

# Institute of Cognitive Science Newsletter

Winter, 2014

## Welcome to the Institute

### *Research Professors:*

Barbara  
Weiland



Cinnamon  
Bidwell



### *Research Associate:*

Karli  
Watson



## From the Director of the Institute

It's really nice to be back as Director of the Institute. I missed the daily interactions with all of you and the energy and vigor you bring to science. My sabbatical was very productive, providing me with time to pursue in depth some ideas I've been grappling with for a while, but also providing time to learn a lot of wonderful new things. Before I get to that, however, I'd like to thank Martha Palmer for her stewardship of the Institute in my absence. It was very much appreciated.

In addition to pursuing a line of research examining the development of neural systems for emotional and cognitive control in adolescence during my sabbatical, I also took the time to increase my knowledge with regards to new ways of learning and also with regards to content areas. In particular, one might say I became a student all over again or a MOOC (Massive Open Online Course) addict, taking 9 courses (which included completing all assignments, quizzes, tests, and papers) during my one-year sabbatical. Discussions of MOOCs and how they may or may not change higher-education have been in the news lately, and I thought that one of the best ways to come up with my own opinion was to take a number of them. And once I got started, it was hard to stop. To sum up my experience, I don't think college or graduate courses are going away any time soon, but for the motivated learner, MOOCs can be invaluable (and for now they are free!). Another excellent feature was that with so many students enrolled online, there was usually someone having the same problem or questions as you are and from a similar vantage point. For example, I took a course in learning Linear Algebra through programming in Python. There were programming jocks in the class (which I am not), and there were math jocks in the class (which I surely am not), so answers by both of these groups to a question I had were basically undecipherable to me. But, among the other thousand of individuals, there was at least one person who knew a little math, and a little programming, and provided a hint for how to solve a particular homework problem in a way I could understand.

I focused my MOOC experience on courses related to machine learning, statistical learning, and data science. In our program review, we noted that the strength of the Institute was in computational approaches to cognition. I thought that as Director of the Institute, it would do me good to bone up a bit more on newer computational approaches. After all, how can I help to lead the Institute into the future if I am not well versed in important new approaches? It has been very gratifying to me to realize even in the short time that I have been back that I have a much better handle on the approaches taken, both by researchers within the Institute and those outside, who have come to visit and share their work with us. Moreover, I feel that I'm in a better position to help with our faculty search this year, as we are focusing on finding someone who uses computational models and tools to aid in understanding cognition. We expect to be inviting candidates to come for interviews in the early part of next semester, and I strongly encourage you to be involved in the process of selecting another faculty member for the Institute. And if you have the chance, please pull me aside to tell me how you are using random forests in your research, what normalization method you prefer in logistic regression under which conditions, and when you have found smoothing splines useful. I'd love to hear more!

All the best,  
Marie



## Congratulations Graduates!

### Claire Bonial

Combined Ph.D. - ICS and Linguistics

Dissertation Title: *Take a look at this! Form, function and productivity of English light verb constructions*

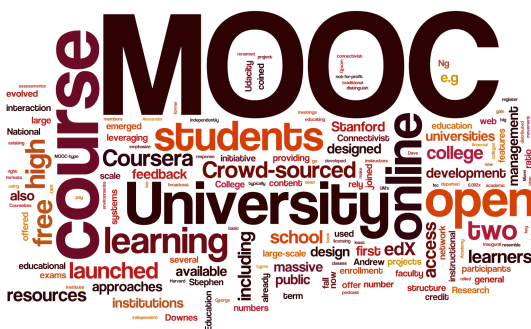
Claire will continue her work with Dr. Palmer as a post-doctoral researcher. She is currently visiting the University of Kyoto to share some of the CLEAR lab's research on NLP resources with the University and the National Institute of Information and Communication Technology lab.

### Jena (Da Cheong) Hwang

Combined Ph.D. - ICS and Linguistics

Dissertation Title: *Identification and Representation of Caused Motion Constructions*

Jena is currently a post-doc for Dr. Andy Cowell in the Linguistics Department working on building a lexical resource/dictionary for Arapaho language. August 1, 2015, Jena will be starting a position at Florida Institute for Human Machine Cognition working for Dr. Bonnie Dorr on language resource and technology projects.



## Smiles Breed Smiles

In my interview with new ICS Assistant Professor, McKell Carter, I found that smiles breed smiles. For those of you who have not yet had the privilege of meeting McKell, he has a great outlook on life and admits he is pretty easy going.

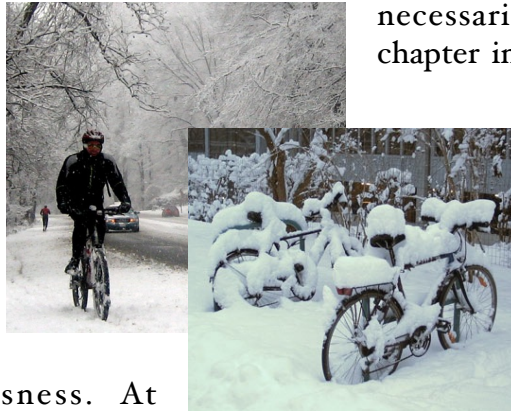
In his early research McKell studied bacterial genetics. This research was done as an undergraduate student at the University of Utah, under John Roth, currently a Distinguished Professor of Microbiology and Molecular Genetics at UC Davis. The research involved trying to identify mutants of salmonella bacteria that would no longer show evidence of reciprocal DNA repair – fixing a bad chromosome from a good one while preserving both. McKell found bacteria were great organisms for working on puzzles but it was hard to see the impact the work would have.

McKell decided he needed to do something bigger so he began to focus on consciousness. At graduate school McKell was mentored by Christof Koch, the Lois and Victor Troendle Professor of Cognitive and Behavioral Biology and Professor of Computation and Neural Systems at California Institute of Technology. They worked on characterizing implicit and explicit mechanisms of awareness and the underlying neural structures. The goal of the work was to find an area of the brain that could be lesioned in rodents to eliminate whatever rudimentary form of consciousness they carry. Again, McKell enjoyed the research but wanted to see a practical impact of his work.

After graduate school, McKell's wife, Karli Watson, was invited to Durham, NC, for a post-doc position with Michael Platt, Professor; Director, Duke Institute for Brain Science, Center for Cognitive Neuroscience. McKell connected

with Scott Huettel, Professor and Director, Duke Center for Interdisciplinary Decision Science, Center for Cognitive Neuroscience. He found his niche, looking at the brain and seeing how people make practical decisions. Through this chapter of his life McKell became interested in how people play games. He argues that people are at their most compelling when they are interacting with others or trying to make decisions that concern others.

The work at Duke has informed McKell's current study. Along with PRA, Jacob Parelman, McKell created an experiment using the BART (Balloon Analogue Risk Task). This game tests ambiguity tolerance, in other words, a person's willingness to choose an option where the outcome is not necessarily known. Thus begins McKell's chapter in the Institute of Cognitive Science at CU Boulder.



This spring semester McKell will be teaching his first undergraduate class at the University. He is looking forward to the challenges of a large class. McKell is excited about instigating ideas to keep the students involved and inter-

acting. He is hopeful that by keeping the students engaged he will create a positive learning atmosphere.

When asked what compelled McKell to apply for the job at CU he said the extraordinary set of colleagues and the way they situate themselves in the Boulder environment is more conducive to his way of life. As an example, the day of our interview it had snowed yet McKell rode his bike to work. He loved that others were also riding so he wasn't viewed as an oddity. McKell appreciates that he can incorporate aspects of the things he enjoys into his every day life.

McKell and Karli have two boys, ages 6 and 1½ and the Boulder environment lets the family stay physically active too, which they enjoy.



## Marie Banich named Editor-elect of "Cognitive, Affective, & Behavioral Neuroscience"

The Psychonomic Society announced the appointment of Marie T. Banich as Editor of Cognitive, Affective, & Behavioral Neuroscience. Her four year appointment begins on January 1, 2015.



Cognitive, Affective, & Behavioral Neuroscience (CABN) offers theoretical, review, and primary research articles on behavior and brain processes in humans. CABN is the leading vehicle for strong psychologically motivated studies of brain-behavior relationships, through the presentation of papers that integrate psychological theory and the conduct and interpretation of the neuroscientific data. Cognitive, Affective, & Behavioral Neuroscience is a publication of the Psychonomic Society.

## Awards

### Md Arafat Sultan's research wins competition



Ph.D. student, Md Arafat Sultan; ICS faculty, Tamara Sumner; and Steven Bethard of the University of Alabama, won the 2014 SemEval Semantic Textual Similarity (STS) competition at this year's International Workshop on Semantic Evaluation in Dublin, Ireland. Their unsupervised STS algorithm has been published in the Proceedings of SemEval 2014 under the title "DLS@CU: Sentence Similarity from Word Alignment".

Sultan also presented a paper at Digital Libraries 2014 in London this September. This paper was also co-authored by Tamara Sumner and Steven Bethard and is entitled "Towards Automatic Identification of Core Concepts in Educational Resources".

### James Foster receives Silver Award from "Best Should Teach" Program

James Foster, PhD candidate in ICS and Psychology & Neuroscience has received a Silver Award from the "Best Should Teach" program at the University of Colorado Boulder. Foster was selected as a graduate student teacher on campus for his exceptional teaching skills. Foster has served as the ICS student representative on the ICS executive committee, and is currently the Chair of the ICS Student Research and Travel Awards committee.



### Jessica Bloise awarded Fulbright for 2014-2015

Jessica Bloise was a 2013 undergraduate in ICS with a double major in Linguistics and Spanish Language. Bloise was recently awarded a Fulbright to travel to Mexico to teach English as a Second Language.

### Yuko Munakata awarded \$2000

ICS Fellow and Psychology and Neuroscience Faculty member, Yuko Munakata, was awarded \$2000 in the category of Life Sciences in the Best Digital Data Management Plans and Practices Competition. This competition is sponsored by the Office of the Vice Chancellor for Research at the University of Colorado Boulder.

The University of Colorado Boulder supports the idea that the primary data, and derived knowledge

products developed on campus, should be easily available to other researchers within a reasonable time and in ways that promote re-use, broader synthesis, and long term preservation. The competition looks for examples of best practices in a variety of fields that they can use as examples as part of the efforts of the University to promote the development of effective data management plans.



### Eliana Colunga and Bhovana Narashimhan awarded Gamm Interdisciplinary Course award for “Learning Languages in the World”



With this award, ICS Fellows, Eliana Colunga, Associate Professor in Psychology & Neuroscience, and Bhuvana Narashimhan, Associate Professor in Linguistics, will co-teach a course on language acquisition that will present diverse theoretical perspectives. It will highlight the contributions of multiple disciplines to our understanding of the sociocultural and cognitive factors that drive language development. The course will offer students hands-on experience with a variety of methodologies - corpus analysis, observational studies, behavioral experiments, and computational modeling - to address a set of core research questions.

## Publications

**Walter Kintsch**, ICS Professor Emeritus, was recently published in *Psychological Review* (2014, vol. 121, no. 3, 559-561). The article is entitled “Similarity as a Function of Semantic Distance and Amount of Knowledge” and is a good qualitative account of how word similarities may be obtained by adjusting the cosine between word vectors from latent semantic analysis for vector lengths in a manner analogous to the quantum geometric model of similarity.

ICS and Psychology and Neuroscience graduate student, **Choong-Wan (Wani) Woo**, co-authors, **Leonie Koban**, **Marie Banich**, **Luka Ruzic**, **Tor Wager**, **Jessica Andrews-Hanna**, **Ethan Kross**, and **Martin Lindquist**, were recently published in *Nature Communications*. Their study shows that physical pain and social pain are processed by the brain in two distinct ways. These findings could lead to more targeted treatments and a better understanding of how the two kinds of pain interact.

**Orin Hargraves**, a Professional Research Assistant in Martha Palmer’s Lab, in the Institute of Cognitive Science, recently published a book through Oxford University Press. His book *It’s Been Said Before - A Guide to the Use and Abuse of Cliches* examines the peculiar idea and power of the cliché. It has been praised for being informative and engaging.



ICS Director, **Marie Banich** and ICS Fellow, **Yuko Munakata** were Guest Editors for a special Executive Function and Cognitive Control section of *Neuropsychologia* (Volume 62, September 2014).

**Caccamise, D. Friend, A., Littrell-Baez, M.E., & Kintsch, E.** (2014). Constructivist theory and the situation model: Relevance to future assessment of reading comprehension. In S.R. Parris & K. Headley (Eds.), *Comprehension instruction: Research-based best practices* (3rd ed.). New York: NY: Guilford.

## Papers

Rowan Wing, a PhD candidate in ICS and Computer Science, along with Mohammad Khajah, PhD Computer Science candidate and Mike Mozer, ICS and Computer Science faculty, was awarded best overall paper at the Educational Data Mining 2014 conference in London. Their winning paper is entitled

*Incorporating latent factors into knowledge tracing to predict individual differences in learning.* Mozer presented the paper and also co-organized a workshop on Bayesian Knowledge Tracing.

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Healy, A. F., & Cunningham, T. F. (2014). Detecting letters and words in prose passages: A test of alternative theoretical accounts of the missing letter effect. *American Journal of Psychology*, 127, 281-302.

Sherwood, D. E., Lohse, K. R., & Healy, A. F. (2014). Judging joint angles and movement outcome: Shifting the focus of attention in dart-throwing. *Journal of Experimental Psychology: Human Perception and Performance*, 40, 1903-1914.

## Conference Presentations

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Ketels, S. L., Healy, A. F., Jones, M., Lalchandani, L., & Martichuski, D. K. Comparing recall and recognition in the use of classroom response systems. Poster presented at the Festschrift in Honor of Alice F. Healy, Boulder, CO, June 8, 2014.

Schneider, V. I., Healy, A. F., & Barshi, I. Specificity and transfer of training in following navigation instructions with different response types. Poster presented at the Festschrift in Honor of Alice F. Healy, Boulder, CO, June 8, 2014.

Tack, L. A., Healy, A. F., & Jones, M. Isolating the effects of different feedback contents on learning. Poster presented at the Festschrift in Honor of Alice F. Healy, Boulder, CO, June 8, 2014.

Tao, L., & Healy, A. F. Word identification in Chinese and English prose passages by native and nonnative speakers varying in fluency. Poster presented at the Festschrift in Honor of Alice F. Healy, Boulder, CO, June 8, 2014.

Sherwood, D. E., Lohse, K. R., & Healy, A. F. Judging joint angles and movement outcome: Shifting the focus of attention in dart-throwing. Poster presented at the annual NASPSPA (North American Society for the Psychology of Sport and Physical Activity) conference, Minneapolis, MN, June 12-14, 2014.

Ketels, S. L., Healy, A. F., Jones, M., Lalchandani, L., & Martichuski, D. K. Testing two pedagogical prescriptions in the use of classroom response systems. Paper presented at the Thirteenth Annual Summer Interdisciplinary Conference, Moab, UT, June 23-28, 2014.

Corral, D., Rozbruch, E. V., Healy, A. F., & Jones, M. Predicting memory retention from an initial quiz. Poster to be presented at the 55th Annual Meeting of the Psychonomic Society, Long Beach, CA, November 22, 2014.

Healy, A. F., Jones, M., Lalchandani, L., & Tack, L. A. A cognitive antidote to boredom: Motivational effects of interspersing quizzes during fact learning. Paper to be presented at the 55th Annual Meeting of the Psychonomic Society, Long Beach, CA, November 22, 2014.

Schneider, V. I., Healy, A. F., Tack, L. A., & Barshi, I. Training specificity in time and distance estimation: Effects of secondary task presence. Poster to be presented at the 55th Annual Meeting of the Psychonomic Society, Long Beach, CA, November 22, 2014.

Tao, L., & Healy, A. F. Impact of word resenation format on reading Chinese and English text. Poster to be presented at the 55th Annual Meeting of the Psychonomic Society, Long Beach, CA, November 21, 2014.

Friend, A. & Caccamise, D. J. Entropy rate as a predictor of reading comprehension skills in writing. Annual Conference of the Society for the Scientific Study of Reading, Santa Fe, NM, July 18, 2014.

Caccamise, D., Friend, A., Groneman, C., Littrell-Baez, M.K., & Kintsch, E. (2014). Teaching struggling middle school readers to comprehend informational text. In J.L. Polman et al. (Eds.), *Learning and Becoming in Practice: The International Conference of the Learning Sciences (ICLS) 2014, Volume 2* (pp. 1002-1006). Boulder, CO: International Society of the Learning Sciences.



## Recent Grants Awarded to Members of the Institute of Cognitive Science

<u>PI Name</u>	<u>Sponsor</u>	<u>Project Title</u>	<u>Amount</u>
Michael Eisenberg	Indiana - NSF	SHB: TypeI(EXP): Health Sense: Motivating Health Awareness in Children through Wearable Computing (2 years)	\$200,838
Martha Palmer	Penn-DARPA	Linguistic Resources for Multilingual, Genre-Independent Language Technologies (BOLT) (1 year)	\$510,000
Angela Bryan Co-PI: Marie Banich & Jessica Andrews- Hanna	NIH	Enhancing Function in later life: Exercise and Functional network connectivity (5 years)	\$2,794,372
Cinnamon Bidwell	NIH	Deconstructing the Smoking and ADHD Comorbidity: A Multilevel Genetic Approach (3 years)	\$509,922
Al Kim Co-PI: Akira Miyake- PSYC	NSF	ERP Investigations of Syntax-Semantics Interaction During Sentence Comprehension: An Individual Differences Approach (3 years)	\$549,958
Jessica Andrews- Hanna	Templeton	Large-scale momentary experience sampling and neurocognitive mechanisms of functional and dysfunctional prospective thought (2 years)	\$145,000
Douglas Seals Co-PI: Marie Banich	NIH	Nitrite Supplementation for Improving Physiological Function in Older Adults (5 years)	\$2,516,799
Joseph Orr	NIH	NRSA Fellowship F32 DA034412-01A (1 year)	\$53,282
Scott Schafer	NIH	NRSA Pre-Doctoral Fellowship (1 year)	\$39,358
Karli Watson (Carston)	NIH	Animas Model of Genetics and Social Behavior in Autism Spectrum Disorders (1 year)	\$50,885
Tor Wager	UT Austin-NIH	Large-scale Automated Synthesis of Functional Neuroimaging Data (2 years)	\$90,660.43
Tim Curran Co-PI: Tor Wager	DOD Navy	Bidirectional Vision (5 years)	\$3,500,000
Mike Eisenberg	Berkeley-NSF	EAGER: Paper Mechatronics: Creating High-low Tech Design Kits to Promote Engineering Education (1 year)	\$119,924
Tor Wager	NIDA	fMRI-based BioMarkers for Multiple Components of Pain-Supplement (1 year)	\$159,996
Mike Mozer	Samsung Electronics	Samsung Music Recommendation (1/2 year)	\$11,318





## INC News

The Intermountain Neuroimaging Consortium has seen an explosion in growth over the past six months and now supports research projects from over two dozen principle investigators, including faculty and research associates in ICS, departments and institutes at CU Boulder, and other universities and research organizations throughout the Front Range. Investigators using the INC explore a range of topics from traditional areas in cognitive science such as learning, memory and attention to the neural basis of physical and emotional pain to topics such as how exercise and drug addiction influence brain connectivity.

A number of new studies have started up this fall at the INC, with many new studies scheduled to begin in 2015. Studies starting up this fall include studies focused on:

- Predictors of executive cognitive control (Naomi Friedman, Institute for Behavioral Genetics)
- Activity patterns of emotions induced by salient images (Tor Wager, Institute for Cognitive Science)
- Emotion regulation via cognitive reappraisal (Kateri McRae, University of Denver)
- Exercise as a way to prevent the development of psychosis in high-risk adolescents (Vijay Mittal, Dept. of Psychology and Neuroscience)
- Testing for effects of vascular changes on cognitive function in a pre- and post- hormone intervention (Kerry Hildreth, Anschutz Medical Campus)
- Determining whether the amygdala can flexibly track evaluative goals (Kateri McRae, University of Denver)

- Effects of an exercise intervention on resting state connectivity in older adults (Angela Bryan, Jessica Andrews-Hanna, Institute for Cognitive Science)
- Exploring the potential for an underlying neural mechanism of reading and math difficulties (Erik Willcutt, Institute for Behavioral Genetics; Marie Banich, Institute for Cognitive Science).

To accommodate this large increase in scanning the INC has hired three new MRI technologists. Teryn Wilkes joins INC staff as a full-time technologist after working for 12 years at Boulder Community Hospital. Keli Salyards and Jeremy Trembly join INC staff as on-call MRI technologists who will cover weekend scanning.

The INC continues its outreach efforts with a second award from the CU Boulder Office of Outreach and Engagement to Marie Banich and Monique LeBourgeois to expand a program to teach undergraduates to deliver interactive neuroscience lessons to K-12 students. In addition, INC researchers continue to participate in public talks at local libraries, sponsored CU events, and private engagements with various community groups with an interest in neuroscience (e.g., retirement home communities, teacher education programs). If you would like to schedule a visit or learn more contact Nicole Speer ([Nicole.Speer@colorado.edu](mailto:Nicole.Speer@colorado.edu), 303-492-2875).



Teryn Wilkes  
New MRI Technologist