Keynote Talks

- **Andrea Scarantino** , Georgia State University, United Sates of America
  - Title: Disentangling Three Concepts of Information in Cognitive Science
- **Claus Emmeche** , Niels Bohr Institute and University of Copenhagen, Denmark
  - Title: Thinking with friends: Reflexivity and Situated Cognition in Friendship
- **Dora Selma Fix Ventura** , Institute of Psychology, University of São Paulo, Brazil
  - Title: The non- image-forming visual system: its relation to sleep, circadian rhythm, pupillary reflex and other functions
- **Frederick Adams** , University of Delaware, United States of America
  - Title: A Slim Defense of Narrow Content
- **Gualtiero Piccinini** , Center for Neurodynamics, University of Missouri - St.Louis, United States of America
  - Title: Explaining Cognition: The Cognitive Neuroscience Revolution
- **João Fernandes Teixeira** , Federal University of São Carlos, Brazil
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- **João José Neto** , Polytechnic School of Engineering, University of São Paulo, Brazil
  - Title: Simulation and Adaptivity
- **José Roberto Castilho Piqueira** , Polytechnic School, University of São Paulo, Brazil
  - Title: Computational Complexity and Information Measure: the Turing and Shannon ways
- **Koichi Sameshima** , School of Medicine, University of São Paulo, Brazil
  - Title: Can Brain Connectivity Analysis Help Understand Brain Functions ?
- **Lauro Frederico Barbosa Silveira** , State University of São Paulo - Marília, Brazil
  - Title: The Conception of Emotion According to Peirce
- **Luiz Antonio Baccalá** , Polytechnic School of Engieeringl, University of São Paulo, Brazil
  - Title: A Neural Link-centred Approach to Brain Connectivity
- **Maria Eunice Quilici Gonzalez** , State University of São Paulo - Marília, Brazil
  - Title: Autonomous Action in Complex Mechanical Systems: an Actual Dilemma ?
- **Sofia Inês Albornoz Stein** , University of Vale do Rio dos Sinos, Brazil
  - Title: Neutral Monism from a Pragmatic Perspective

Abstracts

Andrea Scarantino , Georgia State University, United Sates of America

- **Disentangling Three Concepts of Information in Cognitive Science**

Ever since Dretske (1981) published his seminal Knowledge and the Flow of Information, philosophers have tried to develop an adequate theory of information. The Holy Grail of this research program is to make sense of information as a naturalistic commodity, and then use it to provide a reductive account of knowledge and other sophisticated mental capacities. This project requires

disentangling a variety of concepts of information that are commonly conflated in cognitive science. In this talk, I will distinguish between what I call natural information, code-based referential information and evidence-based referential information, and provide tentative theories of each grounded in probability theory.

Claus Emmeche , Niels Bohr Institute and University of Copenhagen, Denmark

- **Thinking with friends: Reflexivity and Situated Cognition in Friendship**

Can research in situated and embodied cognition inform the study of interpersonal relations like friendship? And conversely, can friendship studies from disciplinary and interdisciplinary perspectives inspire the research in cognitive science? These will be the guiding questions for this talk. The individual and social formation of a human self as a cognitive and emotional agent, from its emergence in early childhood through adolescence to adult life, has been described within philosophy, psychology and sociology as a product of developmental and social processes mediating a linguistic and social world. Focusing upon levels of information and sign action specific to humans, the formation of the personal self and the role of friendship and similar interpersonal relations in this process is explored through classic ideas of the friend as 'another self', and contemporary research on the interplay between individual subjectivity, social structure and interpersonal relations in a dynamics of human agency. Although processes of reflexivity and friendship follow general patterns in the formation of an emerging cognitive agent, such processes are socially heterogeneous and contingent upon different modes of reflexivity.

Dora Selma Fix Ventura , Institute of Psychology, University of São Paulo, Brazil

- **The non- image-forming visual system: its relation to sleep, circadian rhythm, pupillary reflex and other functions**

The discovery of melanopsin in the retina provided answers to questions that had no response after decades of search. What controls the circadian rhythm of sleep and awakeness ? Why people have Winter depression? The replies to these questions were surprising. A new type of cell, that is directly activated by light, as the cones and rods are, was found in the retina. This cell type forms a subset of retinal ganglion cells – the intrinsically photosensitive retinal ganglion cells (ipRGCs). They are also known as melanopsin retinal ganglion cells (mRGCs), after the pigment that found in their soma and projections, which enables them to respond to light and is maximally activated by blue light, dominant in daylight. Research on the functions of these cells show that they give rise to a separate visual pathway, a non-image forming visual pathway. Thus in addition to the well known image forming visual pathways, initiated by the activation of rods and cones, we have a second type of pathway initiated by the ipRGCs whose neural circuits are related to non-image forming functions – pupillary light reflex, circadian rhythm, mood, and cognitive capacity. A brief review of these important discoveries and of our research on the topic will be presented.

Frederick Adams , University of Delaware, United States of America

- **A Slim Defense of Narrow Content**

This talk considers Gabriel Segal's recent attacks on content externalism. Segal argues that the existence of empty kind terms refutes content externalism. He argues that an obvious rescue of saying that empty kind terms have no content might save the theory but for the fact that thoughts involving those empty kind terms are involved in perfectly meaningful behavior. Then Segal gives several examples of such terms and such meaningful behavior that they explain. Hence, he claims empty kind terms cannot be meaningless, and thus externalism is false. I show why Segal's examples and arguments still fail to establish that content externalism is false.

Gualtiero Piccinini , Center for Neurodynamics, University of Missouri - St.Louis, United States of America

- **Explaining Cognition: The Cognitive Neuroscience Revolution**

I outline a framework of multilevel neurocognitive mechanisms that incorporates representation and computation. I argue that paradigmatic explanations in cognitive neuroscience fit this framework and thus that cognitive neuroscience constitutes a revolutionary break from traditional cognitive science. Whereas traditional cognitive scientific explanations were supposed to be distinct and autonomous from mechanistic explanations, neurocognitive explanations aim to be mechanistic through and through. Neurocognitive explanations aim to integrate computational and representational functions and structures across multiple levels of organization in order to explain cognition. To a large extent, practicing cognitive neuroscientists have already accepted this shift, but philosophical theory has not fully acknowledged and appreciated its significance. As a result, the explanatory framework underlying cognitive neuroscience has remained largely implicit. I explicate this framework and demonstrate its contrast with previous approaches.

João Fernandes Teixeira , Federal University of São Carlos, Brazil

- **A Few Remarks on Machine Ethics and Transhumanism**

The talk will focus on the ethical consequences of the enhancing of human Body through the use of exoesketons, prosthetic attachments and the ingestion of drugs for the potentialization of cognition. The main focus will be on the transhumanistic proposal as advocated by Bostrom et alia as well as on a reconsideration of meritocracy in this new scenario.

João José Neto , Polytechnic School of Engineering, University of São Paulo, Brazil

- **Simulation and Adaptivity**

Simulation is among the most popular computing techniques, feaqturing a multitude of applications in almost all areas of knowledge. Simulators and their variations turn computers into versatile tools that help their users to mimic behaviors in selectable degrees of fidelity that range from crude approximations to detailed and faithful reproductions, even in real time. In our current state of technology, an ambicious challenging goal remains steady in focus, despite its complexity and low feasibility: replicating the behavior of natural, biological and especially neuronal and cognitive processes. Rule-driven devices are those whose behavior can be fully encoded in a finite set of *if..then* rules, and for their simplicity, the behavior they describe can be easily interpreted by a computer program such as a simulator. Adaptivity is the feature that enables devices to self-modify the set of rules defining their behavior, without external intervention, just in response to its history. One may turn any rule-driven computing device into a corresponding adaptive one by allownig them to perform self-modifications, and their ease of simulation is then further improved by allowing them to change their own behavior by modifying their set of *if..then* rules. In order to do so, adaptivity is easily achieved with the help of a couple of functions: one for inserting new rules and another for erasing existing ones. Even under the limitations of current technology, the association of adaptivity to simulation (and to other standard techniques) has shown to be helpful to the search of solutions in the field of complex problems. Standard divide-and-conquer strategies usually help us to separately investigate, understand and explore the multitude of aspects considered of interest, by adequately modeling learning and cognition processes, and by upgrading them with extra features from adaptive methods. Therefore, adaptivity is not proposed here as a “magic” for solving all problems in this area, but it has already proved to be highly promising as an effective tool (when used in conjunction with standard techniques and methods) to make successful incursions into unexplored and hard-to-access fields of knowledge, as it happens in cognitive sciences.

José Roberto Castilho Piqueira , Polytechnic School, University of São Paulo, Brazil

- **Computational Complexity and Information Measure: the Turing and Shannon ways**

This talk presents, in a qualitative way, the concepts of algorithmic computational complexity (Turing) and informational computational complexity (Shannon), emphasizing how independent thinking, with different nature, produced similar mathematical concepts with great utility for modern computation.

Koichi Sameshima , School of Medicine, University of São Paulo, Brazil

- **Can Brain Connectivity Analysis Help Understand Brain Functions ?**

Neurons are the basic elements of the nervous system that connect to each other using structures called synapses, thru which send and receive chemical or electrical signals. To understand the human brain, with its more than 80 billion neurons, neuroscientists have been studying its structures and functional dynamics at multiple scales of organization from molecules, genes, cells, neuronal circuits, to neural networks in an attempt to unravel its complex interactions. It has long been known that the brain is functionally segregated and hierarchically organized. One of important experimental paradigms in neuroscience to uncover brain functions has been the study of how neurons or neural structures interact to process information and generate behavior. Since we introduced it in 2001, we have been studying a connectivity measure called *partial directed coherence* (PDC), that is closely related to the *Granger causality*, which we believe is a robust and clinically promising method to analyze brain connectivity and stage brain dynamics in the frequency domain. We will show that by combining well designed behavioral protocols with multisite/multichannel brain activity recording (e.g., EEG and BOLD signals) one can study novel aspects of neural information processing and brain functions thru PDC connectivity analysis. An interesting line of exploration is to understand neurological diseases and disorders that emerge with abnormal brain connectivity, such as epilepsy.

Lauro Frederico Barbosa Silveira , State University of São Paulo - Marília, Brazil

- **The Conception of Emotion According to Peirce**

Peirce, along the years worked on the exerted role of emotions and sentiments for the foundation of thought and the scientific inquiry. Relevant researchers contributed with their reading attending to the elucidating dialogue on this relevant question. The reading of Peirce's texts and of those produced by these commentators intends to collaborate to the evaluation of the sense and the relevance of theme in consideration.

Luiz Antonio Baccalá , Polytechnic School, University of São Paulo, Brazil

- **A Neural Link-centred Approach to Brain Connectivity**

The last couple of decades has seen a methodological shift in the characterization of brain dynamics where the early prevalent search for areas of increased neural activity under stimulus, often termed neofrenology, is slowly being replaced by investigations that focus on how those areas interact. The general term connectivity has been used far and wide to describe this trend. Early on, however, the need was felt for qualifying what one means by connectivity with more precision. Adjectives like 'effective' and 'functional' connectivity are in common use today even though their application is often inconsistent throughout the literature. This fuzzy scenario has been recently compounded by

the advent of *Granger causality* based connectivity estimators that expose the directionality of information flow in addition to the presence of mere correlation, leading to the need for establishing a more general and consistent classification of how one should interpret connectivity issues, we which address by touring the historical evolution of these ideas.

Maria Eunice Quilici Gonzalez , State University of São Paulo - Marília, Brazil

- **Autonomous Action in Complex Mechanical Systems: an Actual Dilemma ?**

In this talk, we analyse the relationship between situated and embedded information and autonomous action in complex mechanical systems such as self-organizing robots. This type of system involves nonlinear interactions, which due to the degree of interdependence established among its elements, lead to the emergence of order parameters that control the elements that gave rise to them. Complex mechanical systems involving self-organization processes and circular causality, amongst others, characterize contemporary neo-mechanicism. In this context, the problem that will guide this analysis can be characterized as follows: Is there compatibility between the concepts of autonomous action and self-organizing mechanical actions? We shall argue that the paradigm of complexity, which unites inter-and transdisciplinary research perspectives in the areas of Physics, Biology, Robotics, Complex Systems Science, and Cognitive Science, offers a useful conceptual resource for analysis of the problem in question.

Sofia Inês Albornoz Stein , University of Vale do Rio dos Sinos, Brazil

- **Neutral Monism from a Pragmatic Perspective**

We are facing now a widespread dilemma in the scientific community: either we accept the common descriptions made by humans of their own subjective experiences (their "talk about impressions") and correlate to what we can observe scientifically from the physical changes they have, taking them as parallel events, or we try to investigate, from a behaviorist point of view, what is happening physically and in terms of behavior given they are at the right position of perception, discarding the first-person mental description, by linking initial physical behavior to resulting physical behavior. Anyway, the link between subjective experiences and starting or ending physical behavior is yet to be discovered. This link, thought Russell (1921) by maintaining the neutral monism, to be found in particular neutral elements that synthesize sensations (mental) and sensory data (physical). Today, the neurosciences do not prove the existence of sensory data, but retain the empirical goal of finding a causal network that goes from the physical objects to the "mental" perception of them. This network must include various forms of "representations" of object properties. The observation of neuronal activation in the process of perception of physical objects led to the conclusion that perception goes through several stages and that, in a broad sense, the objects are actually built gradually in our brain, through the inter-relationships that are established between different parts of it, each performing a different function. I discuss, using recent literature, the possibility of interpreting Russell neutral monism - and criticize, to be able to use it parcially - from a semantic and

pragmatic perspective that relativizes discourse about mental events, making it plausible to think mental events as something knowable and describable from different perspectives, without thereby falling into idealism.