HPI – Stanford
Design Thinking Research Program

Hasso Plattner Institut

STANFORD ENGINEERING

MONDAY, SEPTEMBER 10, 2018

Symposium:
Neuroscience and Physiological Perspectives on Design Thinking and Creativity

Where: Hasso Plattner Institute Potsdam, August-Bebel-Straße 88, 14482 Potsdam, Campus II, Haus E, ground floor

When: Monday, Sept. 10 2018, 1-5 pm

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Session Abstract

Creativity is an outstanding human ability. It enables innovative developments in areas such as science, technology and the arts. But not all people are equally creative. Design thinking is an approach taught at various universities worldwide to promote creativity and the development of user-centered innovation. This symposium illuminates the biological basis of creativity, and design thinking in particular. What physiological processes predict great creative achievements? By contrast, when does our biology incline us to rather think in terms of conventional solutions? On September 10, researchers from the Hasso Plattner Design Thinking Research Program (HPDTRP) from Stanford and Potsdam as well as scientists from Bologna, Chicago and Berlin discuss the biological foundations of creativity and innovation. The event will be led by the renowned neuroscientist and creativity researcher Prof. Allan Reiss of Stanford University.

Program

1:00 pm	Allan Reiss (SU): Opening
1:10-1:35 pm	Julia von Thienen (HPI)
1:35-2:00 pm	Naama Mayseless-Yahav (SU)
2:00-2:25 pm	Serena Mastria (Bologna)
2:40-3:05 pm	Caroline Szymanski (MPI Berlin)
3:05-3:30 pm	Manish Saggar (SU)
3:30-3:55 pm	Stefanie Faye Frank (Chicago)
4:15-5:00pm	Overall Discussion, mod. Allan Reiss
5:30pm	HPDTRP Welcome BBQ

Allan L. Reiss, M.D. is the Robbins Professor of Psychiatry, Radiology and Pediatrics, and Director of the Center for Interdisciplinary Brain Sciences Research (CIBSR) at Stanford University. Dr. Reiss uses neuroimaging, genetic analyses, neurocognitive assessment and measurement of salient environmental factors to construct comprehensive models of human brain function in individuals with both typical and atypical learning and behavior. This work includes research focused on the neural bases of humor, positive emotion and resilience, human territorial behavior, cognitive enhancement and creativity. While providing new insights about brain function in individuals with typical learning and behavior, the results of this research are also intended to provide new ideas for more effectively preventing or treating individuals with learning and behavioral problems. Dr. Reiss is the recipient of numerous honors and awards including election to the Institute of Medicine of the National Academy of Sciences.

Design Thinking, the Body and Neuroscience: Exploring Some Bridges
Julia von Thienen

Design thinking has a long tradition of appreciating bodily dimensions of creativity and innovation. Over decades, great attention has been paid to aspects of morphology (e.g., what roles hands and sense-organs play in the creative process), bodily motion, arousal and affect. Even predictions about changes in brain activity after creativity trainings have been voiced decades ago. This presentation explores links between different strands of design thinking studies, those applying neuroscientific research methods and others. Moreover, two challenges are formulated to fuel the interpretation of neuroscientific observations. A framework of analysis is proposed that distinguishes between (1) individual creativity, (2) culture building and (3) ratcheting/increasing solution effectiveness over time, to help clarify the physiological underpinnings of creative capacities in individuals and populations. It shall ease the understanding of how different creativity studies connect to each other, including comparative research on humans and non-human animals. The framework spans research topics such as creative achievements of individuals and teams, audience reactions to (non-)novel stimuli and social learning, i.e. how individuals build on each other's ideas.

Julia von Thienen, PhD, studied psychology at the Free University of Berlin. She received her doctorate in the field of research methodology, where she explored opportunities for psychology and neuroscience to build up joint knowledge about causal relationships despite of conflicting validity standards. Julia taught philosophy of science and research methodology for social science students at the Free University of Berlin and the University of Potsdam, as well as for students of cognitive neuroscience at the University of Chicago together with Dr. Pascal Wallisch. Since 2008, Julia has worked in the Design Thinking Research Program at the Hasso Plattner Institute Potsdam. Her empirical works concern the effects of environments on emotions and behaviours, how design thinking education impacts students and doctor-patient-relationships in medical treatments. She also works on design thinking theory, including historical and philosophical perspectives, and cares to facilitate the knowledge exchange between design thinking and adjacent fields of expertise.

The Impact and Value Creation of Team Collaboration
Naama Mayseless, Grace Hawthorne, Allan L. Reiss

Team collaboration is an essential component of the design thinking methodology for innovation. Understanding the neuroscience behind team collaboration can help us identify the processes that occur during collaborative team work and move us forward in building a comprehensive model of team collaboration. We will present our work which aims to examine team collaboration from a neuroscientific perspective with a focus on design thinking. Specifically, we will focus on presenting an inter-brain synchrony model of team collaboration using functional near infrared Spectroscopy (fNIRS). fNIRS is a non-invasive optical imaging method that measures concentration changes in hemoglobin. fNIRS has the advantage of being portable, low cost and less reactive to movements than other imaging methods. Furthermore, fNIRS allows us to measure brain activity in more ecologically valid environments. We employed a naturalistic experimental design to ascertain the impact and value creation of team collaboration. Two person teams were asked to design a product while their brain activity was simultaneously measured using ultra portable fNIRS. Design sessions were video and audio recorded and later analyzed for collaboration and leadership. We will present data examining how measures of team collaboration map with brain to brain synchrony between team members and discuss the implications of our results and future directions.

Naama Mayseless, PhD, is a postdoctoral fellow working with Dr. Allan Reiss in the Center for Interdisciplinary Brain Sciences Research (CiBSR) at Stanford University School of Medicine. Dr. Mayseless obtained her Bachelor degree in Physics (2004) from the Hebrew University in Jerusalem and a Research Master in Neuroscience (2007) from Haifa University (Israel). She obtained a PhD in Social Psychology from Haifa University (Israel) in 2015 for her work on the neuroscience of creative ability. Currently, Dr. Mayseless is conducting research on a brain-based model of team interactivity which incorporates brain-to-brain synchrony related to team collaboration. A goal of this work is to create an inter-brain synchrony model of team collaboration that can inform successful team collaborations. In addition, Dr. Mayseless is conducting research on the neuro-developmental trajectories of creativity and its relation to humor and mathematical ability in young children.

Predicting Creative Potential through Brain Activity
Serena Mastria, Sergio Agnoli, Marco Zanon, Alessio Avenanti, Giovanni Emanuele Corazza

During the symposium, we will draw attention to the concept of creative potential. We will specifically discuss the results of a recent study which aimed at exploring whether: (1) brain activity is modulated by the time-course of the idea generation process; (2) changes in brain activity can predict ideational originality as an indicator of creative potential; (3) individuals characterized by different creative potential levels differ in brain activity during the

ideational process. We asked participants in this study to perform a modified version of the Alternative Uses Task (a classical test to measure divergent thinking), in which they had to sequentially produce four alternative uses for common objects. Originality of the creative production was used as a measure of participant's creative potential. Results showed that brain activity changed as a function of the time-course of idea generation: the first idea is associated with a desynchronization in the EEG alpha band, while the following ideas are associated with synchronization in the same alpha band. Moreover, creative potential can be predicted through alpha activity as a function of the time-course of the ideational process and of the involved cortical areas. Interestingly, the time-course of the ideational process is not universally-defined, but depends on individual differences in creative potential: the brain activity associated to the ideational activity seems indeed to be modulated by the individual's creative potential.

Serena Mastria, PhD, is currently research fellow at the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi" (DEI) and the Marconi Institute for Creativity (MIC). During her doctoral training in psychophysiology at the Emotional Perception Laboratory at the University of Bologna, she focused on the functional significance of physiological indexes underlying emotion and perception. She conducted several studies on visual perception of natural scenes, with particular regard to the brain's response associated to picture novelty and picture emotionality, which have been published in well-known peer-reviewed Journals in the field. Currently, her research interest lies in the cognitive neuroscience of creativity, with a specific focus on brain mechanisms associated to the generation of novel ideas.

Neural Perspectives on Teamwork
Caroline Szymanski

Design thinking has long recognized the power of teamwork, which sometimes gives rise to creative achievements no individual could realize alone. While creative teamwork can be impressively successful, in other cases it is cumbersome or fails altogether. What is the bodily basis of more versus less successful teamwork? This presentation discusses respective studies that we conducted at the Max Planck Institute for Human Development and collaborating facilities. In one study, participants performed a visual search task alone or together with another person. Dyads that benefitted from teamwork, in terms of increased task performance, showed significantly more synchronized EEG-patterns compared to dyads where the team members did not benefit from partnering up. In another study, an experimental intervention was used to manipulate the oscillatory activity across brains. Participants were asked to drum in synchrony with a partner at a set pace, or to drum individually in accordance with a metronome. Teamwork performance decreased when the participants obtained Hyper-Transcranial Alternating Current Stimulation (hyper-tACS) over right frontal and parietal sides, but the individual performance in the metronome condition remained unchanged. All in all, studies point to the importance of phase-synchronized brain activity for people to excel in teamwork. Yet, what interventions might help to increase this phase-synchronization and thus might boost creative team performance remains an issue for further research.

Caroline Szymanski, PhD, is a Postdoctoral Research Fellow at the Max Planck Institute of Human Development. She studied neuroscience in Cologne, Paris, Berlin and Milan, investigating phenomena such as the neural correlates of deception and consciousness. In recent years, her studies at the Berlin School of Mind and Brain as well as the Max Planck Institute of Human Development focused on the neural underpinnings of team dynamics. In parallel, Caroline has a long background in design thinking, including studies at the HPI D-School in 2010, where she subsequently worked for many years as a design thinking coach or project manager. Being a co-founder of Kandoee, Caroline is also dedicated to spreading Design Thinking in the corporate world as a coach and consultant.

Examining the Role of Design Reflection and Associated Brain Dynamics in Creativity
Manish Saggar

Design reflection has been shown of critical import for the development of design expertise. Yet, we know little about how design reflection affects creative performance in individuals and teams. Previous researchers limited the study of reflection to the domain of language used and its reference to the design problem or solution space. Further, previous work on design reflection did not take into account the arch-nemesis of reflection – rumination, which is shown to negatively affect creativity and problem solving. In this talk, I will share some exciting preliminary results from a cross-disciplinary investigation, across neuroscience, interaction dynamics, and speech analysis, where we attempted to find the neural correlates of reflection/rumination and link them to individual differences in creativity and design thinking.

Manish Saggar, PhD, is a computational neuroscientist and currently focusing on understanding brain dynamics at rest as well as during learning. The overarching goal of Dr. Saggar's research is to develop reliable computational methods that will allow for characterizing and modeling temporal dynamics of brain activity, without averaging data in either space or time. He strongly believes that using brain dynamics as a "lens" might hold the key to finding disorder-centric biomarkers for mental illness as well as to finding novel interventions for optimal brain performance (e.g., enhanced creativity). Funded by a career development award and a young investigator award (NARSAD), Dr. Saggar is currently working as an Assistant Professor in the department of Psychiatry & Behavioral Sciences. He also teaches at the Hasso Plattner Institute of Design in Stanford University.

How do Fear and Shame Affect Physiological States that Relate to Creativity, Ideational Fluency and Flexible Problem-Solving?

Stefanie Faye Frank

To help us explore how we can enhance creativity, it can be useful to look at when creativity is at its lowest, when human behavior is rigid, inflexible and maladaptive. Moreover, while brain imaging, NIRS and EEG data are giving us clues as to what networks, brainwaves and brain activity relate to creative thinking, ideational fluency and improvisation, research focused on sensorimotor components of self-regulation, movement, and autonomic nervous system functioning could prove useful in complementing this data. Researchers involved in trauma therapy and post-traumatic growth, and in particular those interested in 'embodied cognition' may give us a glimpse into how some environmental factors, and physiological states block creative movement and thinking. Fear and shame are reflected in differences in heart rate, blood flow and expressiveness of facial gestures, movement and voice. How does shame appear in the body and how does it block creative, flexible and adaptive behaviors? On the other hand, how do play and psychological safety affect blood flow, sensorimotor feedback and biological movements of the body in ways that increase access to flexible, creative behaviors?

Stefanie Faye Frank's graduate degree from New York University and fieldwork at the Phelps Lab for Neuroscience Research, NYU's Institute for Prevention Science and Yeshiva University Albert Einstein College of Medicine focused on the cross-section of neuroscience, resilience and empathy. During her studies, she was mentored by a professor studying meditation and its effects on the brain, and later trained with meditation masters from Vietnam, India and Africa. In her previous career, she was an intelligence analyst for the department of defense, studying social network analysis, and before that was a French teacher for diplomats and high-level government officials being posted abroad. She combines insights from all of this previous work to offer training and consulting on how to optimize mind-brain-body systems for learning and creativity. Her clients include: Google, Northwestern, UCSD Center for Mindfulness, Alberta Children's Hosptial, Illinois State University, as well as financial institutions, nonprofits and universities across the US, Canada and Europe. Her podcast, "Relational Minds", focuses on how to optimize human relationships to enhance creativity and innovation.