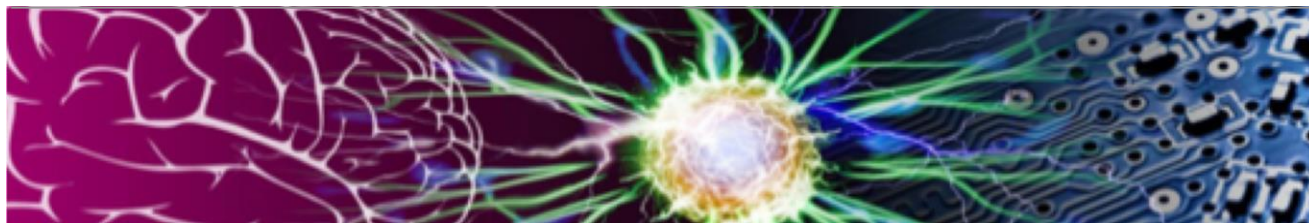


INSTITUTE OF COGNITIVE SCIENCE

Newsletter | Fall | 2018



NEW ICS ONLINE COURSE

This Fall, ICS successfully developed and implemented an online course for the Computer Science Post-Baccalaureate online program. This effort was overseen by Donna Caccamise, ICS Academic Program Director with course development and teaching led by ICS/Computer Science (CS) professor Mike Eisenberg. Mike developed the online lectures using the state-of-the art lightboard delivery system hosted by CS as well as assessments and online student forums. Mike was assisted in teaching the course this fall by a recent Institute of Cognitive Science/CS Joint Ph.D. graduate, David Quigley.

The course, called Mind and Machines, is an Institute of Cognitive Science computer science course that introduces students to the study of the mind, as an interdisciplinary field with roots in Computer Science along with Psychology, Education, and a variety of other fields. The scope of this course centers on how these ideas of mind both inform and are influenced by computer science ideas.

Plans are to offer a version of this online course in the Fall 2019 to the cognitive science student community, under the COGS call sign, and it will count as the introduction to cognitive science (3702) course requirement in our undergraduate certificate program. This course, once implemented for the cognitive science student community, represents the beginning of what we hope to become a full slate of online courses that meet the requirements of both our undergraduate and graduate level course requirements for the academic programs offered through ICS.

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FROM THE DIRECTOR



We have a lot to be proud of this semester. Our community pulled together to produce an outstanding self-study report: one that highlights our strengths as well as where we want to focus our improvements in the years ahead. As a result of these multiple rounds of discussion and document feedback, we made a few “shifts” in our thinking that I believe will strengthen our community going forward.

We have a new mission statement: *to identify and address key questions in cognitive science.*

This new mission statement reflects our desire for our interdisciplinary research to have a positive impact on people’s lives. It recognizes the outstanding work we have done, and will continue to do, in forging new models for translational research as well as new models for integrating practitioners into research enterprises.

We have a new vision statement to guide our activities over the next few years:

- *Be a campus leader in innovative, interdisciplinary research*
- *Be a campus leader in inclusiveness, diversity, and equity*
- *Reimagine our interdisciplinary educational programs*
- *Develop a robust resource engine to support future growth*

The first component of this vision has been a central pillar of our Institute since its founding. The other three components emerged from the self-study process.

Our climate analysis suggested that we have created a warm and welcoming community, where people are welcome regardless of their field of study or position at the University. But as with many departments at CU, ICS has not made *inclusion, diversity, and equity* an explicit focus of attention until now. We are confident that concerted attention will enable the Institute to better fulfill its research and teaching missions, and more closely align with the University’s vision and strategic imperatives.

The front page of this newsletter describes our first steps towards *re-imagining our educational programs*: our new Machines and Minds online course. Going forward, we will build on our partnering skills with affiliated units and other campus programs, with the aim of developing approaches that are financially sustainable and can scale to meet student demand.

In a small, non-profit organization such as ours, it is important to remember that money is only one component of a *robust resource engine*: the time and energy that our members bring to our community is just as important, if not more. Moving forward, we need to think creatively about providing a range of ways for members to participate in the Institute and to develop their interdisciplinary research and education capacity.

Tamara Sumner PhD, Director  Institute of Cognitive Science
UNIVERSITY OF COLORADO BOULDER

ICS PUBLICATION HIGHLIGHTS

Banich, M.T., and Compton, R.J. (2018) Cognitive Neuroscience, 4th Edition, Cambridge University Press. Fourth edition of *Cognitive Neuroscience* has been published by Cambridge University Press.

Bidwell L.C., York Williams, S.L., Mueller, R.L. Bryan, A.D., Hutchison, K.E., Exploring Cannabis Concentrates on the Legal Market: User Profiles, Product Strength, and Health-related Outcomes. *Addictive Behaviors Reports* 8, 102-106

Hagerty, S.L., York Williams, S.L., **Bidwell, L.C.**, Weiland, B.J., ...DRD2 Methylation is Associated with Executive Control Network Connectivity and Severity of Alcohol Problems Among a Sample of Polysubstance Users. *Addiction biology*.

Marceau, K., **Bidwell, L.C.**, Karoly, H.C., Evans, A.C., ... Within-family Effects of Smoking During Pregnancy on ADHD: the Importance of Phenotype. *Journal of Abnormal Child Psychology* 46 (4), 685-699

Cheng, J. Bernstein, J., Rosenfeld, E., **Foltz, P.W.**, Cohen, A., Holmlund, T., & Elvevåg, B. (2018). Modeling Self-Reported and Observed Affect from Speech. Interspeech 2018, *The 19th Annual Conference of the International Speech Communication Association*.

Cohen, A.S., Fedechko, T., Schwartz, E., Le, T., **Foltz, P.W.**, Bernstein, J., Cheng, J., Rosenfeld, E., Holmlund, T. B. & Elvevåg, B. (in press). Ambulatory Vocal Acoustics, Temporal Dynamics, and Serious Mental Illness. *Journal of Abnormal Psychology*.

Cowan, T., Le, T.P., Elvevåg, B., **Foltz, P.W.**, Tucker, R.P., Holmlund, T.B., Cohen, A.S. (2018). Comparing Static and Dynamic Predictors of Risk for Hostility in Serious Mental Illness: Preliminary Findings. *Schizophrenia Research*.
<https://doi.org/10.1016/j.schres.2018.08.030>



Institute of Cognitive Science
UNIVERSITY OF COLORADO BOULDER

NEW ICS ONLINE COURSE cont.



ICS spoke with David Quigley, ICS Research Associate and an instructor for the Mind and Machines course.

ICS: David, how was teaching this course different from a face to face course?

"The online course has really given me an opportunity to respond more thoroughly to students. Students post their questions on Piazza rather than waiting to bring them up in a class that doesn't (physically) exist.

Piazza is free online platform for instructors to manage and answer questions and answers from students.

With that approach, I am able to review and consider their questions fully before I make a response. And since the entire discussion is on the boards, all students can refer to the discussion and I don't have to answer a bunch of redundant questions."

ICS: How do you hold "office hours" for students?

"Since we have Zoom available as a video meeting space, I can hold office hours that feel very similar to an in-person session, and it's much easier to set up impromptu meetings to answer a quick question on the digital whiteboard."

SPECIAL MENTIONS

ICS Fellow **Angela Bryan** in *Slate Magazine Podcast* (7 October 2018) How Does a Cannabis Researcher Do Her Job?

ICS Faculty **McKell Carter** is co-author on a study published as the cover of *Nature Human Behavior* (29 October 2018) Modelling the Effects of Crime Type and Evidence on Judgements About Guilt.

ICS Faculty **Peter Foltz** in *Association for Psychological Science for Research e-publication on Teaching Collaboration Skills*. APS Latest Research News (3 December 2018) Solving 21st-Century Problems Requires Skills that Few are Train in, Scientists Find.

Peter Foltz was interviewed in a June *National Public Radio* news story on uses of AI for assessment of student writing. (30 June 2018) More States Opting to 'Robo-Grade' Student Essays by Computer.

Clayton Lewis participated in a study group on conceptual change in science learning at the Hanse-Wissenschaftskolleg (HWK) in Delmenhorst, Germany, November 28-30. The HWK is an institute for advanced study where Lewis and ICS Prof Emeritus **Gerhard Fischer** have held fellowships.

Quigley, D., Peffer M., Mostowfi, M. "Clustering Analysis Reveals Authentic Science Inquiry Trajectories Among Undergraduates" accepted at the 9th annual Learning Analytics & Knowledge Conference in March 2019.

Reddan, M.C., Wager, T.D., Schiller, D., Attenuating Neural Threat Expression with Imagination (August 17, 2018), *Neuron*.

Wager, T.D. Pain Can Be a Self-Fulfilling Prophecy (November 13, 2018) . *Science Daily*

ICS PUBS– Cont.

Foltz, P.W., (2018) Automating the Assessment of Team Collaboration through Communication Analysis. In R. Sottolare, A. Graesser, X. Hu, & A. Sinatra (Eds.), *Design Recommendations for Intelligent Tutoring Systems: Volume 6 – Team Tutoring*, Orlando, FL: U.S. Army Research Laboratory.

Holmlund, T.B., **Foltz, P.W.**, Cohen, A.S., Johansen, H.D., Sigurdson, R., Fugelli, P., Bergsager, D., Cheng, J., Bernstein, J., Rosenfeld, E. & Elvevåg, B. (2018/ in press). Moving psychological assessment out of the controlled laboratory setting and into the hands of the individual: Practical challenges. *Psychological Assessment*

Le, T. P., Elvevåg, B., **Foltz, P. W.**, Holmlund, T. B., Schwartz, E. K., Cowan, T., & Cohen, A. S (2018). Aggressive urges in schizotypy: Preliminary data from an ambulatory study. *Schizophrenia Research*. DOI: <https://doi.org/10.1016/j.schres.2018.05.04>.

Marvaniya, S., Saha, S., Dhamecha, T., **Foltz, P. W.**, Sindhgatta, R., and Sengupt, B. (2018). Creating Scoring Rubric from Representative Student Answers for Improved Short Answer Grading. ACM International Conference on Information and Knowledge (CIKM). Turin, Italy, October.

Ventura, M., Chang M., **Foltz, P.W.**, Mukhi, N., Jarbro, J., Ma, T., Dhamecha, T., Marvaniya, S., Watson, P., D'helon, C., Tejwanji, R., & Afzal, S., (2018). *Primary Evaluations of a Dialogue-Based Digital Tutor*. In C. Rose et al. (Eds.) *Artificial Intelligence in Education*. Springer.

VISIT THE ICS WEBSITE FOR NEWS

For information on special events, colloquia, and research updates & news, visit:

www.colorado.edu/ics

ICS FACULTY AWARDS



Congratulations ICS Faculty Cinnamon Bidwell (right) and ICS Fellows Kent Hutchison (center) and Angela Bryan (left), co-directors of the CU Change Lab for their selection as the 2018 Cannabis Researchers of the Year award by readers of the *Analytical Scientist*, voting on the top-ten scientists in featured in an issue highlighting researchers innovating in the fields of chemistry, biomedical science, and plant biology for their annual “The Year of Cannabis Science”.

Cinnamon Bidwell was also awarded the Arts & Sciences Fund for Excellence in support of the Clinical Overview of the Recovery Experience (CORE) Conference Poster Session sponsored by ICS and CU REACH.

WELCOME ICS FACULTY



Leanne Hirshfield, PhD

ICS: Welcome to ICS Leanne! Can you share your research background and what you hope to accomplish here as part of the Institute?

Leanne: My background is in Computer Science, with specialties in Human-Computer Interaction (HCI) and Machine Learning. My favorite part about HCI research is getting to work with collaborators from a wide range of disciplines. I'm a firm believer that the coolest research occurs at the fringes of disciplines, and I'm thrilled to be a part of the interdisciplinary team of exceptional researchers at ICS. My goal at ICS is to shape a research portfolio focused on non-invasive (fNIRS and EEG) brain measurement to enhance human performance in individual and team settings via the design of intelligent systems that adapt in real-time based on the human(s) social-cognitive-affective states.

ICS PUBS– Cont.

Foltz, P.W., (2018) Automating the Assessment of Team Collaboration through Communication Analysis. In R. Sottolare, A. Graesser, X. Hu, & A. Sinatra (Eds.), *Design Recommendations for Intelligent Tutoring Systems: Volume 6 – Team Tutoring*, Orlando, FL: U.S. Army Research Laboratory.

Holmlund, T.B., **Foltz, P.W.**, Cohen, A.S., Johansen, H.D., Sigurdson, R., Fugelli, P., Bergsager, D., Cheng, J., Bernstein, J., Rosenfeld, E. & Elvevåg, B. (2018/ in press). Moving psychological assessment out of the controlled laboratory setting and into the hands of the individual: Practical challenges. *Psychological Assessment*

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Marvaniya, S., Saha, S., Dhamecha, T., **Foltz, P. W.**, Sindhgatta, R., and Sengupt, B. (2018). Creating Scoring Rubric from Representative Student Answers for Improved Short Answer Grading. *ACM International Conference on Information and Knowledge Management (CIKM)*. Turin, Italy, October.

Ventura, M., Chang M., **Foltz, P.W.**, Mukhi, N., Jarbro, J., Ma, T., Dhamecha, T., Marvaniya, S., Watson, P., D'heon, C., Tejwanji, R., & Afzal, S., (2018). *Primary Evaluations of a Dialogue-Based Digital Tutor*. In C. Rose et al. (Eds.) *Artificial Intelligence in Education*. Springer.



Poster Session at the CORE Conference held at CU Boulder's Sustainability, Energy and Environment Community Building

NEW STAFF AT ICS



Yasko Endo has joined ICS for the long-term, after her temporary part-time appointment earlier this year. As the Strategic Communications & Program Manager, Yasko will continue to improve the ICS communications, marketing, support INC's Brain Awareness Week outreach activities, and manage the Inquiry Hub curriculum adoption scaling program. Yasko spent 6 years working in the Department of Computer Science at CU, program managing and co-directing the Scalable Game Design project which pioneered new methods for introducing children to programming.



Anna Redman joins ICS from the State Veterinarian's office at the Colorado Department of Agriculture, where she assisted with livestock traceability efforts. She spent her two years at CDA working with veterinarians throughout the US, Canada, and Mexico to ensure that proper measures were being taken to protect Colorado from livestock disease. As a new member of the ICS team, Anna is thrilled to learn the ins and outs of the research grant world. She coordinates with Jean to ensure that grant spending is appropriate, allocable, and reasonable.

CU REACH CENTER UPDATE

The Center for Research and Education Addressing Cannabinoids and Health (CUREACH) Center partnered with the Clinical Overview of the Recovery Experience (CORE) Network to sponsor a research poster session during the fourth annual CORE Conference, held November 3, 2018 on the University of Colorado Boulder campus.

Researchers from undergraduate, graduate, professional, from any field participating in the conference submitted abstracts for original research projects falling broadly within the theme of "Cannabis and Health".

Blind reviewed abstracts were reviewed accepted with abstracts published online and in a pamphlet accompanying the poster presentation. Abstracts were judged on significance, approach, innovation, relevance to the theme "Cannabis and Health," organization, and clarity.

NEW ICS FELLOWS – WELCOME!



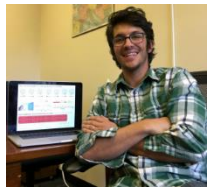
June Gruber

Assistant Professor Psychology & Neuroscience
June's research focuses on positive emotion disturbance, or the delineating the ways in which positive emotion can go awry and towards developing an integrated clinical affective science model of positive emotion disturbance.



Roselind Kaiser

Assistant Professor Psychology & Neuroscience
In the Research on Affective Disorders and Development (RADD) laboratory we are working to understand neurocognitive dysfunction in depression, including abnormalities in the structure, molecular signaling, and coordinated activity of brain networks involved in cognitive regulation and learning.



Zack Kilpatrick

Assistant Professor Applied Mathematics
Zack's research covers five main areas of inquiry: Mathematical neuroscience, Spatiotemporal pattern formation, Stochastic dynamics of neural activity, Evidence accumulation and decision making and Dynamics of collective decisions.



Liu Liu

Assistant Professor Leeds School of Business
Liu's research focuses on the intersection of marketing and machine learning, in areas such as visual marketing, branding, product design and innovation, social media, and consumer choice modeling.



Nicholas Reinholtz

Assistant Professor Leeds School of Business
Nicholas Reinholtz is an assistant professor of marketing at the Leeds School of Business. Nick's research focuses on different aspects of consumer behavior, including financial decision making, product and price search, and the cognitive processes and representations underlying choice.

CENTER ON RESEARCH AND TRAINING

Congratulations to Matthew Jones, the new director of CRT.

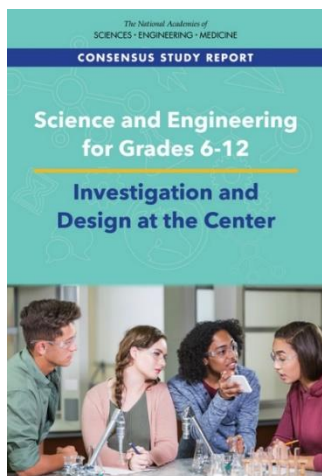
Matt serves as the director of CRT, an ICS Fellow and is Associate Professor in the department of Psychology and Neuroscience.

The primary goal of training research at CRT is to construct a theoretical and empirical framework that can account for and make accurate predictions about the effectiveness of different training methods over a large range of tasks including military, industrial, vocational, and academic.

His Jones' Lab studies human learning and knowledge representation, with emphasis on categorization, similarity, generalization, relational representations, and sequential decision making. His research is based on laboratory experimentation and mathematical and computational modeling.



INQUIRY HUB'S DESIGN AT THE CENTER



The "Inquiry Hub" (iHub) is a research-practice partnership bringing together educational researchers, computer scientists, school district leaders, teachers, and students from Denver Public Schools, curriculum developers, interactive resource providers, and multiple publishers of STEM curricula to undertake a systemic approach to learner-centered teaching that promotes adaptability and responsiveness to the differing needs of diverse learners.

The National Academies of Sciences Engineering Medicine has published the report "Science and Engineering for Grades 6 - 12: Investigation and Design at the Center (2018)" which includes multiple mentions of the Institute of Cognitive Science research center, Inquiry Hub.

Chapter 4: "How Students Engage with Investigation and Design" prominently features the work of Profs. Tamara Sumner, Jennifer Jacobs, William Penuel, and Katie Van Horne's Inquiry Hub research program. Inquiry Hub's Biology course curriculum

Evolution unit was presented as the primary example of how to integrate three-dimensional science and engineering performances for student engagement. Inquiry Hub Research + Practice Partnership began in 2008 as a joint research venture between Denver Public Schools and the University of Colorado Boulder. The mission of this partnership is to design, test, and implement tools and strategies for supporting teachers in developing rigorous and responsive instruction that can help all students achieve at high levels in mathematics and science.

LATEST DISTRICT ADOPTION OF IHUB BIOLOGY COURSE: A TALK WITH ICS FACULTY KATIE VAN HORNE

ICS: Can you give us a summary of what iHub has been doing recently?

We have been collaborating for over 4 years with district and central office leadership at Denver Public Schools along with between 20 to 30 high school biology teachers to collaboratively co-design a year of phenomena-based biology that aligns with Next Generation Science Standards (NGSS).

I think the development exemplifies the mission of ICS because we co-developed and corevise the curriculum in a collaborative process with teachers who will use the curriculum, researchers, scientists, NGSS curriculum design experts from Northwestern University and CU Boulder, piloted by teachers, then revised by the same team of people.

ICS: What do you mean by 'phenomena-based biology' and why is that important?

Phenomena-based biology is big shift in NGSS instruction and is about students learning science ideas and facts and figuring out how to explain a phenomena using Big Ideas (Disciplinary Core Ideas such as "understanding how and why antibiotics work or stop working"), for engaging in science and engineering practices. The end goal is for the students themselves to figure out that they need science to explain the content's Big Ideas. it's important because when students are in phenomena-based science class they are experiencing coherent (i.e., they know why they are doing what they are doing) and relevant (i.e., real life applications) work that is useful and meaningful for them right now in the present, not about learning for some nebulous future use.

Continued on page 8...

IHUB BIOLOGY COURSE TALK WITH KATIE cont.

ICS: What is the curriculum adoption process like?

For the Denver Public School (DPS) adoption, they announced a “Request for Proposals” for Biology curriculum adoption in August of 2018. We submitted the curriculum and are currently undergoing DPS committee adoption process. This is exciting because it is the first time that we know of where a collaboratively designed open source curriculum worked on by teachers in their own district has gone through DPS adoption process.

ICS: What do you mean by open source curriculum?

The curriculum units have been released for use through Open Educational Resource Creative Commons Licensing - meaning it's free to use and adapt as needed.

ICS: Is there anything else you'd like to share with the community?

For this work, the design and development was collaborative and the funding involved collaboration too. CU Boulder received a grant from National Science Foundation's Cyberlearning program, then the Gordon & Betty Moore Foundation, Hewlett Foundation, Spencer Foundation contributed to create curricula with embedded assessments, as well as support from Denver Public School.

The coolest part has been seeing teachers in classrooms with students, and going through the curriculum design process which was such a good way to see and understand their value as professional educators. They are experts at what they do. Collaborative design means learning from each other, which makes curricula that much better.

DONORS

ICS thanks the following fall semester donors for their generous contribution to the Institute.

Margaret Blazek
Bidwell Lab Fund

Tom Yoksas
CU Reach Gift Fund

UPCOMING ACTIVITIES: Students

Applications for the
**Spring 2019 ICS Student Travel &
Research Awards**
will open in January.

Contact Stephen Sommer
Stephen.sommer@colorado.edu chair of
the Student Award Committee for more
information

VISITING SCHOLARS



Dr. Brita Ellevåg is a neuroscientist and professor at the University of Tromsø, Norway. Before that, she was head of the neuropsychology unit in the Clinical Brain Disorders Unit at NIMH. Her work focuses on the neuropsychological and neuropsychiatric components of schizophrenia, and the use of computational models of language as an assay of brain function and dysfunction.

Brita will be collaborating with Peter Foltz as well as others at ICS on the crossover points of neuroscience, language, computational methods, and clinical psychology.

A message from Brita: "I have over 20 years of full-time research experience of initiating, leading and coordinating multidisciplinary clinical research teams and projects, both at a national and international level. My expertise is within cognitive neuropsychiatry, cognitive neuroscience, and the cognitive and neural basis of language in those with brain disorders, especially psychosis and dementia. I have validated a novel automated approach to quantifying incoherence in speech with wide applications in psychiatry and neurology, and is of specific relevance to the current application. This research documents the value of these techniques in discriminating patients with schizophrenia from controls, discriminating schizophrenia probands, first-degree relatives and unrelated healthy controls, differentiating those at high risk of psychosis from unrelated putatively healthy participants and in a candidate gene study linking language in general to underlying neurobiology. I am also applying these methods via telemedicine/ehealth solutions and was PI and co-ordinator for a recently completed multi-country study (with Peter W. Foltz) that developed a diagnostic support system for remote and automated monitoring of psychosis that utilized automated computational approaches to analyse language and other behavioural data streams. My current work builds on this validation and application of automated computational language methods."

Continued on page 10...

CU BOULDER TO HOST CUNY CONFERENCE

Organized by ICS Faculty AI Kim and ICS Fellows Eliana Colunga, Laura Michaelis-Cummings, and Bhuvana Narasimhan and hosted by the Institute of Cognitive Science at the University of Colorado Boulder, the 32nd Annual CUNY Conference on Human Sentence Processing will be held at the Hilton Embassy Suites Hotel in Boulder, Colorado March 29 – 31, 2019.

The conference focuses on comprehension, production, and acquisition of language at the sentence level, traditionally drawing researchers from psychology, linguistics, cognitive science, neuroscience, computer science, education, and philosophy.

Registration begins early 2019
www.colorado.edu/event/cuny2019



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www.colorado.edu/ics/about-us

ICS VISITING SCHOLARS cont.



Mark Strom. MD

Having spent many years as Chief of Cardiac and Thoracic surgery in Los Angeles, I became interested in understanding why some of my patients developed persisting postoperative pain and others did not. I spent time with John Sarno, MD, at New York University School of Medicine, studying the relationship between pain and the brain, a condition he named tension myositis syndrome (TMS). John began referring me most of his West Coast patients. At the same time, I pursued advanced training in medical acupuncture at the UCLA School of Medicine. In my practice, I treat many patients with chronic pain and have effected many cures non-pharmacologically. My success with patients led to my interest in learning more about why such treatment worked so well, and sparked my interest in learning more about the brain and neuroscience. My time in Tor Wager's laboratory has afforded me total immersion in this area of learning. I have

been able to learn a great deal about the interaction of pain and the brain. My contribution is to use all of my clinical experience, and participation in the lab's research projects, to act as a bridge between the lab and the actual treatment of patients.

ICS CERTIFICATES AND PHD COMPLETION

Congratulations

Combined PhD

David Quigley
Computer Science and
Cognitive Science

Triple PhD

Adam Young
Psychology & Neuroscience,
Neuroscience, and Cognitive Science

ICS Graduate Certificates

Hayley Coniglio
Ramesh Muralimanohar

NEW ICS STUDENT AWARD COMMITTEE

Welcome

Thank you new members of the ICS Student Awards
Committee for your efforts.

Stephen Sommer (chair)

Education

Lisa Thomas Smith

Philosophy

Alexandra Gendreau

Computer Science

Shannon Mcknight

Psychology

Norielle Adricula

Linguistics

Carly Schimmel

Speech Language Hearing Sciences

ICS STUDENT PUBLICATIONS

Bhaduri, S., Van Horne, K., Sumner, T. Designing an Informal Learning Curriculum to Develop 3D Modeling Knowledge and Improve Spatial Thinking Skills. To appear in the *Proceedings of the 2019 CHI Conference Extended Abstracts on Human Factors in Computing Systems*. ACM (2019).

Gendreau Chakarov, A., Recker, M., Jacobs, J., Van Horne, K., Sumner, T. Designing a Middle School Science Curriculum that Integrates Computational Thinking and Sensor Technology. *SIGCSE (To appear in 2019)*.

Gendreau Chakarov, A., Recker, M., Jacobs, J., Sumner, T., Herve, S., Van Horne, K., Penuel, W.R. Designing Sensor-Based Science Units that Incorporate Computational Thinking. *AERA (To appear in 2019)*.

Parker, R. Interest-based capstone team formation. *Capstone Design Conference (CDC)*, Rochester, New York (2018).

Parker, R. Who I am becoming, now: Toward a computer science professional identity instrument. *Frontiers in Education (FIE)*, San Jose, California (2018).

Sommer, S., Hinojosa, L., Polman, J. collaborated on a recently published interactive website "The STEM Literacy Through Infographics Project", including curricula, teacher PD materials, and data resources related to data visualization and teaching STEM through infographics. Science-infographics.org (2018).

Suresh, A., Sumner, T., Jacobs, J., Foland, B. & Ward, W. (accepted). Automating analysis and feedback to improve mathematics teachers' classroom discourse. Paper submitted to the ninth symposium on Educational Advances in Artificial Intelligence (EAAI 2019).

Suresh, A., Sumner, T., Huang, I., Jacobs, J., Foland, B. & Ward, W. (poster paper accepted). Using deep learning to automatically detect talk moves in teachers' mathematics lessons. Poster Paper submitted

GRADUATE STUDENTS RECOGNIZED

Abhijit Suresh, a student of ICS Faculty McKell Carter, was recognized as a **Distinguished Student Speaker** by the Department of Computer Science.

IEEE Brain DataBank Challenge winner **Abhijit Suresh**; Suresh, A., Sumner, T., Huang, I., Jacobs, J., Foland, B. & Ward, W. Using deep learning to automatically detect talk moves in teachers' mathematics lessons. **Poster Paper accepted to 2018 IEEE International conference** (IEEE BigData 2018).

Student Travel & Research Awards

These awards encourage students in one of the ICS certificate or PhD programs to participate in interdisciplinary study and research. The Institute provides funds to attend and present at interdisciplinary conferences or to conduct original research. The awards are administered by a student committee representing several disciplines of study.

For Fall Semester, congratulations to:

Lakshi Lalchandani in PSYC was awarded \$500 for research

Leighanna Hinojosa in EDUC was awarded \$500 for research.

Stephen Sommer presented a paper "From Quantified Self to Building a More Fit Community; Data Tracking and Science Infographics as Boundary Objects" at the **International Conference of Learning Sciences in London** this summer, with ICS Student Travel support.

Richard Parker, ICS Combined PhD student (Computer Science) participated in the **Doctoral Symposium at Frontiers in Education**.

**Graduate Certificate and Combined PhD Program
Information is found @
www.colorado.edu/ics/graduate-programs**

DISSERTATION SPOTLIGHT

Elucidating the Cognitive Processes Involved in the Note-Taking Effect

Lakshmi Arjan Lalchandani

Advisor: Alice F. Healy, Professor



The fact that research on note taking extends as far back as the early 1900's is unsurprising as it is a practice that is ubiquitous throughout our

lives. Note taking helps us to retain information even when there is no opportunity to review the notes. This phenomenon is known as the encoding effect or the note-taking effect. Much of the research investigating the note-taking effect focuses on the impact of note-taking media or note-taking strategy on the size of the effect. However, there is no consensus on the cognitive mechanisms underlying the note-taking effect. When mentioned, there are three primary hypotheses of cognitive processing during note-taking: generative processing, cognitive effort, and sustained attention. After thoroughly comparing these hypotheses, there were only three unique cognitive processes that required further investigation: generative processing, summarization, and sustained attention. Therefore, the purpose of this investigation was to compare the separate effects of the three cognitive mechanisms in relation to the note-taking effect.

Two experiments were designed to compare generative processing to (a) sustained attention and (b) summarization.

Generative processing is the active construction of associations between novel information and prior knowledge.

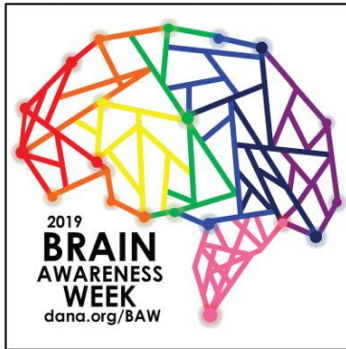
Generative processing is most cited as the explanation for the note-taking effect. Summarization forces the learner to identify the most pertinent information to create a coherent summary. This process thereby facilitates retention and comprehension. Sustained attention, in this context, is selectively concentrating on the novel information while ignoring all irrelevant distraction. The first experiment in the present investigation, through the measurement of task-relevant and task-irrelevant distraction, found that sustained attention is positively related to retention and generative processing is negatively associated with retention. Analyses of the content of the notes revealed that students are more likely to take summary style notes when not given specific instruction and moreover, the rating of summary quality is positively correlated with performance on the retention test. The second experiment found that generative processing impeded and summarization facilitated retention. Therefore, although most cited for the benefits of note taking, generative processing appears to be detrimental to retention. This conclusion was deduced from both internally motivated and externally motivated measures.



Institute of Cognitive Science
UNIVERSITY OF COLORADO BOULDER

2019 BRAIN AWARENESS WEEK IS COMING

Save the dates - March 10th to the 19th,
2019.



The Intermountain Neuroimaging Consortium
@ICS announces the 2019 Brain Awareness
Week @CUBoulder.

From speaker and panel events targeted to
parents, caregivers, teachers, students, a
'Brain Bumble' highly interactive and fun
educational event for high school students, to
the Community Brain Day Expo where
researchers share what they know and are
exploring with community members ages 4 to
104.

Strong participation is expected as INC @ICS
partners with BVSD science, innovation, gifted
& talented programs which will support and
promote the CU Neuroscience Club student
led event for high school students and the
week of free events. The CU Office of
Outreach and Engagement will also support
and disseminate NeuroSci Club and other
events for BAW through website and
newsletters.

Event details will be available on the
www.colorado.edu/mri starting January.

THE 20TH ICMI 2018 CONFERENCE A SUCCESS

The ACM International Conference on Multimodal
Interactions (ICMI 2018) was held in Boulder CO,
October 16 to 20, 2018. The ICMI conference series
serves as the premier international forum for
multidisciplinary research on multisensor, multimodal
human-human and human-computer interaction and
interfaces.

Institute of Cognitive Science was a major sponsor for
this conference, and ICS Faculty Prof. Sidney D'Mello
served as Chair of the conference.

ICMI 2018 was a single-track conference featuring
three keynotes, 63 technical full and short papers
(including 28 oral and 35 poster presentations), two
panel sessions, two tutorials, 18 papers presented in
two grand challenges, 5 demonstrations/exhibits, a
Doctoral Consortium with 12 papers, late-breaking
results papers, and 5 workshops with approximately
50 papers, keynotes, and extended discussions.
Considerable cutting-edge and exciting multimodal
interaction research was presented and discussed at
the conference.

Soon after the conclusion of the event, one of the
conference sessions were featured in the Science and
technology section of the Oct 25, 2018 print edition of
the Economist under the headline "Listen and Learn"
titled "A simpler, better way to diagnose mental illness
- Patterns of speech may be telltales of particular
symptoms".



ICS FACULTY PRESENTATIONS

LONDON FESTIVAL OF LEARNING

This unique event was the first time three conferences: International Conference on the Learning Sciences (ICLS); Learning @ Scale (L@S); and Artificial Intelligence in Education (AIED) came together under one roof, in what organizers hope will become a major annual event in the education and technology calendars. The London Festival of Learning held June 22-30, 2018 brought together world experts in artificial intelligence, the learning sciences and technical innovations in education. ICS associate director **Donna Caccamise**, ICS Fellows **Bill Penuel** and **Joe Polman**, ICS graduate students **Steve Sommer** and **Leighanna Hinojosa**, and former ICS student **Sam Severance** presented session talks and posters. ICS Faculty **Peter Foltz** was also in attendance.



CENTER FOR STEM LEARNING SYMPOSIUM

David Quigley, ICS Research Associate, presented "Translating Theory to Practice: Technology Solutions to Solve Practical Issues for Teaching Reading Comprehension at the Secondary Level" at the CSL Symposium on 9/26, showing an overview of our eBRAVO work to the CU and broader [Colorado STEM Learning](#) community at CU Boulder.

INTERMOUNTAIN NEUROIMAGING CONSORTIUM

After a busy summer, this fall brought the completion of a few milestone studies:

- The Wager Lab completed data collection for their 2-year study of an open label placebo injection and psychotherapeutic intervention for chronic back pain
- The Adolescent Brain Cognitive Development study, a collaboration between the Institutes of Behavioral Genetics and Cognitive Science, finished its enrollment and baseline data collection by scanning 550 9 and 10 year old Coloradans in just under 2 years. The lab will be following these children for ten years as part of the national cohort of 11,877 children

Continued on page 15...

INC UPDATE Cont.

- The CU CHANGE Lab completed data collection for their 4-year study of the effects of exercise on functional network connectivity in older adults.

Congratulations to the labs and research personnel who worked diligently to accomplish these ambitious goals! We look forward to hearing about the results of these important studies over the next few years.

NEW STUDIES AT INC @ICS

We have a number of new studies starting this summer and fall, including investigations to:

- characterize the neurophysiological mechanisms that make an individual a strong or weak placebo responder
- build computational models of naturalistic emotion perception and examine brain signatures of emotion cue integration in healthy and mood disordered subjects
- assist in the development and testing of novel uncooled magnetoencephalography (MEG)
- examine how reduced hemispheric connectivity and interhemispheric inhibition in people with multiple sclerosis may result in mobility detriments (i.e. walking and balance)
- develop and understand how stress impacts a) mental and emotional demands related to pregnancy and parenting in mothers, and b) newborn brain development
- understand how the amount of sleep children get influences changes in the brain associated with emotional development
- investigate the influence of sex hormones on vascular and cognitive function

INC WELCOMES NEW STAFF



Over the summer Keely Garcia joined the INC MRI research technologist staff to enable the INC to offer additional scan hours for brain imaging studies. Keely works primarily at Children's Hospital Colorado, and her expertise is particularly appropriate given the increase in studies at the INC that are collecting data on infants, children, adolescents, and working adults. We are thrilled to have Keely on board and appreciate her additional work for our center!

INC TOURS AVAILABLE

If you would like to visit our facility or learn more about the INC, please visit our [website](#) or contact the INC's Executive Director, Dr. Marie Banich (Marie.Banich@Colorado.edu),
or

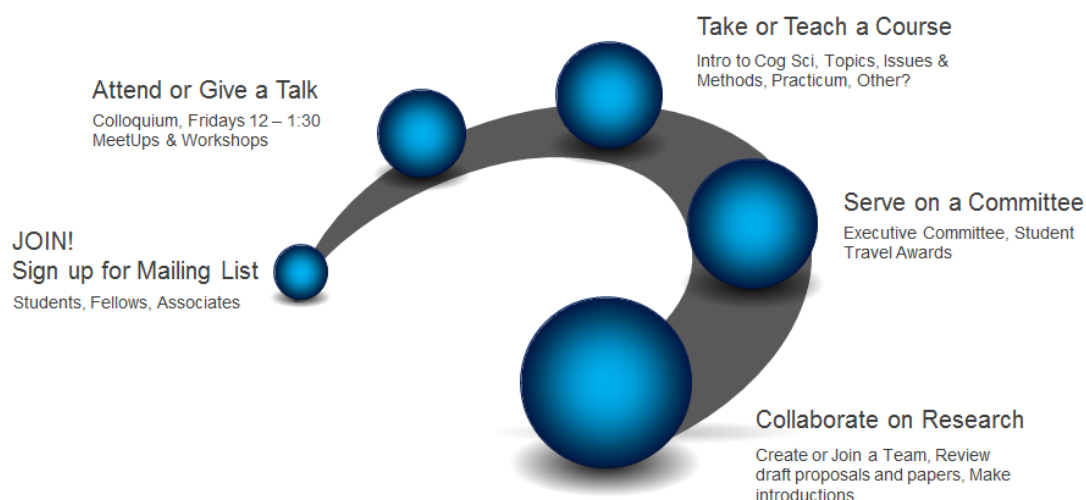
Dr. Nicole Speer, INC Director of Operations
(Nicole.Speer@Colorado.edu).

NEW ICS GRANTS AWARDED

PI Name (CAPS)	Sponsor	Title of Project	# of Yrs	Total Award
D'MELLO	New Venture Fund	Inferring Mindset and Motivation from Natural Language to Predict College Success	1	\$39,779.00
KIM Gilley	NSF	The neural mechanisms of predictive coding during language comprehension	3	\$571,321.00
KIM , Michaelis-Cummings, Colunga, Narasimhan	NSF	Workshop on Variation in the Mechanisms of Human Language Processing (CUNY Conference)	1	\$46,585.00
MOZER	Oculus	Explorations of predictive models of human memory in virtual and augmented environments	1	\$209,322.00
PALMER Martin, Heckman	DoD	RAMFIS: Representations of Vectors and Abstract Meanings for Information Synthesis (stats represent years/totals if all options are fully funded)	4.5	\$2,763,020.00
PALMER Martin	NSF	RI: Medium: Collaborative Research: Developing a Uniform Meaning Representation for Natural Language Processing	3	\$399,894.00
PENUJEL Sumner, Van Horne	Spencer Foundation	Building Capacity for Using Data on Student Experience as Formative Assessment (SEFA) to Promote Equitable Instruction	2	\$399,960.00
PENUJEL Van Horne	William/Flora Hewlett Foundation	Deepening Learning through Relevant, Community-Focused, and Phenomenon-based Science Teaching	3	\$1,000,000.00
SPANN	Mind Life	An Investigation into the Use of Breathing Practices and their Impact on Emotion, Cognition, and Problem Solving Performance under Stress	2	\$15,000.00
SUMNER Tan, Jacobs, Ward, Martin	NSF	BIGDATA: IA: Automating Analysis and Feedback to Improve Mathematics Teachers' Classroom Discourse	3	\$1,998,505.00
VAN VUUREN	SRA Lab	Modifying ORLA + writing program for texting therapy	1	\$12,271.00
WAGER Fieldman, Keller	NIH	Brain and Genetic Predictors of Individual Differences in Pain and Placebo Analgesia	5	\$3,221,049.00
WAGER	NIH - WaviMed	Development of a scalable, portable fMRI-validated device platform for acute musculoskeletal spatial topology in functional neuroimaging pain	6 months	\$57,020.00
WAGER	NIH-Dartmouth	Dynamic Brain Representations Underlying Emotional Experience	5	\$1,651,525.00
WAGER	PainQx	EEG data collection in patients with chronic back pain	1	\$46,169.00

WAGER	NIH-JHU	Individualized spatial topology in functional neuroimaging	5	\$1,353,457.00
WIGGIN Yoshinaga-Itano	CDC-USC	Coordinating Center for Research to Promote the Health of Children with Birth Defects and People with Developmental and Other Disabilities	2	\$196,028.00
YOSHINAGA-ITANO , Wiggin	CDC-USC	Coordinating Center for Research to Promote the Health of Children with Birth Defects and People with Developmental and Other Disabilities	1	\$98,014.00
Non Grant Funds				
BIDWELL	CU	Gift Award Arts and Sciences Fund for Excellence	n/a	\$1,000.00

WAYS TO GET INVOLVED WITH ICS



HAVE QUESTIONS? NEED HELP?

Website: www.colorado.edu/ics

Jean Bowen, MUEN Office, Mon - Fri 9 to 5,

Jean.Bowen@colorado.edu

Donna Caccamise, Associate Director

Donna.Caccamise@colorado.edu

Open office hours: MUEN D422: Mon: 9-12, Wed: 1-3, Friday 10-12
CINC 227: TTH

Tammy Sumner, Director

Sumner@colorado.edu

Open office hours: MUEN D420: Fridays 2 to 4pm
CINC 182j: Thursdays 1 to 3pm