI's Callosum Poster Session on April 1st, 2016. Her poster was titled, "K Means Defined Brain States and Cognitive Control". Yiran Zhao attends Georgia Tech and is a member of Dr. Schumacher's CoNTRoL Lab. She will graduate in 2017.



Maria Misiura, Graduate Student

Maria was awarded for having the best graduate student poster at CABI's Callosum Poster Session on April 1st, 2016. Her poster was titled, "The interrelationship of Neuropsychiatric measures and brain volumes in Prodromal HD". Maria Misiura is a 3rd year graduate student at Georgia State University. She is a member of Dr. Jessica Turner's Imaging and Genetics Lab.

## Upcoming Events

### CABI Users Meeting

9:30am - 10:30am

(3rd Thurs of each month)

First Meeting - September 15, 2016

Monthly meeting of CABI Users to discuss neuroimaging issues.

### Callosum Neuroscience Meeting

4:00pm - 5:30pm

(1st Tuesday of each month)

First Meeting - October 4, 2016

Monthly meeting and social for GSU and GT neuroscientists and students

## Message From The Director

CABI has undergone considerable growth over the past several semesters. We have nearly 10 new faculty members using the facility and our revenue has increased by over \$175,000 over the past 2 years! This increased usage, although welcomed, has led to some growing pains. It is now difficult to schedule time on the scanner, there are often parking issues, and the extra space in the building is filling up. We have begun to implement new policies and procedures to help deal with these issues. I hope our long-time and new users will be patient as CABI works to increase its capacity. As always, I encourage users to reach out to CABI staff if you have questions or concerns. We are committed to working with you to help you achieve your research objectives.

