

# Abstracts

## In-Depth Workshops

In-depth workshops offer detailed information about a topical theme that is coherently presented by several speakers from different angles. TSC 2019 features 14 such workshops on Tuesday, June 25. They are distributed into 7 morning sessions and 7 afternoon sessions in parallel. Attendance at in-depth workshops is included in the conference registration fee.

## Critical Neuroscience

Renowned neuroscientists have begun to critically reflect upon the metaphysical underpinnings of their discipline (e.g. [1-3]). Contemporary neuroscience assumes, to a large extent, mid-19th-century rationalist metaphysics regarding questions about the cortical localization of cognitive functions, the reduction of behavior to physiology, the epistemological challenges of big-data technology, or the ecological validity and reproducibility of neurophysiological experiments. Therefore, critical reflection of their own tacit methodological assumptions by active researchers is a remarkable turn that can be compared with Kant's [4] critical philosophy that eventually overcame dogmatic metaphysics. According to Kant [4, BXXII], critical philosophy "is a treatise on the method, not a system of the science itself". In this sense, our in-depth-workshop on Critical Neuroscience [5] will bring together active neuroscientists and an interested audience in order to reflect and to discuss the methodological and "transcendental" [4, B27] prerequisites of current theoretical and experimental neuroscience.

[1] Frisch, S. (2014). How cognitive neuroscience could be more biological - and what it might learn from clinical neuropsychology. *Frontiers in Human Neuroscience*, 8.

[2] B. Kotchoubey, F. Tretter, H. A. Braun, T. Buchheim, A. Draguhn, T. Fuchs, F. Hasler, H. Hastedt, T. Hinterberger, G. Northoff, I. Rentschler, S. Schleim, S. Sellmaier, L. Tebartz Van Elst, & W. Tschacher (2016). Methodological problems on the way to integrative human neuroscience. *Frontiers in Integrative Neuroscience*, 10, 41.

[3] J. W. Krakauer, A. A. Ghazanfar, A. Gomez-Marín, M. A. MacIver, & D. Poeppel (2017). Neuroscience needs behavior: correcting a reductionist bias. *Neuron* 93(3), 480-490.

[4] I. Kant (1999). *Critique of Pure Reason*. Translated and edited by Paul Guyer and Allen W. Wood. Cambridge: Cambridge University Press.

[5] S. Choudhury & J. Slaby, eds. (2012). *Critical Neuroscience: A Handbook of the Social and Cultural Contexts of Neuroscience*. Hoboken: Blackwell.

## Harnessing Stochasticity – for Flexible Brains

Hans A. Braun

Institute of Physiology, University of Marburg

If one accepts that decisions are made by the brain and that neuronal mechanisms are obeying deterministic physical laws it is hard to deny what brain researchers like Gerhard Roth or Wolf Singer conclude, e.g. "We do not want what we want but we want what we do" or "We should stop talking about freedom. Our actions are determined by physical laws". On the other hand it is known that biological systems, due to their particular organization, can harness stochasticity thereby offering innumerable choices for the brain – only to overlook with the knowledge of Laplace's demon. However, this would be metaphysics, not only in the opinion of philosophers like Bertrand Russell. Here, experimental recordings, supplemented by computer simulations, will be used to demonstrate that biological systems, specifically brain functions, are built up on randomness which is already introduced at the lowest level of neuronal information processing, the opening and closing of ion channels. These transitions, indeed, are following physiological laws but apparently also need to make use of randomness – principally unavoidable under all life compatible conditions. This randomness will not necessarily smear out

towards higher functional levels but can even be amplified by cooperative effects with the system's nonlinearities. Examples shall be given to illustrate how stochasticity can propagate from ion channels to single neuron action potentials to neuronal network dynamics to the interactions between different brain nuclei up to the control of autonomic functions and consciousness. This is not an additional attempt among many others to demonstrate that the complexity of the brain makes it difficult to avoid randomness. This study is specifically emphasizing on the particular organization of biological systems to taking advantage of stochasticity – from whatever sources.

## Contextual Emergence in Neuroscience

Peter beim Graben [chair]

Communication Engineering, Brandenburg University of Technology

Cottbus-Senftenberg

I survey three applications of contextual emergence in neurodynamical systems. The concept of contextual emergence has been proposed as a non-reductive relation between different levels of description of physical and other systems where a "lower level" description comprises necessary but not sufficient conditions for a "higher level" description. These are supplied by contingent contexts implementing particular stability conditions. Regarding neural systems as high-dimensional dynamical systems that can be coarse-grained by contextually chosen observables, the coarse-grained dynamics can be described by Markov chains. Stability conditions require the existence of invariant, ergodic (and mixing) probability measures over the system's phase space. First, I argue that the canonical Hodgkin-Huxley action potential dynamics can be regarded as being contextually emergent upon a higher level Markov chain description of ion channels that is not comprised by its lower level description as molecular dynamics. Secondly, I rephrase Amari's macrostate criterion for random neural networks as structural stability for coarse-graining contextual observables. If those observables induce a finite partition of the phase space, Amari's criterion can be related to the existence of a Markov partition implementing structural stability. Thirdly, I relate Chalmers' definition of "Neural Correlates of Consciousness" (NCCs) with contextual emergence, when a neural system is necessary for the emergence of a conscious state. The sufficient conditions are then provided by contextually given "phenomenal families" of mental observables that induce a partitioning of the neural phase space. This partition is stable when sequences of mental states form an ergodic Markov chain.

Reference: P. beim Graben (2016). Contextual emergence in neuroscience. In A. El Hady (Ed.) *Closed Loop Neuroscience*, Amsterdam: Elsevier, 171 – 184.

## Deep Thought and Questionless Neuroscience

Alex Gomez-Marín

Behavior of Organisms Laboratory, Institute of Neuroscience Alicante

The answer to the ultimate question of life, the universe and everything is 42 — at least according to Deep Thought, the supercomputer featuring in the Hitchhiker's Guide to the Galaxy. To the desolation of the descendants of the programmers who posed that question seven and a half million years ago, the machine replies: "You have to know what the question actually is in order to know what the answer means". To answer (not the question but) what the question was, Deep Thought then promises to design yet a more powerful computer. It shall provide the ultimate question to the existing ultimate answer. Comedy science-fiction and current neuroscience can often be indistinguishable. If the brain is the answer, what was the question? The promise of technology to disclose the mysteries of the mind is the mantra of so many scientists, administrators, journalists and politicians today. They say we can because we will. It is difficult to be against more tools or more data in principle. Mistake us not for neuro-luddites. Yet, the worship for "big data" and "new technology" reflects a void, which is a drain. Neuroscience is theory poor (and lately even proudly so). What counts as results is nearly exclusively empirical; the rest is deemed either as a review or speculation. When "all you need is data" (and to "let it speak"), we can't produce but questionless answers (and hear voices). Moreover, data collection for data's sake is arguably something different than experimentation. When it comes to intervention, the null hypothesis is actually dull: "let's change X to see what happens to Y". And when correlation is not mistaken for causation, counterfactuals are erected explanation, if not understanding. Causality is neuroscience's holy-grail; to "manipulate and measure" the methodology deployed to obtain its surrogate: "necessity and sufficiency". Who needs theory or hypothesis-driven science when we have the latest device for high-throughput data collection and the latest software for unsupervised analysis? But that is not all. It is worse. The conceptual scaffold with which we formulate our research programmes, paper abstracts and lecture titles is "the role of X in Y". X is your favourite molecule or neuron, Y is a psychological construct. The molecular vision of life of the previous century ("I am my genome") has reincarnated in the neural vision of mind ("I am my connectome"). Biology has become gene mapping and circuit cracking. The mereological fallacy is rewarded: localize of function and publish. Reduction (rather than unification, so powerful in physics) is sought. Namely, the autocracy of the neural level explains away behavior and cognition as epiphenomena. Life and mind can only be complicated mechanisms, and the individual is smeared out by statistics (we know what mice do, not what the mouse did; nor do we care). Materialism still reigns — but in the paradoxical flavour of informationalism, where matter actually does not matter. What is mind? No matter. What is matter? Never mind. Finally, a philosophy that disdains philosophy guides the field. Attempts to be conceptually deep meet the conversation stopper: "it is just semantics". And we mask all that with filler verbs and clickbait adjectives (ie, "the critical role of"). Students do not read books anymore, but only the latest Nature paper in their narrow field of interest. Thinking is time not spent producing data (which equals money). Overall, we have a "halting problem". Critique is taken as criticism — negative, unproductive, and progress inhibiting (we are encouraged to always move forward even if we do not go

anywhere). That's all bad news indeed, but fake news are worse. Personally, the challenge is to get better, not bitter. Collectively, I am not sure what can be done. It is time we engage in critical neuroscience. It has to be an inside job.

## What Provides the Link Between Brain and Consciousness? Temporo-Spatial Theory of Consciousness

Georg Northoff

Mind, Brain Imaging and Neuroethics Research Unit, University of Ottawa

Consciousness and its neural substrates remain mystery. Several neural theories of consciousness like integrated information theory and global neuronal workspace theory have been suggested. However, why and how a neuronal state can transform into a phenomenal and thus conscious state remains still unclear. This raises the question for the glue or "common currency" of neuronal and phenomenal states as that necessary for the former to transform to the latter. Based on several lines of evidence including neuroscience, neurology, and psychiatry, I here suggest a temporo-spatial approach to consciousness that conceives phenomenal features as constructions of virtual time and space, e.g., the brain's inner time and space. This amounts to a temporo-spatial approach to consciousness and its phenomenal features as recently formulated in the temporo-spatial theory of consciousness.

Tuesday, June 25, 2019, 09:00–12:30

Harder 2

## What Can Multistable Perception Tell Us About Consciousness?

The information that enters our senses is incomplete, noisy and to varying degrees ambiguous. Our perceptual system needs to disambiguate and interpret this restricted information in order to construct plausible conscious percepts. Ambiguous figures, like the well-known Necker cube, are paradigmatic in this context. During prolonged observation of such an ambiguous figure our perception becomes unstable and alternates spontaneously between two or more about equally probable interpretations. In this workshop five experts coming from different disciplines (physics, engineering, biology, medicine, physics, cognitive science) and working with different methodological approaches (psychophysics, modeling, EEG and fMRI) will provide different viewpoints (first person perspective, predictive coding approaches, quantum inspired models) on the phenomenon of multistable perception. We will focus on how our perceptual system constructs a stable and reliable conscious endogenous world out of a priori low-quality exogenous sensory information.

### **A Quantum Model for Bistable Perception**

Thomas Filk

Institute of Physics, University of Freiburg

The Necker-Zeno model for the perception of ambiguous stimuli is based on a quantum formalism for so-called 2-state systems. The model predicts a sharp relation between three time-scales: the average dwell time (i.e. the inverse reversal rate), a time-scale related to our ability to sequence perceived events in a temporal order (the “order threshold”), and a time-scale related to our conscious awareness of perceptions. There are several ways to test the predictions of the Necker-Zeno model using mild assumptions about the quantitative identification of the mentioned time-scales.

### **Can I Trust in What I See? EEG Evidence for Reliability Estimations of Perceptual Outcomes**

Jürgen Kornmeier (chair)

Department of Psychiatry and Psychotherapy, Medical Center, University of Freiburg

During observation of an ambiguous figure perception becomes unstable and alternates between different interpretations. Tiny low-level changes can disambiguate an ambiguous figure and thus stabilize its percept. We compared ERPs evoked by ambiguous stimuli and by disambiguated stimulus variants across different visual categories (geometry, motion) and complexity levels (up to emotional face expressions).

Disambiguated stimulus variants cause stable percepts and evoke much larger amplitudes of two positive ERP components than ambiguous stimuli ( $d > 1$ ). This pattern of results is highly consistent across very different categories and complexity levels.

The generality of our findings points to higher-level mechanisms: We postulate that a meta-perceptual/cognitive inference unit evaluates the reliability of perceptual constructs beyond sensory details. Small ERP amplitudes reflect high small amplitudes low perceptual reliability. I will discuss our results with respect to what perceptual (in) stability can tell us about mental (in)stability and the contents of perceptual awareness.

### **Uncertainty in Visual Perception**

Pascal Mamassian

Perceptual Systems Laboratory, Ecole Normale Supérieure Paris

Visual perception is severely affected by uncertainty. This uncertainty comes in various forms, from the ambiguity of the relationship between a retinal image and the three-dimensional world, up to the limitations and noises sources inherent to the visual system. All these sources of uncertainty make it harder for us to determine the shape and color of objects, their distance to us, or the speed at which they travel. And yet, we do not struggle much to interpret the images that impinge on our retinas, and except in some rare cases of visual illusions, we are rarely aware of their alternative interpretations. In the recent past, we have been using the framework of Bayesian probabilistic

inference to better understand how the visual system copes with uncertainties. We have shown that observers rely on prior knowledge such as that light comes from above our head to interpret the shape of objects. When observers have to interpret ambiguous oriented or moving images, they are influenced by the history of their past perceptual decisions and they exhibit strong consistent biases with very slow dynamics. But surprisingly, in spite of all these uncertainties and biases, observers are very precise at monitoring their own performance.

### **A Bayesian Account of Perceptual Multistability**

Philipp Sterzer

Department of Psychiatry and Psychotherapy, Charité Universitätsmedizin Berlin

Perceptual inference is the process by which current beliefs are used to give rise to conscious perception by inferring the probable causes of the incoming sensory signals. When sensory signals are perceptually ambiguous, inference may result in spontaneous alterations between two or more conscious perceptual states, a phenomenon called multistable perception. The neural mechanisms of the underlying inferential processes have remained controversial. Whereas some authors argue that multistable perception is governed by local processes in sensory cortices, others have proposed a role for higher-level frontoparietal brain regions in driving perceptual inference. Here, I will propose an account of multistable perception that may reconcile these apparently contradictory views within the computational framework of Bayesian inference. I will also present results from behavioral experiments, computational modeling and model-based fMRI that support the proposed account. Finally, I will discuss how these findings may contribute to our understanding of the neural mechanisms underlying conscious perception.

### **From Perceptual Irritation to the Functional Layer Theory of Mental Action**

Johannes Wagemann

Chair for Consciousness Studies, Alanus University of Arts and Social Sciences, Mannheim

I will give an overview of my current research on the first-person perspective in perceptual reversals during observation of ambiguous visual situation. By means of life-worldly examples and with short perceptual exercises for the audience, two complementary experimental tasks will be explained and discussed with regard to methodological issues such as introspective data acquisition. Furthermore, it shall be indicated how a structure-phenomenologically informed account can bring the observed aspects of mental activity into a conceptual context, which also allows references to the brain-physiological level of perceptual reversals.

## Mind-Body Reciprocity. Applications and Empirical Results in Psychology, Linguistics, and Phenomenology

The perennial philosophical problem of the mind-body relationship has become a topic of intense research activity in the cognitive and social sciences. A variety of empirical studies have resulted, which examine the reciprocity of mind and body theoretically and empirically. The concepts of embodiment, enactivism, and interpersonal synchronization are hallmarks of this research. In the in-depth workshop, we will gather viewpoints from different disciplines –psychiatry, psychology, linguistics and phenomenology. The presentations focus on sensorimotor cycles in an enactive account of mental functioning, on nonverbal synchrony in social interaction, on the gaze patterns indicating the social sharing of attention, and on the embodiment of depression and its treatment by mindfulness-based psychotherapy.

### The Circularity of the Embodied Mind

Thomas Fuchs

Section Phenomenological Psychopathology, Psychiatric Department, University of Heidelberg

From an embodied and enactive point of view, the mind-body problem has been reformulated as the relation of the lived or subject-body on the one hand, and the physiological or object-body on the other (“body-body problem”). To further explore this problem, the lecture develops the concept of circularity under three aspects:

- (1) as the circular structure of embodiment, which manifests itself (a) in the homeostatic cycles between brain and body, and (b) in the sensorimotor cycles between brain, body and environment;
- (2) as the circular causality which characterizes the relation of parts and whole within the living organism;
- (3) as the circularity of process and structure in development and learning. On this basis, the subjective experience of the lived body may be conceived as the integral of organism-environment interactions, which has a top-down, formative or ordering effect on physiological processes.

### Be Mindful of Your Body: Mind-Body Interaction in Depression and Its Treatment

Johannes Michalak

Department of Psychology and Psychotherapy, Witten/Herdecke University

Mindfulness-Based Cognitive Therapy (MBCT) has been developed for relapse prevention in depression and has proven its efficacy in a number of clinical trials. Mindfulness means paying attention to the present moment in a non-judgmental and compassionate way. Most mindfulness exercises taught during MBCT are based on the development of

a heightened awareness of one’s body. The important role of the body is also stressed in the basis research in mind-body interactions. However, research on the role of the body in depression and in MBCT is relatively sparse. In this presentation an overview of the background and empirical foundation of MBCT will be given. Moreover, studies about the role of the body and mindful body awareness in dysfunctional states of mind in depression will be presented. Finally, the concept of vital energy that is seen as a link between the body and the mind and as an essential basis for contemplative and meditative practice in different traditions (e.g., Qi in the Chinese Daoist and Buddhist tradition, Prana in the Indian Yoga tradition, Lüng in the Tibetan Tradition, Ruah in the Hebrew tradition and Spiritus Sanctus in the Christian tradition) will be discussed.

### Synchronizing Minds and Bodies in Moments of Shared Attention

Anja Stukenbrock

Faculté des lettres, Université de Lausanne

Research in psychology, cognitive sciences and linguistics has shown that the ability of human beings to share attention on phenomena in their surroundings is crucial for the development of the socio-cognitive skills for what has been termed “the cooperative infrastructure of human communication” (Tomasello 2008: 7). There are various verbal and embodied ways in which a participant (ego) can direct a co-participant’s (alter’s) visual attention to a phenomenon he or she wants to share. In face-to-face interaction, the interpersonal coordination of ego’s and alter’s gaze plays a crucial role in how they synchronize their bodies and minds, jointly orient to visible (or imagined) phenomena and display mutual understanding to each another.

Based on mobile eye tracking recordings undertaken with two pairs of eye tracking glasses worn by dyads of participants in naturally occurring social interaction, the study presents qualitative analyses of interacting gaze patterns of participants who establish joint attention while being involved in everyday activities such as shopping at a market, looking for a book in the library, visiting a museum. In order to provide for ecologically valid eye gaze data, the study departs from experimental frameworks by taking eye tracking out of the lab and “into the wild”. Here, attention-sharing emerges as an embodied, temporally fine-tuned interactional accomplishment of participants jointly on the move in a world of fleeting phenomena that may be noticed, pointed out and shared, or left passing by (Stukenbrock 2018).

Stukenbrock A (2018). Mobile dual eye tracking in face to face interaction. The case of deixis and joint attention. In: G. Brône & B. Oben (eds.). *Eye-tracking in Interaction. Studies on the role of eye gaze in dialogue*. Amsterdam: Benjamins, 265-302.  
Tomasello M (2008). *Origins of Human Communication*. Cambridge/Massachusetts: MIT Press.

### Nonverbal Synchrony: The Embodied and Extended Self

Wolfgang Tschacher [chair]

University Hospital of Psychiatry and Psychotherapy, University of Bern

A growing volume of quantitative research in psychology has shown how social interaction is embodied in nonverbal behavior. In several projects by different labs, using



video-analysis tools, actigraphic measures, and physiological measures, the cross-correlations of peoples' time series were used to define 'synchrony'. Synchrony is the synchronization occurring in social interaction displayed by a number of different kinds of nonverbal data (body movement, gesture, posture, markers of the autonomous nervous system, etc.). Synchrony has been found associated with affectivity of communicators and, in psychotherapy, with attachment styles and interpersonal problems of clients. A recent elaboration of the synchrony phenomenon has focused on the definition of a duration measure – the social present (or shared 'nowness') of communicating dyads. We defined the social present as the temporal extension, in seconds, of the window within which the behavioral time series of interacting individuals were significantly correlated. This may yield a novel marker of William James' 'specious present'. A study on the basis of 84 experimental dyads (1) showed that the duration of the social present has an extension of around six seconds (roughly twice the individual nowness of Ernst Pöppel and others). Consistent with the previous results on embodied communication, we found associations of this social present with personality and with state variables of the participants. In general, social synchronization is an important, usually unattended, capacity that regulates communication and expresses participants' engagement and satisfaction with social exchange. Its analysis provides valuable insights into the mind-body reciprocity found in embodied cognition, which in our view underlies processes of consciousness and nowness.

(1) Tschacher W, Ramseyer F, & Koole SL (2018). Sharing the now in the social present: Duration of nonverbal synchrony is linked with personality. *Journal of Personality*, 86, 129-138.

Tuesday, June 25, 2019, 09:00–12:30

Brünig 1

## Psychedelics: Phenomenology, Neurobiology and Clinical Use

Psychedelics have fascinated mankind over centuries due to their powerful ability to induce altered states of consciousness. After a nearly 50 years break, the science of psychedelics is reviving to enjoy a „renaissance“ thanks to the development of novel neuroimaging technologies. This workshop will focus on phenomenology, neurobiology and clinical use of psychedelics by the talks of four pioneering scientists. The talks will explain the state-of-the-art research on the phenomenology of the psychedelic-induced state, on the neuropharmacological changes induced by psychedelic substances, the effects of these changes on the large-scale brain activity and also discuss the clinical and therapeutic use of psychedelics.

### Introduction

Selen Atasoy [chair]

Department of Psychiatry, Oxford University

## Effects of the Psychedelic Compound Psilocybin on Mystical Experience and Therapeutics

Matthew Johnson

Psychiatry and Behavioral Sciences, Johns Hopkins University, Baltimore

For over 15 years the Johns Hopkins Psychedelic Group has been the preeminent and most productive research team in the United States conducting human research with psychedelics. They have shown breathtaking scientific productivity, having published over 50 peer-reviewed manuscripts on psychedelics. Notable accomplishments have included: The first research since the 1970s to focus on mystical experience resulting from psychedelic administration to drug-naïve volunteers; the development of safety guidelines for human psychedelic research which have advanced the approval of psychedelic research at a growing number of universities; the first research showing that psychedelic administration increases personality openness; the first research examining a psychedelic in the treatment of tobacco/nicotine addiction; the first research demonstrating the psychedelic effects of salvinorin A and dextromethorphan under blind conditions; the development of valid psychological scales for assessing mystical experiences and challenging experiences resulting from acute psychedelic administration; the first study on the effects of psychedelic administration on volunteers initiating a meditation program; and the largest randomized trial showing that psilocybin produces large and sustained decreases in depression and anxiety in patients with a life-threatening cancer diagnosis. This presentation will provide a review of this large program of research.

## Psilocybin- and LSD-Induced States - How Psychedelics Can Help Us Understand Social Cognition and Self-Experience

Katrin Preller

University Hospital of Psychiatry, University of Zurich

Due to their unique effects on consciousness, psychedelics offer the opportunity to investigate the neuropharmacological mechanisms underlying alterations in perception and cognition important for increasing our understanding of psychiatric disorders. Furthermore, renewed interest in the potentially beneficial clinical effects of psychedelics warrants a better understanding of their underlying neuropharmacological mechanisms. However, major knowledge gaps remain regarding the neurobiology of psychedelics in humans.

In our studies we show that LSD modulates brain connectivity and subjective effects via agonistic activity on the serotonin 2A receptor in humans. Furthermore, we elucidate the neuropharmacology of self-relevance and meaning processing, as well as the intertwined relationship between selfprocessing and social cognition via the administration of LSD and psilocybin. Our results thus attenuate major knowledge-gaps regarding the neurobiology and neuropharmacology of psychedelics. Furthermore, they increase our mechanistic understanding of meaning processing and social cognition and therefore offer important directions regarding the development of novel therapeutics.

### **Causal Understanding of the Nonlinear Effects of LSD Using Whole-Brain Multimodal Model with Serotonin Receptor Maps**

Morten Kringelbach

Department of Psychiatry, Oxford University

The talk will explore how understanding the underlying mechanisms of the human brain in health and disease requires models with necessary and sufficient details to explain how function emerges from the underlying anatomy and is shaped by neuromodulation. As proof of principle, we combined multimodal anatomical and functional data including neurotransmitter data obtained with positron emission tomography of the detailed serotonin 2A receptor (5-HT<sub>2A</sub>R) density map. This allowed us to model the resting state and mechanistically explain the functional effects of 5-HT<sub>2A</sub>R stimulation with lysergic acid diethylamide (LSD) on healthy participants. The model identified the causative mechanisms for the non-linear interactions between the neuronal and neurotransmitter system, which are uniquely linked to (1) the underlying anatomical connectivity, (2) the modulation by the specific brainwide distribution of neurotransmitter receptor density, and (3) the non-linear interactions between the two. The talk will show further evidence of how modeling global brain dynamics with neuromodulation can lead to novel insights into human brain function in health and disease - and altered states of consciousness.

### **Effects of DMT in the Brain and in Human Experience**

Christopher Timmermann

Psychedelic Research Group, Imperial College, London

DMT is known for inducing rich experiences characterized by feelings of deep immersion into a “different reality or dimension” in which people encounter complex scenes and communicate with seemingly conscious entities. In our research we studied the effects of DMT by administering more than 60 doses while capturing the effects of the compound in the brain using EEG and fMRI, as well as range of subjective effects inspired by a neurophenomenological approach. Results reveal an intimate relationship between different measures of brain activity and dynamic shifts in different dimensions of conscious experience. Our findings indicate the potential relevance of using DMT in the context of consciousness research as well as its similarities with dreams, near-death experiences and a range of non-ordinary states of consciousness.

Tuesday, June 25, 2019, 09:00–12:30

Ballsaal

## **Towards a Theoretical Understanding of Conscious and Unconscious Processes and Their Cognitive Architecture**

We are still far from having a clear theoretical understanding of attention, consciousness, and unconsciousness, let alone their relations. Scientists often work with an intuitive understanding of consciousness rather than a clearly defined concept. Unconsciousness is usually only negatively defined as the complement of consciousness. Not only does this leave both terms underspecified. It also makes it impossible to fruitfully address questions such as what the relation between consciousness and attention is and what exactly the role of conscious cognitive processing in contrast to unconscious cognitive processing is.

The aim of this workshop is to develop a new concept of conscious and unconscious processing which is strongly empirically anchored. We will clarify the concept of consciousness (1) by discussing the relation of consciousness, information and attention (Montemayor), (2) by presenting novel empirical findings concerning the offline stream of conscious representations supporting the global workspace theory (Sergent), (3) by suggesting a cognitive architecture of conscious processing which is anchored in Bayesian processing and which accounts for basic evolutionary functions of consciousness: the ALARM theory of consciousness (Newen) and (4) by presenting challenges for the empirical investigation of unconscious mentality and by showing how only a conceptual pluralism with regard to unconscious mentality has the potential to meet these challenges (Krickel). The combination of these contributions will deliver fruitful new theoretical perspectives, include new experiments, and novel ideas, whereby all proposals are strongly anchored in up-to-date empirical research.

### **Consciousness, Information and Attention**

Carlos Montemayor

Department of Philosophy, San Francisco State University, Daly City

How exactly does consciousness differ from other fundamental components of the mind? This talk explores the differences between conscious and unconscious mental states within the context of information processing. The talk examines current approaches to how consciousness is associated with information and presents various possibilities about how to define consciousness in terms of information. Some of the central questions examined are: Can we avoid a functionalist approach and address the hard problem of consciousness with a theory of information? How can we account for information processing that is not conscious. (e.g., information that is necessarily conscious versus information that is necessarily unconscious)? How might answers to these questions elucidate the relationship between consciousness and attention?

## Global Workspace Theory and the Offline Stream of Conscious Representations

Claire Sergent

Laboratory for the Psychology of Perception, University of Paris Descartes

Spontaneously we think that the flow of our conscious perception is in synchrony with the external events. However, several current theories of consciousness might predict otherwise. According to the global workspace theory, conscious access does not arise during the initial phase of sensory processing, but is linked with a second, optional phase of processing where reactivation of local sensory information by top-down attentional influence allows this information to be broadcast to a wider network of areas, including fronto-parietal hubs. Interestingly, this theoretical proposition leads to a counter intuitive prediction : that conscious access to a sensory information is not necessarily time-locked with the external event, as sensory processing would be ; it is time-locked with the broadcast of a representation. In a series of experiments, we validated this prediction by showing that retrospective attention can trigger conscious perception of a past and previously missed stimulus, suggesting the existence of a form of « retro-perception ». Based on these observations, as well as other intriguing phenomena such as the psychological refractory period and latent working memory, I will explore the idea that such temporal flexibility -this possibility to process information offline, in a slightly asynchronous manner- is a key aspect of the conscious mode of processing.

## The ALARM Theory of Consciousness

Albert Newen (chair) with Carlos Montemayor

Institute for Philosophy, University of Bochum

What is the cognitive architecture of consciousness? Is it best described by higher-order theories of consciousness, by global workspace theories or do we have to presuppose consciousness as a nonreducible property? We think that neither of these theoretical strategies is capturing the heart of consciousness. We presuppose that cognitive systems use Bayesian processes to implement learning processes by reweighting of Bayesian priors. Conscious processing plays a crucial role in learning processes since it allows for instantaneous learning in contrast to cumulative learning. Cumulative learning enables a cognitive system to account for former experiences which is realized by a systematic Bayesian reweighting of former priors that integrates the new experience. In contrast, instantaneous learning provides a great advantage over cumulative learning since it allows for a radical reweighting of priors in a life-challenging situation: if life is in danger, the cognitive system cannot just do a cumulative integration of the challenging experience. Rather, it must give absolute priority to it. For example, if you burned your hand, it is highly beneficial to consciously feel this and thereby giving the pain absolute priority to save the organism. The ALARM architecture is described in detail.

## Is there Unconscious Mentality?

Beate Krickel

Institute for Philosophy, University of Bochum

The claim that there is unconscious mentality (UM) is ubiquitous in various areas of philosophy and science. It is argued that perception can happen unconsciously, that our actions are influenced by unconscious attitudes, and that even decision-making can occur unconsciously. However, a closer look at the empirical evidence for UM suggests a less clear picture. There are at least five challenges: First, the empirical criteria for non-consciousness of the relevant mental states or processes are not reliable. Second, it is unclear in which sense the unconscious states are supposed to be mental and how this is empirically substantiated. Third, on the assumption that the justification for UM is an inference to the best explanation, it is unclear why explanations invoking UM should provide the best explanation. Fourth, explanations invoking UM can be rationalizing explanations or mechanistic explanations. Failing to appreciate this distinction, researchers misleadingly take subjective reports about reasons to provide evidence about causes. Fifth, it is doubtful whether the postulation of unconscious mental states indeed has any explanatory value as there are many different contrasts to “conscious”: pre-conscious, a-conscious, non-conscious, procedural, non-declarative, automatic, unfelt, subliminal, denied, miscategorized, fragmented, not reportable, implicit, not integrated, not available for rational planning and reasoning – to mention just a few.

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Brünig 3

## Anesthesia, Neurodegenerative Disease, and Consciousness

One way to understand consciousness is its perturbation, either (1) transiently by anesthesia, and (2) permanently by neurodegenerative diseases. In this workshop, we will explore research on how anesthetics mediate loss or perturbation of consciousness, what processes are at play in normal activities leading to consciousness, and links to neurodegenerative disease. This discussion will take us from higher level neuroscientific approaches to the understanding of general anesthesia inwards towards the subcellular workings of neurons, and down the quantum level events through a series of four talks by world leading experts in the field.

## Anesthesia and Consciousness

Marco Cavaglia

Polytechnic University of Torino

This contribution takes a neuroscience approach, reviewing the effects of general anesthetics on the neural substrates of wakefulness and awareness. Anesthesia has been discovered in 1860. Since then Scientific investigations have been conducted at any biological level, from system to Nano scale microtubules, to define the neural correlates



of the hypnotic component of general anesthetic, without conclusive results. Now we are going quantum.

#### **Molecular Modelling to Investigate Protein Folding Dynamics and Kinetics in Neurodegenerative Diseases**

Marco Deriu

Department of Mechanical and Aerospace, Polytechnic University of Torino

Proteins are fascinating molecular machines capable of organizing themselves into well-defined hierarchical structures through a huge number of conformational changes to accomplish a wide range of cellular functions. Moreover, the alternative protein conformations may enable the exposition of hydrophobic protein domains, increasing aberrant aggregation risk. This is the case of amyloidogenic proteins, where a direct correlation between thermodynamic stability and the propensity for amyloid fibril formation is widely demonstrated. As a consequence, determining protein dynamics, folding kinetics and thermodynamics represents a significant scientific challenge for both experimental and computational approaches to date. Molecular modeling may play a key role in describing protein tendencies towards specific conformational rearrangements and protein-protein organization. Approaching this problem from an energetic point of view is of great importance especially in case of amyloidogenic proteins, given the intimate interconnection between the functional energy landscape and aggregation risk. In this connection, insight can be obtained on protein conformational dynamics and kinetics by structural molecular modelling. This work focuses on classical and enhanced sampling molecular dynamics techniques applied to investigate protein fibrillogenesis in spinocerebellar Ataxia and Alzheimer's disease.

#### **The Cytoskeletal Effects of Anesthesia and Oxidative Stress in Tauopathic Disease and Consciousness**

Travis Craddock (chair)

Nova Southeastern University, Florida

Oxidative stress is a pathological hallmark of neurodegenerative and is associated with ultraweak photon emission within cells. This contribution focuses on recent modeling efforts showing that cytoskeletal protein polymers in neurons can feasibly absorb and channel these photoexcitations via resonant energy transfer, on the order of dendritic length scales and neuronal fine structure. Additionally, we show how anesthetic molecules can impair this energy transfer, thus accounting for selective action of anesthetics on consciousness and memory.

#### **Using Neurophotronics to Investigate Anesthesia, Neurodegenerative Disease, and Neural Correlates of Consciousness in Humans**

Felix Scholkmann

University Hospital Zurich, University of Zurich

This contribution to the workshop offers an overview on how to use neurophotronics (functional-near infrared spectroscopy neuroimaging and near-infrared spectroscopy-based cerebral oximetry) to investigate anaesthesia, neurodegenerative disease, and neural correlates of consciousness in humans. An overview will be given about the current state of research and future research projects regarding these topics.

**Tuesday, June 25, 2019, 09:00–12:30**

**Harder 1**

### **Anticipatory Consciousness**

The purpose of this workshop is to provide an in-depth examination of the relationship between anticipation and consciousness. Presenters will address this relationship from scientific, theoretic, and philosophical perspectives. Following the presentations, group discussion will focus upon three issues; specifically, (1) each presenter's use of the concepts "anticipation" and "consciousness", (2) the costs and benefits engendered by these conceptual commitments, and (3) theoretical syntheses that might emerge from conceptual differences revealed during group discussion.

The workshop will begin with a five-minute introduction to the theme by the workshop organizer. Each of four presentations will then last 45 minutes. However, instead of conducting a 45-minute lecture, speakers should generate roughly 30-minutes of "lecture" material so that audience members have the opportunity to engage speakers in real-time, and play an important role in the unfolding of the workshop. After three hours of such presentations, the remaining 25 minutes will be moderated by the workshop organizer, and will be geared toward addressing the three, previously-mentioned issues.

#### **Perceptual Anticipation as Foundation of Social Perception**

Patric Bach

Action Prediction Lab, University of Plymouth

Recent proposals argue that our understanding of other people's behavior emerges from a predictive process that "paints" others future behaviour and their knowledge of the world onto one's own perceptual system. I will report data from two experimental paradigms that provide direct support for such views. These studies show, first, that people's understanding of others' behaviour is guided by perceptual anticipations of their forthcoming actions. These anticipations can be made visible as subtle distortions of a perceived action's path towards those expectations. Second, they show that perceptual expectations of another's sensory input also underlie people's ability to take others' perspective, providing a view how the world looks to them that can support own

decision making. Together, these findings argue for a framework in which perceptual anticipations play a key role in social cognition and provide one with insights into others knowledge of the world and their future behaviour.

### Lessons on Anticipation from Simple Physical Systems

James A. Dixon, Benjamin De Bari, Bruce A. Kay, and Dilip Kondepudi  
Department of Psychological Sciences, University of Connecticut at Storrs

Anticipation has the strong flavor of a cognitive act. When we anticipate, we know what is coming, such that we can become poised for imminent events before they occur. It seems self-evident that only cognitive models could forecast the future this way. In this talk, we will offer an alternative, minimal account of anticipation in which a simple physical system becomes poised with regards to a low-energy field based on its history. The physical system is a dissipative structure that forms and maintains itself in the service of dissipating a high-voltage electrical field. If the electrical field is spatially coupled with a secondary magnetic field during the formation of the dissipative structure, the spatial arrangement of elements within the structure is altered. This spatial arrangement allows the system to maintain a poised state with regards to the magnetic field. The properties of this anticipatory behavior and analogs to biological anticipation will be discussed.

### Organisms Are Consciousness [Aboutness] and Anticipation [Embodied Constraint]

Scott Jordan [chair]  
Department of Psychology, Illinois State University at Normal

The present talk offers an approach to anticipation and consciousness that is based on Wild Systems Theory (WST—Jordan, 2018, 2017, 2013), a recently developed approach to consciousness, life, and cognition that begins by describing organisms as self-sustaining energy-transformation systems that constitute embodiments of context. Within this framework, anticipation refers to a self-sustaining system's ability to pre-specify and constrain the dynamic possibilities of its nested transformation systems. This talk will describe how anticipation, defined as the prospective constraint of context, evolved from the small-scale contexts constrained by a single cell, to the full-blown, self-aware pre-specification and constraint of contexts (i.e., forward-looking thinking) exhibited in human anticipation. Specifically, anticipation scaled up because (1) the systems that phylogenetically entailed it (i.e., organisms) were energy-transformation systems who simultaneously constituted a possible energy source for potentially emergent energy transformation systems (i.e., plants and herbivores), and (2) as self-sustaining embodiments of context, such systems are naturally and necessarily 'about' the contexts they embody. As a result, they are inherently meaningful (i.e., "about"), and the phenomenon we refer to as consciousness is a contextually-emergent, phylogenetically scaled-up recursion on the self-sustaining pre-specification and constraint of nested, dynamic possibilities we see in single cell organisms. In short,

anticipation and consciousness are not something an organism does or has, respectively. Rather, they constitute what an organism is.

Jordan, J. S. (2018). It's hard work Being No One. *Frontiers in Psychology—Theoretical and Philosophical Psychology*. In J. M. Windt's (Ed.), *Philosophical and Ethical Aspects of a Science of Consciousness and the Self*. 9:2632. <https://doi.org/10.3389/fpsyg.2018.02632>  
Jordan, J. S. (2017). Wild anticipation: On the evolution of meaning. In R. Poli's (Ed.), *Handbook of anticipation*. Springer Nature. [https://doi.org/10.1007/978-3-319-31737-3\\_59-1](https://doi.org/10.1007/978-3-319-31737-3_59-1)  
Jordan, J. S. (2013). The wild ways of conscious will: What we do, how we do it, and why it has meaning. *Frontiers in Psychology*, 4.

### Aheadness: On the Temporally Extended Mind

Zdravko Radman  
Institute of Philosophy, University of Zagreb

Can we have experience of something that is not yet present in the senses? Can the qualitative be felt ahead of the actual? If consciousness is, in part, emancipated from the sensory, what is that what helps shaping experience? What are the arguments that support the claim that all perception is about expectation? How does implicit guesswork function? How does the background shape the foreground? Can we conceive of a phenomenology of the forthcoming? Could we not further conceive of a kind of hermeneutics of experience?

These are some of the questions that motivate and help shape this presentation that is basically critical of the too abstract and pretty lifeless account of intentionality, including its present-centeredness. The term 'aheadness' has been coined to account for the multiple aspects of mental capacity responsible for projecting of what seems to be most likely the case in the world and for suggesting of the most appropriate 'next step' in behaviour. An appeal will be thus made to redescribe intentionality in terms of prospecting and establish 'aheadness' as an aspect of 'aboutness'. Seen in such a way 'aheadness' is never innocent; it always comes with attitudes and is in that sense never disinterested.

Tuesday, June 25, 2019, 14:00–17:30

Brünig 1

### The Sense of Time Continuity. Is There a Problem?

Intuitively, we have the impression that we are in direct contact with the outer world, associated with a feeling of immersion. Consistent with this impression, conscious experience appears to us as being continuous, matching the continuity of physical time. However, several studies favor discrete theories of perception over continuous theories. Also the sense of time continuity appears to be disturbed in pathologies like schizophrenia, associated with a disruption of the sense of self, and of the feeling of being immersed in the world. In this symposium we will provide evidence supporting the idea that the mechanisms underlying the conscious flow are not as continuous as we believe; we will specify what happens at a conscious and non-conscious levels, and we will discuss associated models. Marc Wittmann will explore the subjective experience

of time flow, and will focus on those experiences where the sense of time emerges spontaneously, i.e. when we have to wait. The two following presentations will focus on the question of time continuity at the sub-second level. Michael Herzog will show evidence that conscious visual processing is discrete rather than continuous, and will propose a two-step model, in which only the non-conscious level is 'quasi' continuous. Anne Giersch will present results in patients with schizophrenia, and argue that the sense of time continuity requires automatic predictions of sensory events to guide attention. Finally Carlos Montemayor will discuss dual models postulating a distinction between automatic and cognitive timing.

**Lack of Sense of Immersion and Time Continuity in Schizophrenia:  
Arguments for an Interaction Between Non-Conscious  
and Attention Mechanisms**

Anne Giersch (chair)

Department of Psychiatry, University Hospital of Strasbourg

Timing disorders are not part of the diagnosis criteria for schizophrenia, but have been hypothesized decades ago, and related to bodily self disorders. Yet, timing disorders have been explored experimentally only recently. The results show impairments at detecting asynchronies and ordering stimuli, suggesting distortions in the temporal structure of consciousness. The amplitude of the impairments led us to explore timing at a non-conscious level. We showed that in healthy subjects events are distinguished in time automatically even when subjectively judged as being simultaneous. Data suggest that sequences of future visual information are predicted and allow subjects to allocate attention in the right place and right time. This would help to follow visual events fluently and check predictions. Either sensory events confirm the prediction or yield a prediction error, but there is no room for a time gap to be perceived. Conversely, data suggest that time prediction is impaired in patients with schizophrenia with bodily self disorders, and especially the production of sequences at the millisecond level. We will argue that a close synergy between non-conscious prediction of sequences and attention is necessary for the sense of immersion in the environment and the feeling of time continuity to emerge.

**Quasi-Continuous Unconscious Processing Precedes Discrete Conscious Perception**

Michael Herzog, Leila Drissi Daoudi, Adrien Doerig

Brain-Mind Institute, EPFL Lausanne

Consciousness appears to be a smooth, continuous stream of percepts: we are aware of the world at each single moment of time. However, continuous conscious perception is challenged by phenomena such as apparent motion, in which two static disks are presented one after the other but a smoothly moving disk is perceived. Apparent motion and similar phenomena favor models of discrete consciousness: we consciously perceive the world only at certain moments of time, preceded and followed by windows of unconscious processing. Usually, the sampling rate of discrete percepts is determined by temporal resolution: if we cannot perceive two flashes of light presented 40ms after each other, discrete sampling cannot be faster than 40ms. However, experiments found sampling rates ranging from 3ms to 300ms. Obviously, there seems to be something wrong with discrete perception, too. Here, we propose a two-step model, in which a quasi-continuous unconscious processing stage with a high temporal resolution precedes conscious discrete perception, occurring at a much lower rate, in the range of 400ms. We provide evidence for this model from a set of trans-cranial magnetic stimulation (TMS) and visual masking experiments. Finally, we show why continuous consciousness is conceptually problematic.

**Time Cognition and Perception: A Dual Model**

Carlos Montemayor

Department of Philosophy, San Francisco State University, Daly City

Multiple studies show that time perception is a complex and multifaceted phenomenon. This talk analyzes the implications of approaching the findings on time cognition and perception from a dual model perspective. According to this approach, some aspects of time perception must be understood as direct mappings of the environment, while other aspects must be understood as temporal integration, conceptualization, or reasoning. The talk will focus on the impact of language on time cognition, and explain why a limited influence of language explains many aspects of time cognition, including memory. Issues about the evolution of linguistically formatted types of temporal cognition will be examined, especially the possibility of uniquely human types of temporal cognition. Finally, the implications of the dual model of time perception for the study of consciousness will be assessed according to a theoretical categorization that includes unconscious, agential, and phenomenally conscious components. The main proposal in this concluding part of the talk is that only some aspects of time perception are phenomenally conscious.

## Living Through Time as an Embodied Self: The Experience of Time, Boredom, and Flow

Marc Wittmann

Institute for Frontier Areas of Psychology and Mental Health, Freiburg

Based on conceptual considerations in neuroscience and phenomenology, interoceptive and affective states create the experience of time. In the majority of experimental studies only the time range of milliseconds to a few seconds is assessed. However, only during longer time intervals we can refer to lived time as embodied self-experience, as emotional and motivational state of the human condition. I will present a series of empirical investigations where we tried to capture individuals' experiences of time, self, and emotion during a variety of empty and filled time intervals in the multiple-minute range. Different groups of participants were exposed to real waiting situations, watched two different dance performances, participated in instructed meditation sessions, and were exposed to ganzfeld stimulation. Trait-related differences in impulsivity and time orientation as well as state-related variables of relaxation and boredom determine the experience of time in ordinary waking consciousness. Stronger present-oriented impulsivity as trait leads to more irritation and boredom while waiting which expands subjective duration. More cognitive and emotional self-control leads to more positive affect while waiting and in turn to a faster passage of time. Moreover, the felt immersion during altered states of consciousness can lead to a faster passage of time and in individual cases to a feeling of timelessness and selflessness.

Tuesday, June 25, 2019, 14:00–17:30

Harder 1

## Bodily Consciousness. Clinical Observations, the Experimental Approach, and Some Hands-On Experiences [max. 20 Participants]

This workshop presents an overview of various distortions of bodily self-consciousness. The clinical conditions leading to such alterations and the experimental approaches to simulate them are introduced. Starting out from the phenomenology and neurology of phantom body parts, the concept of “phantom body” is explored. This concept helps to understand complex neuropsychiatric conditions, such as reduplications of body and self (“doppelgänger” phenomena) and varieties of out-of-body experiences. Some rare manifestations of phantom limbs are discussed and workshop attendees are given the opportunity to experience a series of bodily (tactile and haptic) illusions including a virtual-reality based body swap, i.e. the lively experience to be in another person's body. Particular emphasis is given to an overview of clinical and experimental research in “body integrity dysphoria” (BID), the desire for limb amputation or for acquiring a marked impairment in sensory or motor functions. This workshop will allow attendees to get an in-depth understanding of the multisensory nature of bodily self-consciousness by a combined intellectual and experiential approach.

## Phantomology I: Phantom Limbs and Related Bodily Illusions

Peter Brugger (chair)

Clinic of Neurology, University of Zurich

Late Stanislaw Lem, famous science fiction writer and futurologist, has coined the term «phantomology» in his *Summa Technologiae* (1964). As the “science of the body in the brain”, phantomology is at the heart of any scientific exploration of bodily consciousness. This introduction provides an overview on history and recent developments of research into phantom limbs. The phantom phenomenon will be discussed in various clinical contexts; after amputation, after spinal cord injuries, in the presence of cerebral lesions, but also as experimentally induced in healthy volunteers (workshop attendees will have the opportunity to experience some bodily illusions). One chapter of phantomology is particularly useful as a lesson in philosophy of science: phantom phenomena in persons born without limbs will be discussed against the background of scientists' proneness to either end of an error continuum, spanning from neglect to over-interpretation of an observation defying explanation by existing theories.

## Phantomology II: From Phantom Limb to Phantom Body

Peter Brugger (chair)

Clinic of Neurology, University of Zurich

Late Stanislaw Lem, famous science fiction writer and futurologist, has coined the term «phantomology» in his *Summa Technologiae* (1964). As the “science of the body in the brain”, phantomology is at the heart of any scientific exploration of bodily consciousness. This introduction provides an overview on history and recent developments of research into phantom limbs. The phantom phenomenon will be discussed in various clinical contexts; after amputation, after spinal cord injuries, in the presence of cerebral lesions, but also as experimentally induced in healthy volunteers (workshop attendees will have the opportunity to experience some bodily illusions). One chapter of phantomology is particularly useful as a lesson in philosophy of science: phantom phenomena in persons born without limbs will be discussed against the background of scientists' proneness to either end of an error continuum, spanning from neglect to over-interpretation of an observation defying explanation by existing theories.

## The Machine to Be Another

[with Demos on Wednesday, June 26, 16:30–19:00]

Marte Roel Lesur

Institute of Psychology, University of Zurich

The “Machine to Be Another” is a collection of methods and techniques that draw from research in neuropsychology and performance art to create the illusion of embodying another real person. The work and research of BeAnotherLab, the multinational interdisciplinary group behind the project, will be presented. In particular, they will talk about the background of the project and how they apply their methods in diverse social

contexts. Afterwards, pairs of participants will experience a body swap in a multisensory manner: two participants mutually exchange perspectives and coordinate their movements. Assistants facilitate the experience providing multisensory feedback. A non-verbal dialogue emerges between both participants provoking a strange experience of togetherness. The experience builds up with the help of the assistants and culminates with participants facing themselves in front of them as another.

### Exploring a New Disease: Body Integrity Dysphoria [BID]

Gianluca Saetta

Clinical and Cognitive Neuroscience, University Hospital Zurich

BID designates the suffering from a perceived discrepancy between actual and desired body configurations. It often presents itself as a long-lasting and distressing desire for the amputation or paralysis of a healthy limb. It is conceptualized as a paraphilia by some clinicians, a right-parietal syndrome by others, and is considered an Internet-induced madness by still other medical authorities. The new release of ICD-11 suggests to define BID as a “disorder of bodily distress or bodily experience” – as such the condition represents a form of bodily self-consciousness in the borderlands of psychiatry and neurology, shaped by both biological and social factors. I review structural and functional neuroimaging findings in persons with BID and present own data in a cohort of 16 men, who all desired amputation of their left leg. The available evidence suggests a breakdown at different levels of body-self integration: (i) insufficient anchoring of the left leg in the cortical representation of the body; (ii) impaired higher-order representation of the bodily self; (iii) shaping of erotic targets according to the own desired body. Together, the data illustrate the multifaced nature of bodily self-consciousness and tentatively outline how contributing factors, from neurological to social, can be mapped to the brain.

Tuesday, June 25, 2019, 14:00–17:30

Brünig 3

## Free Will and Quantum Agency

The traditional problem of free will is that if the human mind can be reduced to a physical process, and all physical processes are governed by the strictly deterministic laws of classical physics, in what sense could our will possibly be “free”? Or, in a dualistic picture, if the physical world is causally closed, how could a non-physical conscious free will possible make any difference to the physical world, including the body? With quantum theory there arose the idea that individual quantum processes are genuinely indeterministic; might such indeterminism leave room for free will to make a difference in the physical world? However, as the usual quantum indeterminism involves mere randomness (governed by the Born rule), some researchers have opted for more controlled quantum processes, such as the “orchestrated reduction” of the wave function (Penrose and Hameroff), or ways of influencing the first-order quantum pilot-wave via

higher-order mental fields (Bohm). Another prominent idea has been that human agents play a different role in quantum mechanics than in classical mechanics. In the context of the “standard” (Copenhagen) interpretation of quantum theory, various statements have been made which strongly implicate the experimenter agent in physics. It has been claimed that the wave function describes our knowledge of the system, rather than the system itself (Heisenberg). It has also been suggested that consciousness collapses the wave function – that it is only when the experimenter becomes conscious of the result of an experiment that a superposition of quantum possibilities collapses into one of the possible outcomes (Wigner). More subtly, some have emphasized the free choice of the experimenter when deciding what to measure and setting up the apparatus, thus partitioning the continuum of quantum potentialities into a finite set of discrete possibilities, while in the end it is nature which “chooses” the outcome according to the statistical laws of quantum theory (Stapp). This workshop will explore these and other questions connected to free will and quantum agency.

### The Role of Conscious Agents in Physics

George Musser

Contributing editor for Scientific American, New Jersey

Ask not what physics does for consciousness, but what the science of consciousness does for physics. This review talk will go over various proposals for how conscious observers and agents might play a role in physics, from questions over the interpretation of quantum mechanics to the measure problem in cosmology and the arrow of time. I’ll take an audience poll to gauge opinion on these questions. In so doing we’ll lay the groundwork for the new results the other speakers in the session will present.

### Extending Quantum Ontology to Include the Agent’s Mental Properties

Paavo Pykkänen (chair)

Department of Philosophy, History and Art Studies, University of Helsinki, Finland

Over the years, ontological interpretations of quantum theory (i.e. interpretations that do not give a special role to “observation” or “measurement” in quantum dynamics) have been developed (e.g. the Bohm theory). In an ontological picture we can assume that there is an “overall quantum world” which quantum theory describes. However, this overall quantum world contains a “classical sub-world”, a domain where certain quantum effects are negligible and the laws of classical physics provide a good approximation. Such ontological pictures raise fascinating questions about free will and the experimenter agent. Do those physiological processes of the agent relevant to free will live in the “classical sub-world” (as orthodox neuroscience presupposes), or might the physiological correlates of cognition and consciousness involve non-classical, quantum processes in some essential ways? Or does the quantum + classical physical ontology need to be extended to properly include the mental properties of the agent? Can this be done in a way that does not render mental properties causally inefficacious?



## Agent Inaccessibility to the Quantum World and the Problem of Free Will and Human Agency

Jan Walleczek

Phenoscience Laboratories Berlin

The indeterminism of orthodox quantum mechanics has often been discussed as a source for human free will and agency. By contrast, deterministic quantum interpretations of the world have often been rejected on the grounds that these would deny the possibility of human freedom. The latter view is known as incompatibilism, i.e., the notion that free will and determinism are incompatible. This presentation shows that the competing interpretations – quantum indeterminism versus quantum determinism – are equally constrained by the same fundamental principle: the agent-inaccessibility principle (AIP) which generalizes the well-known fact of the inaccessibility of the experimenter agent to the complete quantum state (Walleczek [2019] *Entropy*, 21, 4). Based on the AIP and the formal uncomputability of quantum processes, the argument is advanced that the 20th century quantum revolution does not imply a radical shift from determinism towards indeterminism. To the contrary, it is argued that—given present scientific evidence—it is only valid to assert the following: the quantum revolution signifies the profound discovery of an agent-inaccessible regime of the physical universe. Concluding, this principle of agent-quantum inaccessibility appears to place a fundamental limit on human agency, i.e., on the human capacity to freely act in the world. Possible challenges to this conclusion will be discussed.

Tuesday, June 25, 2019, 09:00–12:30

Harder 2

## Embodied Critical Thinking

Donata Schoeller (chair)

Institute of Philosophy, University of Koblenz

Gudbjörg R. Johannesdóttir, Sigridur Thorgeirsdóttir, Björn Thorsteinsson

Department of Philosophy, University of Iceland

Embodied Critical Thinking (ECT) is a research project initiated by philosophers and anthropologists of the University of Iceland, the University of Aarhus, the University of Koblenz, the University of Stony Brook and the Microphenomenology Laboratory in Paris.

In this workshop we will introduce the approaches of Embodied Critical Thinking based on an embodied, embedded, enactive and extended approach to cognition. We will outline a reconsideration of thinking based on the turn to embodiment and its recognition of the important cognitive functions of pre-intentional backgrounds that participate in a felt, experiential and embodied way in thinking. This acknowledgement serves to overcome basic splits organizing our understanding of consciousness in which Cartesian cuts manifest themselves in daily and academic practices until today.

The workshop will introduce basic concepts of body, environment, feeling and thinking that open up new ways to think about a constant micro-genesis of environments that

include our own approaches, our thinking and feeling. One can easily experience the methodological change made by understanding thinking in embodied terms. In our workshop we will lay out interdisciplinary backgrounds and implications of Embodied Critical Thinking which come from pragmatist, phenomenological, feminist and artistic approaches. Furthermore, participants will be invited to experiment with the methods we research by deliberately bridging the first, second and third person perspective. The workshop will thus have two parts: a theoretical and practical session. The latter will give participants the opportunity to dip into their own research-fields or interests by drawing on actual experiences, the specificity of situations as well as the intricacy of experiential backgrounds.

Tuesday, June 25, 2019, 14:00–17:30

Grimmel

## Computational Models of Insight Problem Solving

People are often fascinated by the sudden, unexpected and apparently unintended solution of a difficult problem which pops into someone's mind and often is accompanied by an aha!. For more than 100 years psychologists address the nature and underlying mechanisms of insights by behavioral experiments on human problem solving. It was found that re-structuring of the given problem elements or the goal representation provide important cognitive mechanisms which help to overcome an impasse. It is speculated that mainly unconscious processes drive re-structuring to relax self-imposed constraints and extend the search space for candidate solutions. What here exactly happens is still an open and unsolved question. Since behavioral and neuro-scientific studies allow only a coarse and investigation of cognitive mechanisms characterizing insight problem solving, we propose to exploit the potential of computational models. Those models might provide hypotheses and simulations which help to attain a better understanding of insight processes. In particular, all models need to address the questions: How existing information is recombined, in order to serve the overall goal? How the concerted interplay between unconscious and conscious processes contributes to find the solution? How the system realize that an impasse is met and how to overcome the impasse? And what role has the aha! experience as an emotional correlate of the problem solving process?

The workshop will introduce the state of the art on insight problem solving. We will discuss three different computational approaches (connectionism, evolutionary theory, and rational models) that shed light on these questions from different perspectives. We will discuss strengths and weaknesses of each approach and develop further perspectives.

## Unconscious Search Through Evolutionary Processes in the Brain

Anna Fedor

Institute of Advanced Studies, Köszeg

Darwinian Neurodynamics is a theory that suggests that evolutionary processes in the brain play an important role in human cognition: they can generate new ideas in a matter of a few minutes through dynamic neuronal changes. The theory explains how humans search the problem space when trying to solve a difficult problem and how they come up with new candidate solutions.

These evolutionary processes can be implemented in a connectionist model, which can solve insight problems. Candidate solutions are represented as activation patterns of a population of attractor networks. New variation is generated by error-prone copying of activation patterns and activation patterns are selected based on their fitness, i.e., closeness to the solution. Our hypothesis is that real evolutionary processes come to play a role during the impasse phase of problem solving, when conscious thinking gives way to unconscious thought processes and parallel computing. We are working on a more realistic model too, where the units of evolution are continuous-time recurrent networks and their complex firing rate patterns.

Besides computational modelling, I will explain how the theory of Darwinian Neurodynamics is supported by human behavioral experiments and experiments with in vitro neural cell cultures.

## Explaining the Emergence of Aha Moments as a Consequence of Resource Constraints

Hermish Mehta

Department of Electrical Engineering and Computer Sciences the University of California Berkeley

Rachit Dubey

Computational Cognitive Science Laboratory, Princeton University

Psychology has long been fascinated with understanding the nature of aha moments, moments when we transition from not knowing to suddenly realizing the solution to a problem. In this talk, I will present a resource-rational model that explains when and why we experience aha moments during problem-solving. Our theory posits that during problem-solving, in addition to solving the problem, people also maintain a meta-cognitive expectation about how quickly they will solve that problem. Crucially, aha moments arise whenever we experience a positive surprise i.e. when we solve a task much faster than we expected to solve. In essence, our theory suggests that due to resource-constraints, people routinely maintain expectations about time to finish any task and aha moments emerge as a consequence of maintaining such expectations. I will also present preliminary behavioral evidence that suggests aha moments are indeed a form of meta-cognitive reward prediction errors.

## From Gestalt to Computational Models

Michael Öllinger (chair)

Parmenides Center for the Study of Thinking, Pullach

The Gestalt psychologists founded the experimental research on insight problem solving. They introduced the concept of re-structuring as the key concept for solving difficult and unusual problems. Their ideas informed cognitive models up to now. From a computational perspective modeling self-driven re-structuring represents the greatest challenge. We will build on the Gestalt concept and presenting the most important developments and theories. We focus on the interplay of unconscious and conscious cognitive processes during problem solving and summarize accounts and proposals which address re-structuring within computational models. We will discuss implications and open questions, and close with next steps.

## How Insight Emerges: An Account Based on a Cognitive Architecture

Ron Sun

Cognitive Science Department, Rensselaer Polytechnic, New York

We show computationally how implicit processes lead to the emergence of sudden insight. Human creative problem solving has been tackled using computational modeling and simulation based on the Clarion cognitive architecture. Clarion, in general, attempts to provide unified explanations of a wide range of psychological phenomena using a number of basic principles. With these principles, a framework for understanding creative problem solving was generated, which includes both incubation and emergence of insight. Beyond that, the framework can also account for effects of a number of other factors on insight in creative problem solving (including motivation, personality, emotion, and so on).

Tuesday, June 25, 2019, 14:00–17:30

Ballsaal

## Panpsychism

There has recently been a resurgence of interest in panpsychism in academic philosophy. Many hope that panpsychism can provide an attractive way of solving the hard problem of consciousness, avoiding the deep difficulties associated with the more conventional options of dualism and materialism. In the first session of the workshop we will focus on cosmopsychism, the form of panpsychism according to which the universe is itself a conscious entity and facts about human minds are grounded in facts about the cosmic mind, with Angela Mendelovici speaking in favour and Luke Roelofs speaking against. In the second session, we will consider a couple of critiques of panpsychism, one philosophical (David Bourget) and one empirical (Philip Woodward). In the final session, Philip Goff will consider whether panpsychism can help with philosophical problems pertaining to free will.

### **Complexity without Combination: Panpsychism without the Combination Problem**

Angela Mendelovici

Department of Philosophy, University of Western Ontario, London

Panpsychism is the view that the phenomenal experiences of non-fundamental items, like, presumably, human subjects, are nothing over and above the phenomenal experiences of fundamental items combined in a certain way. Perhaps the biggest problem for panpsychism is the combination problem, the problem of explaining how exactly the hypothesized fundamental experiences combine to form experiences such as our own. This talk considers two apparent cases of mental combination that we might want to accept independent of a commitment to panpsychism: those of phenomenal unity and intentional structure. I argue that these cases cannot be intelligibly explained in terms of mental combination. They suggest, instead, a non-combinatorial view on which mental items can be complex, in that they can contain as parts mental items of the same type, without being mere combinations of those items. If this kind of picture is also true of the kind of mental complexity required by panpsychism, this rules out all but cosmopsychist (of the kind developed by Philip Goff) and similar versions of the view.

### **Why I Am Not a Cosmopsychist (or Am I?)**

Luke Roelofs

Institute for Philosophy, University of Bochum

Cosmopsychism is a variant of panpsychism which adds, to the defining panpsychist idea that the fundamental things are conscious, that there is only one fundamental thing, the universe. Cosmopsychists sometimes suggest that this gives them a major advantage over ‘micropsychists’ (who think that the fundamental things are very many and very small) in addressing the combination problem, or in accommodating their view to modern physics. In my recent book, I defend a version of constitutive panpsychism (‘Panpsychist Combinationism’) that comes very close to cosmopsychism, but doesn’t quite qualify by most standard definitions. I examine the way the debate between cosmopsychism and micropsychism is usually framed, and my reasons for dissatisfaction with this framing. In doing so I try to articulate why I don’t think of Panpsychist Combinationism as either cosmopsychist or micropsychist and why I’m sceptical of claims that cosmopsychism makes a crucial explanatory difference.

### **Russellian Panpsychism and the Heart of the Hard Problem**

David Bourget

Center for Digital Philosophy, University of Western Ontario, London

Russellian panpsychism is supposed to help with the hard problem of consciousness by reconciling the largely a priori position that phenomenal properties don’t reduce to “structure and function” with the existence of mental-to-physical causation in a causally closed physical world, thereby avoiding the dilemma constituted by traditional

physicalist and dualist positions. But this dilemma is not the heart of the hard problem. The heart of the problem is the mapping problem, roughly, the lack of an explanatory pattern in mind-body associations. This is a challenge that both dualists and physicalists have to contend with within their respective metaphysical frameworks. In this talk, I argue that panpsychism is strictly worse than the alternatives when it comes to dealing with the mapping problem.

### **The Selection Problem for Constitutive Panpsychism**

Philip Woodward

Neuroscience Program, Valparaiso University

Constitutive panpsychism is the doctrine that macro-level consciousness is built out of irreducibly mental (or proto-mental) features had by some or all of the ultimate physical constituents of reality. I pose the ‘selection problem’ for constitutive panpsychism: the problem of explaining why/how macro-level consciousness changes over time. For the constitutive panpsychist, changes in macro-level consciousness amount to changes in either the way that micro-conscious entities ‘bond’ or the way that micro-conscious qualities ‘blend’ (or both). We have learned from contemporary neurobiology that changes in consciousness are dependent on high-level functional states of the brain. I argue that it is empirically implausible that any mediating mechanism connects high-level functional states of the brain with changes in bonding/blending at the micro-level, and thus that the selection problem is unsolvable.

### **Panpsychism and Free Will**

Philip Goff [chair]

Department of Philosophy, University of Durham

There has been a resurgence of interest in panpsychism in contemporary philosophy of mind. Many hope that panpsychism can provide an attractive way of solving the hard problem of consciousness, avoiding the deep difficulties associated with the more conventional options of dualism and materialism. There has been little focus, however, on whether panpsychism can help with philosophical problems pertaining to free will. I will argue for that it is coherent and consistent with observation to ascribe a kind of libertarian free will to particles, resulting in a view which we can call ‘pan-libertarianism.’ I will not argue that we have reason to think this view is true, but I will suggest that if one is already motivated to believe in libertarian free will, then one has reason to prefer the pan-libertarian view over more conventional forms of libertarianism.

## Quantum Biology

Functional roles for quantum physics in biological activities relevant to consciousness have been proposed, for example in microtubules in the Penrose-Hameroff theory of ‘orchestrated objective reduction’ (‘Orch OR’). If feasible, quantum computation, entanglement and unitary coherence of states of microtubules and other components, suggested in Orch OR, can account for enigmatic features of consciousness. These include the ‘cognitive binding’ problem (via non-local entanglement among separated brain regions), action of anesthetic gases and psychoactive molecules, temporal non-locality required for language processing and real-time conscious action (free will), the origin of EEG rhythms, and an approach to the ‘hard problem’ of conscious experience. In this workshop, Jack Tuszynski will discuss recent discoveries regarding the quantum biophysics of microtubules. Andrew Adamatzky will describe cytoskeleton-dependent problem-solving and oscillatory behavior in the single-cell giant amoeba slime mould. Christian Kerskens will address quantum nuclear spin in the brain, as seen in MRI images in awake subjects. Stuart Hameroff will point to non-polar ‘quantum-friendly’ regions within microtubules where anesthetics act (the ‘Meyer-Overton quantum underground’) as the biological origin of consciousness, and provide an overview of the current debate on quantum brain biology and consciousness.

### Construction of an Integrated Model of Neuronal Bioelectric Circuitry

Jack Tuszynski [chair]

Department of Mechanical and Aerospace Engineering, Politecnico di Torino

The Hodgkin-Huxley model of action potential propagation has been the corner stone of neuroscience for over half a century. Mounting evidence from microscope and nanoscale experiments indicates a deeper-level of electric conduction behaviour involving various constituents of living cells including neurons. I will provide an overview of the recently revealed non-trivial conductive properties of microtubules, actin filaments, ionic species and, of course, ion channels. I will attempt to provide the outlines of an integrated bioelectronic model of neuronal circuitry.

### From Cerebral Circulation to Quantum Consciousness

Christian Kerskens

Trinity College, Dublin

Long-range quantum coherence is potentially important for the realisation of quantum computing. In this talk, I will report on our findings in the human brain where we showed that the cardiac pressure pulse evoked zero spin echoes (ZSEs) in brain parenchyma. ZSEs are thought to be generated by long-range intermolecular zero-quantum coherence (iZQC). From our experimental results, we could conclude that the observed quantum coherence originated from an underlying unknown physiological mechanism.

In further observations, we linked this unknown mechanism to consciousness because, firstly, only sporadic ZSE signals were detected during sleep and secondly, it was evoked by the pressure wave which in turn is also essential for consciousness. In the discussion, I will focus on the coherence’s possible physiological origin.

### Cytoskeleton-Dependent Problem Solving and Oscillatory Behaviour of Slime Mould

Andrew Adamatzky

Dept. of Computer Science and Creative Technologies, University of the West of England, Bristol

Slime mould *Physarum polycephalum* is a large single cell capable for distributed sensing, parallel information processing and decentralised actuation. Having no nervous system the slime mould is capable for making optimal decisions while met with complex tasks. The slime mould’s “nervous system” is a spatially distributed pool of biochemical oscillators and networks of tubulin microtubules and actin filaments. Using results of our laboratory experiments and computational models we uncover mechanisms of the slime mould’s awareness, perception of its surroundings, and optimal responses to chemical, mechanical and optical stimuli. We illustrate our findings with prototypes of the slime mould morphological processors for approximation of Voronoi diagrams, planar shapes and solving mazes and overview a range of electronic components – memristor, chemical, tactile and colour sensors – made of the slime mould.

### Quantum Biology and Consciousness - The State of the Debate

Stuart Hameroff

Center for Consciousness Studies, University of Arizona at Tucson

Recently, functional quantum states and entanglement have been discovered in photosynthesis, among bacteria, bird navigation, microtubule resonances and anesthetic action. The quantum states originate in non-polar solubility regions inside proteins including microtubules where anesthetics act to specifically erase consciousness. Evidence in this direction has diversified with biological experiments, quantum optics, computer modeling of microtubule quantum states, anesthesia action, microtubule information processing, temporal nonlocality in language and cognition, nuclear spin and quantum coherent MRI. Implications for the Orch OR theory and understanding of consciousness will be discussed.

# Abstracts

## East-West Forum

In order to create intercultural dialog with Eastern views of conscious experience, TSC conferences traditionally offer an East-West Forum. The forum is organized in cooperation with Dayalbagh Educational Institute (Agra, India) on June 25, concurrent with the in-depth workshops.



08:15–08:45

**An Experiential Analysis of the Hard Problem For Consciousness Research**

James J. Barrell

Department of Psychology, University of West Georgia, USA

The Hard Problem for consciousness research refers to the difficulty in *understanding how physical processes in the brain relate to subjective experiences*. I wish to suggest that to better understand this problem we need to go to our own direct experiences rather than to our ideas and beliefs. The primary tool for this exploration is *awareness*. A common barrier to this form of exploration for both Eastern and Western methods of research is a reliance on theories or already established belief systems.

We need to begin with the obvious, that is, even the observation and cognition of physical processes is a subjective experience. We cannot step out of our experiences! Thinking, feeling and sensing are all forms of experiencing. The cognitive observation of physical processes is simply another form of experiencing. Experiences can be discreet and it is the relationship between these experiences that needs to be understood. For example, what is the relationship between an experience that is a visual observation of somatosensory activity in the brain and the experience of felt touch? Is it that of causation, correlation, probability or some other form of association?

Some of the important aspects of experience include the *primacy of sense data* as well as *inner and outer viewpoints*. It will be suggested that sensations are the basic units of experience. Moreover, there will be a focus on the interactions between these sense modalities. The distinction between inner and outer viewpoints can be readily seen in comparing the inner experience of thoughts with the outer experience of the brain or brain waves. These aspects of experience will be utilized to help us better understand the nature of the Hard Problem.

08:45–09:45

**Complete Neuro-Theology as Ultimate Reality Science of Consciousness**

Prem Saran Satsangi, Emeritus Chair (East)

Dayalbagh Educational Institute, Dayalbagh, Agra, India

Radhasoami philosophy (based on ‘Saar Bachan’) revealed by Param Purush Puran Dhani Huzar Soamiji Maharaj two centuries ago has consistency with other extant spiritual meditational practices of the world, to name a few, Buddhism (Buddhavacana), Jainism (Agamas), Christianity (Bible), Islam (Koran), Sufism (e.g. the Masnavi of Maulana Rumi), Sikhism (Guru Granth Sahab) and Hinduism (as represented by Vedas, Upanishads and Gita). In contrast, much of Western scientific and philosophical study of consciousness takes place in a secularized setting. To facilitate this integration, we have generalized the modelling framework for contextuality based quantum telepor-

tation to n-dimensional quantum states, or n-qudits (quantum odd-prime based units) which holds considerable promise for even higher mathematical abstraction. Leading scientists like Stephen Hawking and Max Tegmark find that we are in the age of superintelligent machines and are a little worried and propose our safety as the major requirement. We believe that the Supreme Creator has already provided for that safety and what they dread is indeed, the Ultimate Reality, so there is no need to dread that. The Supreme Creator is behaving as an innovative entity and His actions conform to Hilbert vector space and Schrödinger’s equation and the associated wave function and this is baffling scientists as they do not want God to be identified as a mathematical construct. Once we become spiritual subtle particles, we are not bothered any more about these trivial things of the physical world as we have crossed the physical world. We are in the Universe of Mind, let us say, and that is where the Hindu philosophy and much of the philosophy anywhere else ends. We are the only ones (i.e. religion of Eastern Saints) who go way beyond that and we know that one day, the Universe of Mind has also to be wound up (Great Dissolution) and it will be all Purely Spiritual Universe and that is the ultimate reality, but this will take infinity to the power infinity time to complete its mammoth task of providing this benefit to infinity to the power infinity size of people. They are not all here on this earth for us to be aware of them, but they do exist, some of them in subtler particle shapes, some of them in very much less fortunate births which often require deaths, so they are caught in this cycle of birth, death and rebirth and they are not able to break out from it. This is the kind of task which involves particle sizes which are much smaller than the 10-35 metre known as Max Planck dimension and which involves distances larger than 1010 light years. All these begin to fall in shape and begin to fall in our inner range of experience if we stick to the philosophy such as what we follow. There are other groups also following similar philosophy also and they are enjoying this kind of benefit. We are not the only ones, but like several schools, we are content only with Ultimate Reality, so this is where we differ. We promise and we experience through our Mentor the Ultimate Bliss, final state that we all aspire to reach where there is nothing but happiness all the time, what we characterize as bliss. That explains the motivation for leading a sort of disciplined life and doing selfless service to the community.

09:45–10:00

**Spiritual Experiences Compiled in Workshop Conducted by Divinity Study Forum at Dayalbagh Educational Institute**

Prem Prashant

President, Dayalbagh Educational Institute, Agra, India

The Divinity Study Forum at Dayalbagh has been active since 1981 and maintains a library of religious texts of all Faiths and also issues clarifications sought by members of the community, and even outsiders, as referred from time to time. It remains in contact with similar study groups at other major Radhasoami centres regarding various texts authored by our common Founder.

What distinguishes the Radhasoami Faith or the Religion of Saints is, right from day one of its founding, it is endowed with the clear definition of the object in view. It is

common place that the first initiates do get the refulgent picture of their Mentor or Adept at the seat of the spirit or higher centres of consciousness to which they have gained access, when they perform meditation. The ultimate acid test of consciousness is First-Person Inner Experience Of Spiritual Phenomenology Through “Surat-Shabda-Yoga” (i.e. Meditational Practice of Uniting Spirit Current with Sound Current). We have oath of secrecy in our faith (Radhasoami Faith) prohibiting members of the Faith from sharing inner experiences, but the Mentor or Adept is exempt from this oath and meditationists may confide in him as they do in other religions (e.g. confession). Accordingly, the identity of meditationists is masked by the Mentor / Adept under an assigned Code Name before disclosing the first-person inner experience of spiritual phenomenology for scientific research investigations. The Mentor or Adept exercises the privilege of sharing inner experiences under the assigned code name without disclosing the individual personal identity.

A call was issued in all branches and announced in the Central Satsang Hall, Dayalbagh on April 24, 2018 soliciting first-person accounts of spiritual experiences to be submitted in sealed envelope to Divinity Study Forum by May 15, 2018. The objective was to collect data for a Workshop on first-person experiences for a scientific study of consciousness. Around 269 responses were received from all Regions as well as foreign countries in various languages, mostly English and Hindi, and also in Tamil, Telugu and Oriya. The sealed envelopes were opened after taking due permission of the Mentor. The envelopes were opened and the names and addresses were hidden by pasting paper slips on them to maintain secrecy of the process.

Once again, all these experiences point to the immense Grace and Mercy and Merciful Hand of Protection of Gracious Huzur Prof. Satsangi Sahab on the Radhasoami community all over the world and marks a continuity with spiritual experiences of devotees since the time of Param Guru Huzur Mehtaji Maharaj and Gracious Huzur Dr. Lal Sahab. The experiences were broadly classified into four categories - Worldly Experiences, Meditational Experiences, Out of Body Experiences and General Guidance and Protection. This preliminary study lays the groundwork for more extensive scientific studies to be presented before international audience at events like TSC.

10:40–11:10

### Consciousness as a Process in the Fine Scale Structure of the Universe

Stuart Hameroff MD, Emeritus Chair [West]

Center for Consciousness Studies, Banner-University Medical Center, University of Arizona at Tucson, Arizona, USA

The nature of consciousness and the ‘measurement problem’ in quantum mechanics are scientific mysteries which appear to be related. Regarding consciousness, Western science casts it as a computation among brain neurons, whereas Eastern philosophical approaches view consciousness as a fundamental property of the universe. The measurement problem deals with why we don’t see quantum superpositions (multiple co-existing possibilities) in our perceived world, and one proposed solution is that conscious observation causes superpositions to reduce, or ‘collapse’ to definite states.

Such a view is dualist, putting consciousness outside science. Roger Penrose proposed an alternative solution in which superpositions are separated curvatures in the fine scale structure of the universe space-time geometry. These separations are unstable, and collapse (undergo quantum state reduction) at a critical objective threshold (objective reduction, ‘OR’), selecting particular states, and producing moments of (proto-) conscious experience, ubiquitous throughout the universe. The Penrose-Hameroff ‘Orch OR’ theory suggests these proto-conscious OR events are ‘orchestrated’ (‘Orch’) and unified by quantum vibrations in microtubules inside brain neurons into moments of full, rich conscious experience (‘orchestrated objective reduction’, ‘Orch OR’). Thus Orch OR is a non-dual solution to the nature of consciousness and the measurement problem, reconciling Eastern and Western views by linking consciousness to rearrangements in space-time geometry, the fine scale structure of the universe. Orch OR also provides a scientific basis for quantum ‘non-local’ aspects of consciousness, including various possibilities for consciousness outside the brain.

11:45–12:15

### Consciousness: Translated Matter – or a Matter of Translation?

Anna-Margaretha Horatschek

English Department, Christian-Albrechts University, Kiel, Germany

In Amitav Gosh’s 2004 novel *The Hungry Tide*, Nirmal Bose, an Oxford educated social reformer in India, quotes the German poet Rilke with the observation that “*animals ‘already know by instinct we’re not comfortably at home in our translated world’*”. ‘Translation’ in its root meaning of ‘carried across’ - from Lat. *trans-latus* - here denotes the trans-lation of the precarious ecological reality of the Sundarbans into discourses, which range from ecological models constructed in US universities to religious grassroots traditions embodied by largely illiterate Dalit refugees. Such conceptual border crossings from ‘the Universe of Things’ (Shaviri 2014) to semiosis, from ontology to epistemology, from body to mind and vice versa, occupy center stage in the science of consciousness. This traffic across the Cartesian divide of mind and matter is reflected in – and motivated by - competing definitions and semantics of the ‘object’ of investigation: ‘Consciousness’ is conceptualised for example as a discursive construct, or as the epiphenomenon of highly complex interrelations of material givens, cultural input and individual predispositions, or as the phenomenal manifestation and format of neural processes in the brain. Semantically, in Western cultures ‘consciousness’ is mostly understood as an intramundane – defining - feature of the individual human subject. In various Indian philosophies, ‘consciousness’ denotes a transindividual, metaphysical ultimate reality, which defies any semiotic representation (K.R. Rao, *Consciousness Studies*, 2002): “How may I ever express that secret word?” (Kabir). But then how to format such an entity epistemologically and semiotically?

Literary texts in East and West have negotiated concepts of ‘consciousness’ implicitly for centuries, and explicitly more recently in so-called neuro-novels and in science fiction. My analysis of selected novels including Richard Powers’ *Galatea 2.2* (1995), Peter Watts’ *Blindsight* (2006), and E.L. Doctorow’s *Andrew’s Brain* (2014) on the one

hand will focus on the novels' discursive negotiation of the problems outlined above, on the other hand it will address their literary solutions to representing – and thereby converting and translating – specific concepts of consciousness into verbalised artistic form, sometimes in explicit contradistinction to for example, numerical representation. In contrast to the novels' predominantly discursive negotiation of 'consciousness', poetry by T.S. Eliot (1888-1965), and Kabir (1440 – 1518) illustrates verbal performances in East and West of what would be characterised as spiritual consciousness. Do the forms of semiotic representation perhaps themselves produce specific concepts of 'consciousness' for the reader?

In accordance with the decisive role explicitly assigned to verbal language in the methodology of Barrell and Price (*Inner Experience and Neuroscience*, 2012: 6, 88-91), literature's discursive, performative and aesthetic explorations of 'consciousness' establish language as an indispensable aspect of any concept of consciousness; at the same time these literary "experiments in life" (George Eliot), by storifying and thereby concretising abstract concepts under historically and culturally specific conditions, ground and test central questions of consciousness studies in worlds of lived experiences.

12:15–12:45

#### **Temporal Nonlocality**

Harald Atmanspacher

Collegium Helveticum, Switzerland

The concept of nonlocality is firmly established as a key feature of quantum physics, where it has been demonstrated many times by violations of Bell-type inequalities. Analogous to this spatially conceived nonlocality, one can formulate temporal Bell inequalities, whose violation would imply a temporal kind of nonlocality. It entails that states of a system are not crisply localized in time but range over a temporal interval of non-vanishing duration, expressing the idea of an extended present. Corresponding ideas have often been discussed in phenomenological analyses of mental states, in both Eastern and Western traditions. This presentation will take the concept of temporal nonlocality from phenomenology to the psychophysics of bistable perception. A quantum-inspired model of bistable perception, the Necker-Zeno model, violates temporal Bell inequalities and offers options to test such violations experimentally.

12:15–12:45

#### **From QBism to Active Pluralism: QBism in Search of an Ontology**

Christopher A. Fuchs

University of Massachusetts at Boston, USA

QBism is an interpretation of quantum mechanics that takes any individual agent's actions and experiences as the central concern of the theory. This interpretation is distinguished by its use of a thoroughgoing subjective Bayesian account of probabil-

ities to conceive the quantum mechanical Born Rule as a normative addition to good decision-making. Yet, we are who we are because of the kind of world we live in, and even if the Born Rule is to be understood as merely a normative tool, it does not mean that its mathematical form cannot give a clue to the character of the wider world. Most revealing in this regard is the combination of QBism's interpretation of probability-1 – *even it* is to be understood as subjective – along with Bell inequality violations and the Kochen-Specker theorem. Taken together they indicate that whenever an agent reaches out and touches the world (i.e., performs a quantum measurement), a small instance of creation occurs. From this perspective, quantum theory is a user's manual any agent can use to help guide his little part and participation in the world's pervasive creation. Or to say it a bit poetically, QBism indicates that the universe's creation is not isolated to the distant past (like the Big Bang), but something going on around us all the time, and we by our presence and activity are part of the story. But if creation, creation of what? New material? New information? Perhaps both and neither. Every quantum measurement has a subject pole and an object pole, but neither can be conceptually isolated from the whole, no more than a magnet's north and south poles can. This hints of an ontology in which the stuff of the world is neither mind nor matter, but something else entirely. Philosophers have called this "neutral monism" – but what a dead, inactive term for something animated with activity and additive to the whole in its creative aspect. Perhaps we need a more descriptive turn of phrase, like "active pluralism." In this talk, I will expand on these points and try to draw a grand, Shakespearian conclusion, "We are such stuff as quantum measurement is made on."

13:15–13:45

#### **David Bohm on Dialogue**

Paavo Pykkänen

Department of Philosophy, History and Art Studies, University of Helsinki, Finland

QBism is an interpretation of quantum mechanics that takes any individual agent's actions and experiences as the central concern of the theory. This interpretation is distinguished by its use of a thoroughgoing subjective Bayesian account of probabilities to conceive the quantum mechanical Born Rule as a normative addition to good decision-making. Yet, we are who we are because of the kind of world we live in, and even if the Born Rule is to be understood as merely a normative tool, it does not mean that its mathematical form cannot give a clue to the character of the wider world. Most revealing in this regard is the combination of QBism's interpretation of probability-1 – *even it* is to be understood as subjective – along with Bell inequality violations and the Kochen-Specker theorem. Taken together they indicate that whenever an agent reaches out and touches the world (i.e., performs a quantum measurement), a small instance of creation occurs. From this perspective, quantum theory is a user's manual any agent can use to help guide his little part and participation in the world's pervasive creation. Or to say it a bit poetically, QBism indicates that the universe's creation is not isolated to the distant past (like the Big Bang), but something going on around us all the time, and we by our presence and activity are part of the story. But if creation, creation of

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13:45–14:15

### **Authors of the Impossible: Reading the Paranormal Writing Us**

Jeffrey Kripal

Department of Religion, Rice University, Houston, Texas, USA

The lecture treats paranormal phenomena as "semiotic" in nature, that is, as meaningful signs that need to be interpreted with the tools of the humanities but that also involve physical events. As such, these phenomena break down or challenge our usual egoic assumptions around subjectivity and objectivity and point to some sort of nondual or monistic model of the cosmos and the human being as an expression of it. I have called these paranormal events/experiences "nondual signals."

14:15–14:45

### **Plants, Associative Learning, and the Ubiquity of Minds**

Chauncey Maher

Philosophy Department, Dickinson College, Carlisle, USA

Monica Gagliano and her colleagues (Gagliano et al. 2016) recently performed an experiment that suggests that garden peas engage in associative learning, the type of learning made famous by Ivan Pavlov's experiments with dogs. This is significant, for it leads to a puzzle, arising from the clash of three plausible claims. The first claim grows from Gagliano's experiment: associative learning is ubiquitous, for we see it not only in mollusks (Walters et al. 1981) and the transected spinal cords of rats (Allen et al. 2009), but now also in peas. The second claim is that associative learning is a mental process, studied by psychologists, and taught to students in psychology courses. The third claim is that minds are not ubiquitous; only some creatures have them. So, we have:

1. Associative learning is ubiquitous.
2. Associative learning is a mental process.
3. Minds are not ubiquitous.

These three claims clash; we cannot believe all of them at once. If we accept any two, then we must reject the remaining one, yet each seems plausible. That is the puzzle. What should we do? Are minds not unique, perhaps an aspect of merely being alive

(Thompson 2007; Godfrey-Smith 2016)? Is associative learning not really a mental process, only a physiological one (Buckner 2015)? Or, finally, do garden peas not engage in genuine associative learning, but only a modest precursor of it (Schactman & Reilly 2011)? In this talk, after developing this puzzle more fully, I assess the merits of these alternative solutions to our puzzle.

14:45–15:15

### **A Panpsychism of the "Mighty Hum"**

William Seager

Department of Philosophy, University of Toronto, Scarborough, Canada

Panpsychism, the view that consciousness is a fundamental feature of reality which is ubiquitous or at least widely spread out through the universe, faces a number of objections (beyond the frequently noted but less philosophically serious problem of – to Western analytic minds at least – brute and severe implausibility). One central problem concerns the nature of the fundamental elements of consciousness. It is natural to think of these as highly specific and extremely simple instances of phenomenology (e.g. an experience consisting solely of a particular shade of visual blueness). Some panpsychists then associate these fundamental elements of consciousness with fundamental physical features. This leads directly to the infamous combination problem of understanding how there could be any kind of "mental chemistry" which generates complex conscious states out of the fundamental simple forms. Extending some ideas of Ginsburg and Jablonska as well as Godfrey-Smith, an alternative sees the fundamental form of consciousness as a kind of "white noise" encompassing all possible forms of conscious experience. This is the "mighty hum" of the entire universe. The problem is then to understand differentiation into particular experiences which are "drawn out" of the background hum. This paper explores this way of thinking about panpsychism and its prospects.

## Contributed Oral Presentations

### Quantum Game Theory: Evolving Nash Equilibrium into Quantum Equilibrium Interdependence Game Strategy

Adhar Sharma

The most well known game in game theory – “prisoners’ dilemma” is based on classical definite states or bits that govern the attainment of Nash Equilibrium as the game-play occurs. At times they also lead to a No-Win situation. In the quantum version of game theory, the bit is replaced by a qubit and the qubit’s state constantly flips, thus altering the probability amplitude of each of the base states. This defeats the very statistical-mechanical approach to the game and due to the superposed entangled initial state, the attainment of a singularity of every outcome needs to be measured and no outcome could be predicted considering the fact that Nash Equilibrium would be non-existent under such conditions. It would also eliminate the occurrence of a No-Win situation in certain cases. This would lead to the very creation of a new type of Quantum Equilibrium Game Strategy in a multiplayer setup (more than two) under which entanglement of states would cause the formation of contracts and voids. By bringing quantum mechanics into the game research shows that players using quantum resources would far supersede any classical player and thus revolutionizing the current game theory applications.

### Consciousness Perspectives in Radhasoami Faith - Sustenance of Dual Aspect Monism and Beyond

Swati Idnani, Suresh Idnani, Pushpa Idnani, Sneha Idnani, Teena Idnani

Mind-Body dualism has been known of and discussed far and wide since the origin of various philosophical views associated with but not limited to consciousness and mind-body evolution. In a world that seems to acknowledge the dualism, either we embrace a form of dualism but then we have problems with mental causation or we embrace a form of physicalism but then we seem to have lost something of crucial importance - the very mental character. Double-aspect theory is the view that the mental and the physical are two aspects of, or perspectives on, the same substance. It is also called dual-aspect monism. Double-aspect theory requires the mental and the physical to be inseparable and mutually irreducible (though distinct). It is a parsimonious, elegant, and simple view while avoiding problems with ‘mental causation’. It naturally explains how and why mental states are correlated (and interact) with physical states while avoiding any mysteries concerning the nature of this (cor)relation. In this abstract, we aim to draw upon the depth of the concept of Dual aspect Monism that clearly reflects in the Consciousness Perspectives of Radhasoami Faith, thereby establishing how experience and science together are the foundation of spiritual ascension.

### Comparative Computational Analysis of Synaptotagmin Genes in Human and Plants

Rajiv Ranjan, Mrinalini Prasad

Plant consciousness is the process of bio-communication in plant cells. Neurotransmitters are commonly called brain of plants. Synaptotagmin is a gene which is the master switch responsible for allowing the human brain to release the neurotransmitters. Synaptotagmin genes exist in a large family of mammals. It is an abundant synaptic vesicle protein that contains two copies of a sequence that is homologous to the regulatory region of protein kinase C. Full length cDNAs encoding human and drosophila synaptotagmins were characterized to study its structural and functional conservation in evolution. Many synaptotagmins were discovered from plants and found to perform many crucial physiological roles in plants. In the present study, Synaptotagmin genes of *Arabidopsis thaliana*, *Aegilops tauschii*, *Brassica rapa*, *Brachypodium distachyon*, *Glycine max*, *Hordeum vulgare*, *Oryza sativa japonica*, *Populus trichocarpa* from public sequence databases were compared with SYT genes of human beings as standard using various bioinformatics approaches like Ensembl plant, Emboss needle, ProtParam, SOPMA, Swiss model etc. Amino acid sequence comparisons indicated patterns of conservation in human beings as well as plants. Phylogenetic analysis showed the origin of synaptotagmins in plants which clearly indicated the evolutionary significance of SYT genes in humans, animals and plants. The detailed delineation of the synaptotagmin genes presented here would allow easier identification of orthologs for other plants in future.

### Effect of Mindfulness on Teacher-Stress In Prospective/in-Training Teachers

Vineeta Mathur, Rahul Mathur, S. Anukool

Mindfulness is described as paying attention in the present moment, on purpose, and without judgment (Kabat-Zinn, 1994). Mindfulness as applied to classroom teachers is just beginning to be investigated. Mindfulness practice evolves teacher quality and is a process of becoming skilled in living in the present moment. It is attending to experiences which are happening now.

Teacher stress in the classroom in terms of psychological symptoms, burnout and teaching behaviour remains a significant challenge in education. Stress includes time demands, workload, student disruptive behaviour, and organizational factors. This study aims to quantify the effect of mindfulness of student teachers or teachers in training on reducing teacher stress. The hypothesis is that mindfulness training is a promising means for cultivating attention and reducing stress in prospective teachers. This study is important to inspire educators and suggests that mindfulness training should be made an important part of teacher training programmes to help educate the supermen of the future.



**Modelling Neuro-Psycho-Physical Parameters of Inner Experiences:  
An Integrative Mixed Methodological Experimental Study**  
Pooja Sahni, Prakash Sahni, Jyoti Kumar

EEG studies have provided evidence of enhanced structural plasticity, brain synchrony, and neural oscillations. On the other hand, novel experience monitoring tools can yield an in-depth understanding of the human mind. This study employs a mixed method approach to comprehensively examine the neuro-psycho-physical pathways that are functional during experiences in the natural environment, termed as ‘Nature experience’. Results from pre-post data analysis show nature experience elicits increased positive affect, improved attention and enhanced memory, presence of higher alpha and beta in ‘fronto-parietal network’, altogether suggesting a state of ‘relaxed alertness’ after nature experience. There was no significant change in the engagement index during post-test cognitive task indicating an instorative effect of nature experience which tends to stay after the nature exposure. Nature experience also induced a stronger correlated activity across different brain regions with a right lateralization known for creative thinking and consciously practicing mindfulness. It was interesting to note that subjects engaged in meditation, independent of meditation technique and degree of experience, also report similar neural activity (Lomas, 2015). Therefore, nature experience may be considered to promote the first basic change in the course of meditative development.

**Can Eastern and Western Perspectives Divide Consciousness?**  
Pushpa Sahni

Can we divide this earth, sky and human on the basis of eastern and western perspectives? Is the water present on earth different from eastern and western point of view? Do the trees have roots, stems, branches, leaves and fruits from eastern and western point of view? Can consciousness be divided on the basis of eastern and western perspectives? From eastern perspective, understanding how the material brain produces subjective experiences is based on inner experience which a subject experiences while performing meditation. Some scientists understand that the unique features of quantum physics can explain the mysteries of consciousness. From western perspective, scientists believe that the mysteries of consciousness can be unveiled by understanding mechanism of anesthesia in human brain. Also according to anesthesiologists, there are two intertwined mysteries at work. First, it is difficult to understand how anesthetics work, at least not on a neurological basis. Second, we really don’t understand consciousness – how the brain creates/receives it, or even what, exactly, it is. After brain death, consciousness becomes unrestricted and the personality becomes pure consciousness. It is also arguable that anesthetics may not be a useful tool to study consciousness because of their diverse molecular actions and differing molecular actions can nonetheless result in a single common mechanism. Our present experimental study on microtubules and anesthetics is also in line with above understanding.

**Paramahansa Yogananda: A Yogi or Newton of Biology?**  
Ruchi Kulshreshtha, Mohit Kulshreshtha

Vitalists philosophised that the phenomenon of life cannot be explained in purely mechanical terms because there is something immaterial which distinguishes living from inanimate matter. Yogananda comes with a clarification that this “something” popularly called as life-force or vital force is “immaterial” in the sense that it is having a consciousness-like nature (being actually, “neither grossly material nor purely spiritual”) and so, its “vibration” is too “subtle” to be detected by any “gross” instrument of matter. This explains the failure of vitalists (and their challengers alike) to detect its presence and the consequent erroneous conclusion that it (i.e. the hypothesized life-force) may not actually exist. Yogananda, however, avoids the pitfall by adding that “only consciousness can comprehend consciousness”; thus, according to him the living body of an aspiring yogi is the perfect detector for these “sparks of intelligent finer-than-atomic energy,” Prana (Sanskrit word for the life-force) and the Yogic practice of Pranayama (i.e. life-force control) is the method for doing science with it.

**Metaphysical Poetry as an Expression of Inner Experience: Comparative Study of Eastern and Western Poets**  
Jyoti Swami, Surat Sahni

This paper examines the role of metaphysical poetry to explain the existence of conscious experience and to reveal the significance of unnoticed or hitherto unappreciated aspects of the inner experience. It attempts to decipher the inner experience through poetic expression of metaphysical poets. We study John Donne and T.S. Eliot from the west. From the east we review the works of Rabindranath Tagore and the poetry of His Holiness Shiv Dayal Singh ji Sahab. The review of metaphysical styles reveals some of the significant commonalities and differences that exist.

**Conscious Experience and Cognitive Ability: A Correlational Analysis**  
Sant Pyari Saxena, Sona Ahuja, Ovidiu Brazdau

Conscious experience is the state of wakefulness or state of knowing oneself or something within oneself or being aware of external objects. Conscious experiences are mysterious and subjective in nature. Recent studies in the field of consciousness suggest that conscious experiences can help in better understanding of feelings, emotions of oneself and others and thus improve the rate of development and quality of life. It may also enhance the emotional and cognitive abilities. Cognitive abilities are related to mental skills and brain based functions which play a vital role in growth and development and are needed to carry out any task from the simplest to the most complex. These have more to do with the mechanisms of how we learn, remember, problem-solve, and pay attention, rather than with any factual knowledge. The present study examines the relationship between conscious experience and cognitive abilities.

Consciousness quotient and general mental ability of participants (N=270) were assessed. Pearson's correlation was used to identify the relationship between conscious experience and cognitive ability. The study also determined the influence of conscious experience in prediction of cognitive abilities using linear regression analysis. The relationship of cognitive ability with different dimensions of the consciousness experience (viz. physical, emotional, self, social-relational, mental, spiritual and inner growth) are discussed.

#### **Meditation Improves Ability to Inhibit Conflicting Irrelevant Information: A MEG Study**

Honey Sharma, Sona Ahuja, CM Markan

Meditation improves attention, focus and reduces mind-wandering which enhances the ability to code task-relevant information modulating the task-irrelevant information by its practice. The present study is aimed at testing this hypothesis by examining the effect of yoga and meditation on ability to inhibit conflicting irrelevant information. Sixty participants practiced Surat-Shabd-Yoga meditation for 20 weeks. Twenty participants of control group practiced the relaxation technique of sitting quietly for the same duration. Stroop and Eriksen-Flanker tasks were used to assess the ability to override responses that are inappropriate in a particular context. MEG scans during Stroop / Flanker tasks indicated that meditation diffusely enhanced alpha waves and improved the ability to deal with conflict. Comparisons of source estimations revealed that certain occipital, parieto-occipital and prefrontal cortices were recruited in all variations of conflict. Although replication of these results would be necessary, our findings suggest significance of spectral and coherence analysis of MEG data in enhancing previous efforts to assess benefits of meditation training in conflict resolution using objective brain activity measures in conjunction with behavioral and self-report measures.

#### **Tubulin Isoforms as Potential Biosignatures for Information Processing in the Brain**

Raag Saluja, Amla Chopra

Alpha and beta tubulin heterodimers dynamically assemble to form hollow cylindrical polymers called microtubules. These microtubules are an integral part of the cytoskeleton and are known to perform diverse functions. They are especially known for their crucial roles in the nervous system, including both its development and also for maintaining its operations. Data suggests that this diversity in microtubule function arises from a diversity in tubulin and that there exists a "tubulin code". Diversity in tubulin arises from expression of different genes (tubulin isoforms) and different post-translation modifications (tubulin isoforms). These isoforms and their proportion is tissue specific, e.g. Tubulin beta 8 is found only in the heart and kidney. Tubulins have isoform-specific function, e.g., Tubulin beta III is a neuronal marker. Tubulin beta II is abundant in the brain and has a catastrophe frequency three fold lower than that of beta III and is more abundant in the axons than in the cell soma. Tubulin isoforms

vary primarily at the C-terminal region, which is also the region where microtubule associated proteins bind, where post-translational modifications occur and which plays a role in regulating the permeability of mitochondrial voltage-dependent anion channel.

#### **Indian Perspectives on Intuitive Consciousness and Implications for Pedagogical Practices**

Nandita Satsangee, Bajarang Bhushan

The phenomenon of intuition or intuitive consciousness is widely studied by psychologists, philosophers, quantum physicists and transcendentalists. There are disciplinary differences in these perspectives regarding the notion and nurturing of intuition. Whereas, the psychological sciences treat intuition as emerging from an individual's past sub-conscious experiences and domain specific expertise, the transcendentalists, relying on experiential knowledge, consider intuition to originate from a person's connectivity to cosmic consciousness. It is not constrained by an individual's field expertise and could be related to any aspect of a person's experiential reality. The present paper reports the implications of Indian insights on intuition in the context of educational objectives and pedagogical practices, thereby empowering education to bring about a transformation from the present information-based society to a wisdom-based society. In order to test the validity of the proposed pedagogical implications these were empirically tested in an experimental set up. The study reports the quantitative and qualitative findings of the investigation.

#### **Conscious Multimodal Perception and Cross Modal Experience Inspired Deep Neural Framework**

Dhruv Bhandari, Sandeep Paul

It has been illustrated that humans evolve when it comes to sensory integration as they grow. The multi sensory convergence zones in our brain such as superior colliculus evolve with time which is why humans are getting better at handling complex tasks as they grow. This is in line with the McGurk Effect - people who are better at sensory integration have been shown to be more susceptible to it. Hence, our multimodal perception capabilities along with the ever-evolving cross modal experiences which we have in our life result in a stream of discrete moments of consciousness which are unified in nature. Inspired by the above-mentioned theories, we propose a deep learning framework which gradually simulates human perception capabilities and also includes local experiences to give a unified view of the events. We propose two models as a part of this framework. The first model illustrates the significance of multimodal perception whereas the second model builds on the first one to include local experiences and enhances its learning capabilities. We use a benchmark multimodal dataset to test our proposed model. Experiments have been conducted using various modalities and the results have been compared with other techniques. We demonstrate that the proposed model is able to produce better results in most cases and comparable in some cases since it is inspired by the unified nature of human consciousness.

### **Effects of Mindfulness Based Training on the Social Consciousness, Anxiety, and Social Well-Being of Physically Challenged Children**

Astha Upadhyay, Namrata Singh, Archana Kapoor

In our modern, busy lives, we constantly multitask. As humans, we are often "not present" in our own lives. Human minds are easily distracted, habitually examining past events and trying to anticipate the future. This is even more common for children who suffer from some physical anomaly or damage and who are mocked at most of the times. They lose their confidence, become more conscious of their surroundings as to what people think of them, get anxious always and their well-being is affected greatly. Mindfulness is a way of paying attention to, and seeing clearly whatever is happening in our lives. It helps us recognize and step away from habitual, often unconscious emotional and physiological reactions to everyday events, especially the painful ones. The present study was taken up with the aim of finding out the effect of mindfulness based training programme on the social consciousness, anxiety, and social well-being of physically challenged students. The intervention programme consisted of yoga and meditation sessions along with certain relaxation exercises. The students were found to have become more confident in their dealings. Their anxiety levels dropped significantly and the well-being was restored to at least normal levels in most of the cases, highlighting the importance of mindfulness in the present times. The research thus suggests a regular practice of mindfulness in schools as it may prove helpful in making students more confident and resilient; and socially stable.

### **Eastern Philosophy Inspired Modeling of Values and Ethics in Artificial Intelligence Systems**

Ajay Sandhir, Sukhdev Roy

In the early stages of human evolution, physical strength was the deciding factor for dominance. With industrial revolution most of the mechanical activities were taken over by machines, providing impetus to acquire intellectual acumen to dominate lesser mortals. Now, with the advent of AI, with mental work and decision-making being taken over by intelligent machines, there is growing realization of the importance of human values and virtues, and concern as to how they can be programmed into AI systems. This shifts the focus on the inner spiritual dimensions of a human being and propels Eastern wisdom traditions to the forefront. It is argued that this augurs well for the evolution of the human race, to realize its ultimate spiritual potential, through the eastern experiential science of ultra-transcendental meditation. This would lead to the fulfilment of the highest objective of life, which is to achieve salvation and super-consciousness. It would also ensure that no matter how powerful AI based systems may become, they would always be subjugated to super-intelligent human beings.

### **Topological Quantum Computing for Visualization and Understanding of Multi-Particle Quantum Teleportation**

Apurva Narayan, Dayal Pyari Srivastava, Vishal Sahni, Prof. Prem Saran Satsangi

The graph-theoretic quantum system modeling (GTQSM) framework for modeling microtubules in the brain as n-qudit quantum Hopfield network and n-qudit multi-particle quantum teleportation presented by Srivastava et. al. in [1] and [2] are state-of-the-art, and the most comprehensive theoretical models. It is known that quantum information is encoded in topological properties of matter, and the quantum gates are dependent only on the topology of the evolutions, thus both are protected from local perturbations. Such topological quantum computation exhibits inherent hardware-level stability. In this work, we use braid diagrams and holographic software based diagrammatic representation of quantum computing circuits for visualization and simulations of the multiparticle teleportation circuits presented in [2].

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- [2] Dayal Pyari Srivastava, Vishal Sahni, Prem Saran Satsangi: From n-qubit multi-particle quantum teleportation modeling to n-qudit contextuality based quantum teleportation and beyond. Int. J. General Systems 46(4): 414-435 (2017).

### **Psychophysiological Study of the Effect of Surat-Shabda-Yoga Meditation Using Electro Photonic Imaging and Infrared Thermography**

Sant Saran, Sukhdev Roy

Consciousness is the very ground of being. The main problem in the science of consciousness is to measure inner subjective experiences through the objective scientific approach. Surat-Shabda-Yoga or ultra-transcendental meditation is a powerful technique to attain the ultimate state of pure consciousness. Good health is just a by-product of attaining a balanced and controlled physico-physical state by experiencing pure consciousness. In eastern spiritual traditions, it is important to avoid any disturbances during self-absorption in meditation and not harbour any other intention. Hence, it is important to devise measurement techniques that are non-invasive and non-intrusive. The study highlights the usefulness of Surat-Shabda-Yoga meditation on stress reduction, health improvement and attainment of higher states of consciousness. It also demonstrates the effectiveness of the non-invasive, safe, fast and reliable EPI and IRT techniques for not only consciousness and health assessment, but also as a useful tool for medical biometrics.

### **Quantum Bayesianism and Eastern Philosophy**

Shiroman Prakash

In this talk, we argue that QBism is the most philosophically precise statement of quantum mechanics that can be justified by experimental science with no additional assumptions. We also argue that there are relatively simple answers to many objections to QBism if one accepts the fact that quantum mechanics is necessarily a first-person

theory – a viewpoint that is naturally consistent with eastern philosophy – and that any scientific question one can ask can be answered in a first person language, without any recourse to a classical “view from nowhere”. One of the main objections to QBism is regarding the existence of an external reality. What could possibly constitute a description of an object or the external world other than a description of the different ways you can interact with it and all the possible experiential feedbacks these actions can result in? Quantum mechanics, like science, or any collection of statements written in the first-person, presupposes the existence of a subject/scientist who is able to interact with the world in various ways that result in experiential feedbacks. The reasons for abandoning the third-person perspective are the subtle inconsistencies of the probabilities predicted by quantum mechanics with local or non-contextual reality.

### **Identifying Neural Correlates of ‘Chakras’**

C.M. Markan, Honey Sharma, Sona Ahuja, Manjari Tripathi

Decades of research indicates meditation practice is correlated to changes in the EEG frequency bands that are common to a variety of meditation practices. We study practitioners of Surat Shabd Yog meditation traditions with a control group during a meditative and instructed mind-wandering block. Spectral and coherence analysis of MEG data shows that during meditation, activation is seen in the different areas of the brain in the different frequency bands. At the higher frequencies, the activation is mostly seen in the middle line of the brain or originating to the central part including frontal parietal and occipital regions at different time-windows. At lower frequencies i.e delta, theta, alpha, the activation is observed in frontal and occipital areas. As the frequency increases to beta or higher gamma1, gamma2, the activation seems to shift towards parietal, occipital along the midline of the brain. Independent component analysis used to locate centers of these meditational activity appears to indicate neural correlates of ‘chakras’.

# Abstracts

## Plenary Sessions

Plenary sessions include single-speaker presentations by renowned specialists in their field, scheduled on June 26, 27, and 28, and given in classic lecture style. They are thematically grouped into two or three talks, followed by a panel with all session speakers for questions and discussion.



## Complex Brains, Complex Minds

### Connectomics and Consciousness: Integrating Information in Brain Networks

Olaf Sporns

Department of Psychological and Brain Sciences, Indiana University Bloomington

The study of brain networks has become an important new research direction in modern neuroscience, in part driven by the development of novel high-resolution brain mapping and recording technologies that deliver increasingly large and detailed “big neuroscience data”. Network science offers a new framework for how to model and analyze neural systems, from individual neurons to circuits and systems spanning the whole brain. A core theme of network neuroscience is the comprehensive mapping of anatomical and functional brain connectivity, also called connectomics. In this presentation I will review current themes and future directions of network neuroscience, including comparative studies of brain networks across different animal species, investigation of prominent network attributes in human brains, and – most importantly – the use of computational models to map information flow and communication dynamics. Of particular interest in the context of consciousness are those network attributes that promote the integration of information across network systems and modules.

### Consciousness Itself

Mark Solms

Neuroscience Institute, University of Cape Town

David Chalmers questions the conventional cognitive (functionalist) approach to consciousness. What is consciousness if not a cognitive function? My answer starts from the observation that most cognitive functions – like visual perception, which has been the model example in consciousness studies – are not intrinsically conscious. They readily go on ‘in the dark’. Might we make more progress if we consider affect, rather than vision, as our model example? How can one generate a feeling without feeling it? The functional mechanism of affect must explain how and why it feels like something. Therefore, it is of the utmost interest to note that consciousness as a whole is obliterated by tiny lesions in the brainstem regions that generate affect. This suggests that affect is the foundational form of consciousness. If it is, then consciousness itself (as opposed to consciousness of cognition) might be generated by a relatively simple mechanism.

### Placebos from Imagination to Molecules: Lost in Translation

Kathryn Hall

Program in Placebo Studies, Harvard Medical School, Cambridge

Recent identification of neurological, biochemical and genetic correlates of the placebo response have allowed placebos to step out of the shadows of doubt and the imagi-

nation. With mounting threats to clinical practice and drug development, this understanding of the underpinnings of placebos comes at an important time in the history of medicine. In this talk we will examine how placebos have shaped our beliefs in modern medicine and how the placebo revolution offers novel insights into how drugs work and new ways to practice medicine. We will explore the possibility that drugs target the placebo response and what this tells us about how we might interpret their effects in clinical trials. Finally, we will discuss how by freeing placebos from the double-blind ethical bind, we can potentially use honest or open-label placebos in the clinic.

## Plant Cognition

### On the Possibility of Plant Sentience

Paco Calvo

Minimal Intelligence Lab, University of Murcia

Subjectivity may be traced at various phylogenetic stages, with evolutionary biology putting the focus on the explosion of land vertebrate life. But the degree of sophistication of the perceptual apparatuses found in members of other biological kingdoms licenses the quest for the origins of mind beyond Animalia. Plants lack none of the functional structures allegedly needed, provided that the issue boils down in part to biomechanics, endogenous control, and navigation. The vascular system of plants forms a complex information-processing network that allows plants to coordinate and integrate information signaling from root to shoot, and to take appropriate action as the need arises. My talk suggests that consciousness can be studied from an ecological perspective by focusing on how different species perceive the affordances the environment offers. Considering that consciousness appears to play a role in prioritizing the order of an organism’s responses, this talk explores the very possibility of plant sentience.

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Calvo, P. (2017). What is it like to be a plant? *Journal of Consciousness Studies*, 24(9-10), pp. 205-227.

Calvo, P., Sahi, V. P., & Trewavas, A. (2017). Are plants sentient? *Plant, Cell & Environment*, 40(11), pp. 2858–2869.

Reber, A. S. (2018). *The first minds: Caterpillars, karyotes, and consciousness*. New York: Oxford University Press.

### What Forms of Associative Learning Are Plants Capable of?

Chauncey Maher

Philosophy Department, Dickinson College, Carlisle

Recent work by Gagliano and her colleagues (Gagliano et al. 2016) indicates that plants learn by association. This is important. Some have drawn the conclusion that, together with other facts about plants, this shows that plants are cognitive systems (Gagliano et

al 2017; Baluska et al. 2018; van Duijn 2018). Most others object that this inference is hasty (Allen 2017; Abramson and Calvo 2018). This leads to a debate about what cognition is, which sometimes bears fruit (Buckner 2015), but often is inconclusive (Allen 2017; van Duijn 2018). Here I pursue another fruitful line of response: Are they capable of other forms of associative learning? These forms are well-known by psychologists, but haven't yet been connected with plants. In this presentation, I make that connection, identifying several forms of associative learning that should be tested for in plants: latent inhibition, higher-order conditioning, sensory preconditioning, spontaneous recovery, US-devaluation, blocking, and trace conditioning. Testing for these abilities won't settle whether plants are cognitive systems, but it will give us a more fine-grained understanding of how plants and animals are similar and different, which is at least as valuable as that.

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Buckner, C. (2015). A Property-Cluster Theory of Cognition. *Philosophical Psychology*, 28(3), 307–336.

Gagliano, M., Vyazovskiy, V. V., Borbély, A. A., Grimonprez, M., & Depczynski, M. (2016). Learning by Association in Plants. *Nature: Scientific Reports*, 6(38427), 1-9.

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Wednesday, June 26, 2019, 14:00–16:10

Kongress-Saal

## Physics Goes Conscious

### Artificial Intelligence, Computation, Physical Law, and Consciousness

Roger Penrose

Mathematical Institute, Oxford University

It is a widespread view that not only can all the actions of a human brain be simulated by appropriate computation, but that it will not be too far into the future before computers become so powerful that they will be able to exceed the mental capabilities of any human being. I argue, however, by using examples from chess and mathematics, that the quality of conscious understanding is something distinct from computation. I maintain, nevertheless, that the action of a conscious brain is the product of physical laws, whence consciousness itself must result from physical processes of some kind. Yet physical actions, over a huge range, can be simulated very precisely by computational techniques. This is exemplified by the LIGO gravitational wave detectors confirming precise calculations within Einstein's general relativity theory, of signals from black-hole encounters in distant galaxies.

Despite this, I argue that there is a profound gap in our understanding of how Einstein's theory affects quantum systems, and that there is reason to believe that the process termed "collapse of the wave-function" takes place objectively (gravitational OR), in a

way that defies computational simulation. It is argued that each such event is accompanied by a moment of "proto-consciousness", and that actual consciousness is the result of vast numbers of such events, orchestrated in an appropriate way so as to provide an actual conscious experience (Orch-OR).

Experiments to test the OR hypothesis, involving Bose-Einstein condensates, as put forward by Ivette Fuentes and her group in Nottingham UK, will be briefly described.

### From Three Tenets of QBism to a Whitehead-Style Creative Panexperientialism

Christopher Fuchs

College of Science and Mathematics, University of Massachusetts Boston

QBism is an interpretation of quantum theory that takes any individual agent's actions and experiences as the central concern of the theory. In this talk, I will lay out three of its tenets: 1) The Born Rule for calculating quantum probabilities is a *normative* statement. It is about the decision-making behavior *any* individual agent should strive for; it is not a descriptive "law of nature" in the usual sense. 2) All probabilities, including all quantum probabilities, are so subjective they never tell nature what to do. This even includes probability-1 assignments! Thus quantum states have no "ontic hold" on the world – i.e., there is not even a remnant of them in the agent's external world. 3) Quantum measurement outcomes just are personal experiences for the agent gambling upon them. Particularly, quantum measurement outcomes are not, to paraphrase Bohr, instances of "irreversible amplification in devices whose design is communicable in common language suitably refined by the terminology of classical physics." Indeed most quantum measurements, as most personal experiences, may be hardly communicable at all. Yet, the goal of physics always has been (and should continue to be) to draw an ontological lesson from its theories. QBism is no different in this regard, but the lesson is not that "mind is everything". Rather QBism seems to point to something like a Whitehead-style panexperientialism or pancreativism as the basic stuff of the world. The talk's conclusion will be a brief introduction to these thoughts.

### What is Quantum-Like in Consciousness?

Thomas Filk

Institute of Physics, University of Freiburg

The "science of consciousness" and quantum physics share many similarities, in particular when "measurements" or "observations" are concerned. In quantum theory, a measurement or observation is an intervention which not only produces a recorded value but also changes the state of the measured system. As a consequence, observations do not "commute", i.e. the results of successive observations typically depend on their sequence. An additional consequence is "contextuality": The result of an observation depends on which other observations are (or could be) performed. The mathematical formalism of quantum theory takes this into account. For about twenty years the same formal framework has been applied to areas such as psychology, cognitive sciences, economics etc. In numerous situations the obtained theoretical models match empiri-

cal results with astonishing accuracy. In my talk I will sketch the key features of this formalism and point out some similarities and differences between consciousness and quantum physics.

Thursday, June 27, 2019, 08:30–10:40

Kongress-Saal

## Metaphysics of Consciousness

### Does Self-Awareness Provide Access to Our Own Metaphysical Nature?

Martine Nida-Rümelin

Philosophy Department, University of Fribourg

Mature human experience involves pre-reflective self-awareness: an awareness we have of ourselves as the subject of the experience we presently undergo which does not require reflection or conceptualization and which does not present us to ourselves as an object among others. Although pre-reflective self-awareness is non-conceptual it is the origin of central concepts involved in our understanding of what each of us is as an experiencing subject. Crucially, it allows us to form an understanding of what it is for two experiences to belong to one single subject which is (in a sense to be explained) criterion-free. I shall claim that this criterion-free understanding is nature-revealing, in that it allows us to grasp what it takes for two experiences to belong to one single subject. Based on that result, I will develop an argument for the view that the identity of experiencing subjects across time and across possible worlds is ontologically simple. Experiencing subjects are, in that sense, 'perfect individuals'. The argument requires, as a further assumption, that identity across time and across possible worlds, despite its ontological simplicity, must be understood in terms of belongingness of experiences to one single subject. The resulting understanding of identity across time and of identity across possible worlds is then nature-revealing as well. The crucial premise mentioned before – that pre-reflective self-awareness allows us to form a nature-revealing understanding of what it takes for experiences to belong to one single subject – will be defended pointing out that the specific criterion-free understanding at issue has its origin in the most direct access one can possibly have to oneself – in pre-reflective self-awareness.

### Presence and Panpsychism

William Seager

Philosophy Department, University of Toronto

Panpsychism holds that consciousness is a fundamental feature of the world which is very wide spread (how wide spread depends upon the nature of the fundamental entities of the world). The natural route towards panpsychism is to deny that consciousness could emerge from a fundamentally non-conscious reality. A different route, reminiscent of William James's neutral monism, begins with what I will call "presence" as fundamental. When we have a conscious experience we are presented with something.

This is an undeniable aspect of the world in the sense that if it was taken to be illusory then it would be possible for nothing to exist while my experience remained the same! Presence is open to us all, but obscured by our ways of thinking about it, especially by the categories of "mental" and "physical", "self" and "other". I want to explore the view that arises by taking presence as basic and, to use the phrase of Mark Johnson, regarding experiencers not as sources of presence but rather samplers of presence.

### The Pauli-Jung Conjecture and (Some of) Its Implications

Harald Atmanspacher

Collegium Helveticum Zurich

The Pauli-Jung conjecture is a conceptual framework for relations between the mental and the physical that the physicist Wolfgang Pauli and the psychologist Carl Gustav Jung proposed in the mid 20th century. Its metaphysical core is the assumption of one undivided base reality from which the mental and the physical arise as dual aspects by distinction. The presentation will outline key features of this dual-aspect monist account and address some of its implications that have received detailed empirical support so far: (a) the relevance of non-commutative structures in the mental domain, and (b) a typology of psychophysical phenomena at the interface between the mental and the physical. The significance of the known physical laws within the physical domain remains untouched.

Thursday, June 27, 2019, 11:10–12:30

Kongress-Saal

## Varieties of Religious Experience

### Religion as a Technology of the Imagination: Reflections on the Significance of Religious Experience for the Science of Consciousness

Nathaniel Barrett

Institute for Culture and Society, University of Navarra at Pamplona

What can the study of religious experience contribute to the science of consciousness? This paper outlines one way of seeking an answer to this question by focusing on "ordinary religious experiences" that are learned or cultivated through religious practice. Within this scope, I am especially interested in the effects of practice on the experience of everyday life. The central concept for my approach is imagination, considered as a basic condition for conscious experience. After a brief discussion of imagination and its role in experience, I propose to think of religious practice as a "technology of the imagination": a set of techniques for changing our way of experiencing the world by reshaping the imagination. I suggest that this capacity is distinctly human: no other animal, it seems, can change its experience of the world. But religion is not the only such technology that we have. If music and other arts and disciplines can also work to change experience, what, if anything, sets religion apart? I close with a brief consider-

ation of various naturalistic ways of distinguishing religion as a special technology of the imagination, highlighting those that are most suggestive for our understanding of human consciousness.

### **The Flip: Epiphanies of Mind and the Future of Knowledge**

Jeffrey Kripal

Department of Religious Studies, Rice University Houston

This lecture is an optimistic and hopeful observation about a tipping point, about the future – be it near or far — of a new worldview or public culture that is presently forming around the epiphany of mind as a fundamental feature of physical reality. And I do mean epiphany. I mean to point toward a scattered but consistent set of stories about extreme, life-changing “impossible” experiences that intellectuals, scientists and medical professionals have been reporting for centuries now but have written about with increasing visibility and effect only over the last couple decades. This tipping point is also a flipping point. As these stories so dramatically demonstrate, a radically new world can appear with the simplest of “flips” or reversals of perspective (from “the outside” of things to “the inside” of things, from “the object” to “the subject”), and this without surrendering a iota of our remarkable scientific, technological and medical advances. Materialism is not wrong. It is simply half-right. We know that mind is mattered. What these stories suggest is that matter is also minded. This is what I call “the flip”.

Thursday, June 27, 2019, 14:00–16:10

Kongress-Saal

## **Psychoactive Substances**

### **The Neurobiology and Neuropharmacology of Psychedelic-Induced Altered States of Consciousness**

Katrin Preller

Department of Psychiatry, University of Zurich

Psychedelics exert unique effects on consciousness. Studying these altered states and their underlying neuropharmacology and neurobiology gives us important insights into the nature of consciousness. Furthermore, investigating deviations from normal waking states can reveal neural mechanisms that are important for increasing our understanding of psychiatric disorders. Renewed interest in the potentially beneficial clinical effects of psychedelics additionally warrants a better understanding of their underlying neurobiology.

This talk will present recent results obtained in our studies investigating the effects of psilocybin and LSD on brain activity and connectivity. Using novel brain imaging methods, we pinpoint the role of the thalamic filter and the integration and disintegration of sensorimotor and associative networks respectively in altered states. Furthermore, I will discuss the role of the serotonin 2A receptor in psychedelic-induced altered

states in humans and the implications for potential treatments of psychiatric patients. Our results thus attenuate major knowledge-gaps regarding the neurobiology and neuropharmacology of psychedelics and the nature of psychedelic-induced alterations in consciousness. Furthermore, they increase our mechanistic understanding of important cognitive processes and therefore offer directions for the development of novel therapeutics.

### **Psychedelics and Positive Behavior Change: The Role of Mystical Experience**

Matthew Johnson

Department of Psychiatry and Behavioral Sciences, Johns Hopkins University, Baltimore

The Johns Hopkins Psychedelic Research Unit has published a body of empirical research suggesting that psilocybin results in positive long term outcomes in both healthy participants and in individuals with psychiatric disorders. This research has repeatedly found that under conditions of substantial preparation, interpersonal support, and instructions for introspection, psilocybin administration causes, with reasonable reliability, acute subjective effects that are well described by the psychological construct of mystical experience. Mystical experience is defined by strong endorsement of the following domains: sense of unity, noetic quality, sacredness, sense of transcending of time and space, and ineffability. Compared to psilocybin sessions in which full mystical experience criteria are not endorsed, psilocybin-occasioned mystical experiences are associated with positive long-term (6 months and more) outcomes including increased personality openness in healthy participants, decreased depression and anxiety in cancer patients, and increased biologically-confirmed quit rates in treatment-resistant tobacco cigarette smokers. These findings are consistent with the notion that psychedelic therapy is best thought of as medication-assisted psychotherapy, wherein the drug provides an opportunity for an experience, and that experience may hold therapeutic value. This research also suggests that psychedelics may constitute powerful experimental tools for determining the long-term effects of distinctive states of consciousness on behavior.

### **Dimensions of Consciousness and the Psychedelic State**

Olivia Carter

School of Psychological Sciences, University of Melbourne

Since the 1960s there has been a growing body of research using controlled psychophysical measures to investigate key perceptual and cognitive alterations induced by psychedelics. This talk will review the changes in conscious state associated with psychedelic drug use, focusing on the effects of two serotonergic hallucinogens: psilocybin and lysergic acid diethylamide (LSD). Considering both my own data and that of other research groups, the talk will prioritise the more common and reliably induced effects obtained through subjective questionnaires and psychophysical measures. The findings are grouped into three broad categories (sensory perception, cognitive function and experiences of unity), and demonstrate that although certain aspects of consciousness are

improved or enhanced in the psychedelic state, many of the functional capacities that are associated with consciousness are seriously compromised. This data argues against a unidimensional (i.e., levels-based) framework for understanding consciousness. Furthermore, it shows that research on psychedelic-induced changes in consciousness can make an invaluable contribution to our understanding of consciousness by identifying key dimensions of consciousness and the relations between them.

Friday, June 28, 2019, 08:30–10:40

Kongress-Saal

## Evolution

### Learning and the Evolutionary Transition to Consciousness

Eva Jablonka

History and Philosophy of Science Institute, Tel Aviv University

Simona Ginsburg

Department of Natural Science, Open University of Israel

We suggest that the evolution of learning drove the evolutionary transition to basic consciousness. Using a methodology similar to that used by scientists when they identified the transition from non-life to life, we present a set of criteria and identify an evolutionary marker for the transition to minimal consciousness. We propose that the evolutionary marker of basic (or minimal) consciousness is a complex form of associative learning, which we call unlimited associative learning (UAL). UAL enables an organism to ascribe motivational value to a novel, compound, non-reflex-inducing stimulus or action, and use it as the basis for future learning. We show that characterizing UAL at the behavioral and functional level helps explain the biological dynamics of subjective experiencing, points to its taxonomic distribution and suggests that it drove the Cambrian diversification of animals.

### The Limits of Sentience

Nicholas Humphrey

Department of Psychology, Darwin College, Cambridge

Who or what in the world could be phenomenally conscious, besides ourselves? Some theorists speculate that there is consciousness all the way down, so that all animals and even elementary particles are conscious to at least a small degree. Others, more soberly, suppose that consciousness is linked to complex information processing, and is likely to have emerged wherever there is evidence of sophisticated intelligence, either in animals or machines.

I think both views are profoundly mistaken. I believe phenomenal consciousness is an evolved adaptation, involving dedicated brain circuitry, that has been designed by natural selection specifically because of the advantageous changes it produces in an in-

dividual's sense of self and outlook on life. This means it can have evolved only in such animals as already had (a) brains suitable to house it, and (b) life-styles suitable to benefit from it. If this is right, sentience must be a relatively late evolutionary development, that is rare among animals, and cannot possibly have arisen among non-living things.

### Evolution and Consciousness

Eors Szathmáry

Department of Plant Taxonomy and Ecology, Eötvös Loránd University Budapest

There are two different approaches to this topic: (i) the role of evolution in the rise of consciousness and (ii) the relation between consciousness and (putative) evolutionary search in the brain during cognitive processes. I shall discuss both in turn. (i) How did consciousness evolve? If it did, is it a spandrel (an unselected by-product of evolution) or has it been positively selected for? If the latter, consciousness must be efficacious. (ii) It is an exciting question how the brain arrives at solutions to complex problems (such as natural language acquisition or insight tasks). The idea that bona fide evolutionary dynamics at the millisecond scale might complement other suggested component processes requires close scrutiny. There is a constraint, however. Evolutionary search loses its force without real parallelism. If such search happens in the brain, it cannot be conscious, only a limited number of promising candidate solutions can be uploaded into explicit working memory. A crucial corollary of this idea is that its realization in brains would go beyond conventional evolutionary algorithms, because candidate solutions arise and “live” in a mental ecosystem, hence they are expected to have collateral properties that can serve as un-prestatable preadaptations to problems. This is a key feature that seems necessary for productive open-ended evolutionary dynamics in brains, just as in ecosystems in the wild.

Friday, June 28, 2019, 11:10–12:30

Kongress-Saal

## Carte Blanche

### Zeno Goes to Copenhagen

David Chalmers

Philosophy Department, New York University

### Conversation Across Centuries

A Conversation



## Quantum Brain

### Neurophotronics: The Role of Light in Investigating and Understanding Brain Function

Felix Scholkmann  
University Clinic Zurich

My talk will offer an overview of the relatively new research field termed neurophotronics. As I define it, neurophotronics comprises three main research areas: (i) The use of light to measure brain function non-invasively in humans (for example by functional near-infrared spectroscopy (fNIRS) neuroimaging), (ii) the application of light to modulate brain function, cerebral tissue metabolism and hemodynamics, and (iii) the investigation of the potential role in brain functioning of light produced endogenously by cells and tissue of the brain. I will review the current state of research regarding these three fields of neurophotronics and discuss how neurophotronics can enhance the scientific investigation of human cognition and consciousness.

### Modern Anesthetic Ethers Demonstrate Quantum Interactions with Entangled Photons

George Mashour  
University of Michigan Medical School, Ann Arbor  
Theodore Goodson III  
Departments of Chemistry and Applied Physics, University of Michigan, Ann Arbor

Quantum physics has been invoked to explain the mechanism of consciousness (1) and, by corollary, the mechanism of anesthetic-induced unconsciousness (2). There is indirect evidence suggesting that anesthetic action might relate to nuclear spin (3,4). However, there has been no empirical demonstration that general anesthetics can directly interact with entangled quantum particles, which have been posited to mediate information transfer in the brain during consciousness and be disrupted during anesthesia. Using a novel experimental method involving laser and spontaneous parametric down-conversion, we demonstrate that two halogenated ethers in current clinical use absorb entangled photons but under normal excitation powers do not exhibit classical linear and two-photon absorption properties in the visible spectral region. By contrast, non-halogenated ethers that are not in current clinical use do not exhibit quantum two-photon absorption. We conclude that modern anesthetics can directly interact with photons in a state of quantum entanglement. Although the biological relevance of these findings is unknown, the data represent the first proof-of-principle demonstration that general anesthetics can interact with quantum particles in addition to classical biomolecular substrates.

1. Hameroff and Penrose, *Phys Life Rev*, 2014, 11:39-78

2. Hameroff, *Anesthesiology*, 2006, 105:400-12

3. Turin et al, *PNAS*, 2014, 111: E3524-22

4. Li et al, *Anesthesiology*, 2018, 129:271-277

### Do Consciousness, Anesthetic Action and EEG All Derive from Quantum Vibrations in Microtubules?

Stuart Hameroff  
Center for Consciousness Studies, University of Arizona Tucson

Electro-encephalography (EEG) has been clinically used for 100 years, and gamma synchrony EEG (30 to 90 hertz) correlates well with consciousness. Yet the origin, brain-wide coherence and underlying significance of gamma synchrony and other EEG rhythms remain unknown. A theory of consciousness needs to account for its correlates, including EEG and the action of anesthetic gases which selectively prevent consciousness and gamma synchrony, sparing non-conscious brain activities. The Penrose-Hameroff Orch OR theory does so by proposing that consciousness derives from orchestrated ('Orch') quantum vibrations in microtubules, self-assembling polymers of the protein tubulin inside neurons. The quantum vibrational states are proposed to reach threshold for 'objective reduction' ('OR') at which a moment of consciousness occurs, sequences of which give a stream of consciousness. In support of Orch OR, quantum vibrations in tubulin and microtubules in frequencies ranging through terahertz, gigahertz, megahertz and kilohertz have been detected. Further, it appears that anesthetic gases specifically dampen terahertz quantum vibrations in tubulin to prevent consciousness. Regarding EEG, microtubules in neuronal dendrites and soma are uniquely arrayed in mixed polarity networks, such that energies and vibrational frequencies among adjacent (but oppositely oriented) microtubules in a constant external field will differ slightly. Orch OR suggests negative resonance due to interference effects from slightly off-set microtubule quantum vibrations to give slower beat frequencies extending to gamma synchrony and other EEG rhythms. Consciousness (by Orch OR) may occur holographically due to interference in a multi-scale brain hierarchy, ranging upward from terahertz in tubulin through gigahertz, megahertz, kilohertz and hertz (EEG) processes in microtubules, microtubule arrays, neurons and small-world neuronal networks. Thus quantum terahertz vibrations in brain microtubules can account for consciousness, the action of anesthetic gases, and the origin of EEG.

# Abstracts

## Concurrent Sessions

From Wednesday, June 26, to Friday, June 28, after the plenary sessions, there will be 7 concurrent (parallel) sessions each day with oral communications. Concurrent sessions are thematically organized and have 5 speakers each. Among close to 500 submissions, the program committee selected 105 abstracts for these sessions.

## A1: Altered States of Consciousness

### Yoga and Meditation Based Control Mechanism of Physio-Psycho-Neuro Parameters of University Students

Jyoti Kumar Arora

Dayalbagh Educational Institute, Dayalbagh

[with Ankur Das, Dayalbagh Educational Institute, Dayalbagh]

As per WHO's statistics, the overall performance of students in the modern world is being seriously affected by stresses and anxiety due to competition, which is causing an imbalance between physiological, psychological and neurological parameter levels of the individual. Yoga and meditation offered by ancient science are effective tools for managing and reducing stress, anxiety and depression. These tools are paramount in integration of body, mind and soul for the evolution of an individual into a 'Complete Man'. The present work is carried out specifically for assessing the effect of yoga and meditation on improvement of overall performance of the students of Technical College, DEI, Agra. Students were in the age range 17 to 23 years ( $M=20.5$ ,  $SD=8.35$ ) and performed yoga and meditation for 30 minutes daily for three months. One experimental group contained students practicing yoga alone, while other had those practicing yoga as well as meditation.

Results show that yoga and meditation practices elevated an individual's social, self, physical and emotional well-being. It was also noted that practicing yoga with spiritual intentions resulted in a significantly higher well-being compared to practicing yoga alone.

### [Dis]Connectivities of Awakening

Ulf Winter

Medical Center, University of Freiburg

[with Pierre LeVan, Stefan Schmidt, Medical Center, University of Freiburg]

Within contemplative traditions states of consciousness without any specific content are described, which could represent a minimal, basic form of conscious experience. Therefore, the neuroscientific investigation of such states of consciousness could open a new and unique, approach to understanding the minimal neuronal correlate of the conscious state or consciousness itself.

We are currently investigating the neurophysiologic correlates of deep content-reduced meditative states in expert and novice meditators from different traditions by using latest integrated EEG-fMRI.

Here we present – for the very first time - data of two independent measurements in an extraordinary qualified meditator (meditating for over 35 years or 50,000 hours) who reported to had an experience of awakening during the EEG-fMRI measurement.

The experience was described by the subject as 'awareness-resting-in-it-self' or 'clear open awareness' without any thoughts, body- or sense perception and even without any sense of self, time and space.

The focus of the presentation is on the results of a detailed analysis of the dynamic functional connectivity within and between specific functional networks related to conscious awareness. Implications for the search of the minimal neural correlates of consciousness are discussed.

### Phenomenology and Prediction of Acute and Sustained Response to Psilocybin Versus Placebo During a Mindfulness Meditation Group Retreat

Franz X. Vollenweider

Neuropsychopharmacology and Brain Imaging,

Department of Psychiatry, Psychotherapy and Psychosomatics,

Psychiatric Hospital, University of Zurich

Both meditation and psychedelics have played key roles in human's search for self-transcendence and altered consciousness. However, neither their possible synergistic effect, nor state and trait predictors have been experimentally studied. To elucidate these issues, we administered double-blind the psychedelic drug psilocybin (315 µg/kg PO) or placebo to Zen and Vipassana expert meditators ( $n=39$ ) during a 5-day mindfulness group retreat. Psilocybin markedly increased meditation depth and incidence of positively experienced self-dissolution, with no concomitant anxiety. Personality traits of openness, optimism and emotional re-appraisal were among main predictors of acute responses. Compared to placebo, psilocybin enhanced direct post-intervention mindfulness and produced larger positive changes in psychosocial functioning at 4-month follow-up, which were mediated by different facets of self-dissolution. These findings highlight the interaction of non-pharmacological and pharmacological factors, and the role of emotion/attention regulation in shaping the experiential quality of deep psychedelic states, as well as the state of selflessness as modulator of behavior.

### Professional Meditators Experience Less Cognitive Conflict: An FMRI Study Based on the Stroop Color Task

Naoyuki Osaka

Kyoto University, Japan

[with Takehiro Minamoto, Ken Yaoi, Miyuki Azuma, Mariko Osaka, Kyoto University, Japan, Center for Information and Neural Networks, Osaka University]

Zen meditation emphasizes a bare self-awareness on a path toward an open-minded mental state. Meditation can be defined as paying intrinsic attention to the present moment, which bring one's attention to the present consciousness on a moment-to-moment basis without judgment. However, the mechanisms of Zen practice are poorly understood because their neurological basis remains unknown. Functional magnetic resonance imaging (fMRI) was used in the present study to understand the neurological basis of Zen meditation in two groups of subjects presented with a task causing internal conflict (Stroop task). One group of subjects consisted of professional Zen Buddhist monks (meditators) with long years of training in meditation, and the other was a matched group with no experience doing meditation (controls). The monks from the

Rinzai sect of Zen Buddhism with long-term Zen meditation experience showed fast and correct response with less cognitive conflict when performing the Stroop color task, in which quick attentional focusing and shifting require facing a conflict-producing task. Furthermore, expert Rinzai-Zen meditators had less brain activation than control subjects in critical regions related to large-scale brain network like the default-mode and working-memory networks under incongruent cognitive conflict.

### **Transcendent Consciousness – Near-Death Versus Spiritual Contemplative Experiences**

Robert Hesse

University of St. Thomas, Houston, Institute for Spirituality and Health, Houston, Contemplative Network, Houston

(with Calixto Machado, Institute of Neurology and Neurosurgery, Havana)

This presentation will compare the critical neuroscience and religious studies of two altered states of consciousness, near-death experiences (NDE) and spiritual contemplative experiences (SCE). First person experiences reported for Centuries show they both have similar attributes: cognitive timelessness, affective peace, transcendent oneness, and paranormal out-of-body. Contemporary first-person SCE provided the insight for a current scientific study comparing the memories of NDE and SCE in separate subjects using functional MRI (fMRI), Quantitative EEG (QEEG), and a Greyson Scale. For about 87% of the world's population that believes in God and an afterlife, this research is important in studying the altered states of consciousness that are transcendent between this life and the next. SCE have been reported by all faiths including by Abrahamic religious contemplatives: Christian mystics, Muslim Sufis, and Jewish Kabbalists. This will include an interfaith methodology for concentrative contemplative prayer, which can lead to SCE and how that affects the conscious and unconscious brain.

Wednesday, June 26, 2019, 17:00–19:00

Ballsaal

## **B1: Metaphysics of Consciousness 1**

### **A Field Response to the Combination Problem for Panpsychism**

Laura Weed

The College of Saint Rose, Albany

The combination problem has been identified by William James, David Chalmers, and many others as a significant problem for panpsychism, because it is not apparent how small psychons, however conceived, could combine to form larger selves, while retaining the qualia values and quiddities of the psychons. I will argue in this paper that the problem arises from taking an excessively entitative view of the nature of both physical things, as they are ordinarily conceived, and mental things, as they are ordinarily conceived. I will argue that conceiving of physical and mental things rather as fields will

alleviate some of the puzzles that have traditionally arisen in the literature concerning the physical and the mental. First, I will outline a metaphysics of fields, then I will address the details of David Chalmers' analysis of the combination problem, to show how a metaphysics of fields mutes the force of many of his worries about that problem for panpsychism.

### **A Metaphysics of Fields**

Most metaphysicians in Western Philosophy have followed the lead of Aristotle or Plato and discussed metaphysics in terms of either Aristotelian entities or Platonic properties. Indeed, the psychons rejected by James and Chalmers, are usually thought of as either very small mental entities or very small mental properties. A metaphysics of fields, in contrast, will think of mental activity as a dynamic relationship among attractors, within energy fields, which may or may not also contain entities and properties. The model for mental activity will have more in common with electro-magnetism or gravity, than with quarks and atoms, and will be composed of processes, forces and activities rather than things or properties. Also, fields are not quite Russellian structures, or the entities of structural realism of the type espoused by Ladyman and Ross, although they might contain or generate such structures at times.

### **Theories of Reality Must Reflect How It Was Experienced: A Physical Alternative to Panpsychism**

John Sanfey

NHS [National Health Service], Leeds

The past and the future cannot co-exist. In both quantum and relativity theories a cause must be in the past of its effect. Yet we clearly experience reality as a thick slice of time shared between some part of the past and its future. Consciousness must therefore have unique properties not apparent in our physical view of reality.

One possible explanation, panpsychism, is that consciousness is simply a fundamental property of matter. Another, not previously considered, is that our constructs of objective reality, rather than matter per se, contain artefactual devices reflecting that reality has been experienced. Physical theories must contain some mechanisms allowing the past and its future to relate to each other like consciousness does during the manifestation of reality.

Infinitesimal calculus was invented to overcome problems such as Zeno's paradox arising from the incompatibility between infinitely continuous change and discrete events. Similar paradoxes exist today, not least in the problem of marrying quantum and relativity theories.

If it is true that theories of reality reflect the unique role of consciousness, then understanding the mechanics of the reflection will allow us to describe consciousness as a physical property within the terms of those theories, without resorting to panpsychism.

## Relational Panpsychism

Greg Horne  
University of Toronto

Panpsychism is the view that consciousness is fundamental and ubiquitous in nature (Seager 2009). Russellian monism, arguably the leading version of panpsychism in philosophy, is the view that consciousness is constituted by the intrinsic properties of fundamental physical entities, while physical properties such as mass describe how these entities relate to one another (Alter and Nagasawa 2015). Although it is a tidy worldview, Russellian monism may be incompatible with our best physics. Ontic Structural Realism (OSR), developed to describe reality according to quantum field theory and general relativity, is the view that nature is fundamentally a web of connections: what appear as individuals actually lack intrinsic properties and are composed of relations (Frigg and Vostis 2011). If OSR is true, then Russellian monism is false. In this talk, I will present a version of panpsychism that is compatible with OSR. “Relational panpsychism” is the view that nature is a network of phenomenal-intentional relations between microscopic subjects that lack intrinsic properties. Intended as an empirically-informed panpsychism, relational panpsychism provides new resources to address the “combination problem” of how microscopic experiences combine to form complex experiences (Seager 1995), and the central problem facing OSR: how relations can exist without relata (Psillos 2001).

## The Extended Mind Hypothesis and Memory

Alice Roberts  
University of Cambridge

What counts as a cognitive system, and can our cognitive systems extend beyond our brains? Arguments for the Extended Mind Hypothesis (EMH) are a form of the Active Externalist claim that the material vehicles of cognition can be spread out across brain, body and certain aspects of the physical environment. In this talk, I will be examining the Extended Mind Hypothesis as it is currently formulated, and propose an adaptation which takes into account specific types of memory systems (such as semantic memory). I will argue that this adaptation makes the EMH more plausible.

## Why Russellian Monism Can't Work

Patrick Lewtas  
Institute of Physics, University of Freiburg

This paper argues that Russellian monism (‘RM’) must accord physical reality a purely causal/dispositional nature and consciousness a purely intrinsic (hence non-causal/non-dispositional) nature. It divides RM into three kinds. According to strong RM, physical reality derives both its existence and its nature from its conscious grounds. According to weak RM, physical reality derives only its existence from its conscious grounds. According to proto-phenomenal RM, physical reality depends on proto-phenomenal

rather than conscious grounds. The paper argues that strong RM succumbs to incoherence: it requires that physical entities derive their causal efficacy from a source that can’t provide it. The paper contends that proto-phenomenal RM neither integrates physical reality and consciousness nor qualifies as monism because proto-phenomenal properties comprise mutually irreducible causal and non-causal components. The paper argues that weak RM doesn’t qualify as monism; entails implausible causal theories; deprives consciousness of sufficient causal relevance; leaves the status of physical relations precarious; and prevents consciousness from grounding anything. These failings deny it advantages over other mind-body theories and likely render it incoherent. The paper then defends the existence of non-experiential reality against RM’s covert idealism. Lastly, it argues that RM makes improper use of the norms of simplicity and beauty..

Wednesday, June 26, 2019, 17:00–19:00

Grimset

## C1: Time

### A New Approach to Becoming Time

Jeff Tollaksen  
Chapman University, Orange  
[with Yakir Aharonov, Khalsa Gurucharan, Chapman University, Orange]

We present an alternative view of quantum time evolution in which each moment of time is viewed as a new ‘universe’ and time evolution is given by correlations between them. This new approach has a number of useful qualities, e.g.: 1) the dynamics and kinematics can both be represented simultaneously in the same language, 2) a new, more fundamental complementarity between dynamics and kinematics is naturally introduced, 3) the theory is relativistically covariant at the level of states, 4) it leads to a new solution to the measurement problem which we model by uncertain Hamiltonians, and 5) it leads to a new approach to the problem of the now and a new kind of time which we call becoming time.

### “Time Is Out of Joint:” Consciousness, Temporality, and Probability in Quantum Theory

Arkady Plotnitsky  
Purdue University, West Lafayette

While the juncture of reality, causality, and probability is a familiar feature of foundational discussions concerning quantum theory, this paper considers the role of consciousness and temporality within this juncture, by adopting a nonrealist or, in terms of this article, “reality-without-realism” (RWR) interpretation of quantum phenomena and quantum theory. This interpretation follows Bohr’s ultimate interpretation, but takes a more radical epistemological position (the strong RWR view), according to which



quantum objects and behavior are not only beyond representation (the weak RWR view), but also beyond conception. The paper will argue that, at least in this type of interpretation: a) unlike in classical physics and relativity, the role of consciousness is irreducible in quantum experiments insofar as our conscious decisions determine the course of future events, rather merely allow us to follow what would happen regardless of such decisions; and b) that, in part as a consequence, the workings of temporality, require a radical reconsideration in quantum theory, again, even as against but consistently with relativity and the character of temporality and causality there.

### A Solution to the 'Two Times' Problem

Ronald P. Gruber

Stanford University, Stanford Medical Center

[with Ryan P. Smith, Richard A. Block, Cal State East Bay, Dept. of Physics /  
Montana State University, Dept of Psychology]

Current neuropsychological theories of time have not reconciled the flow of time (FOT) with static space-time cosmologies e.g. Block Universe, in which a feature in common is that all events are discrete or subjective./To solve this 'two times' problem, FOT perceptions ('moving present', temporality, dynamism e.g. motion) should be demonstrated to be similarly discrete or subjective./

To show that the 'moving present' is subjective we constructed (with virtual reality) the first information gathering & utilizing system (IGUS) 'robot.' Confirming Hartle's prediction, the 'robot' can choose an arbitrary past worldline point to be the 'present,' corroborating Einstein's view: 'there is no unique present.' Moreover, there is a 'present' at every worldline point. The 'robot's experience' is realistic to the point that on occasion she may be confused as to which epoch she resides.

We demonstrated that temporality (the before/after experience)//appears to be /discrete,/ not extending to two or more events. We used a reverse cinematography apparatus in which the film is stationary but the observer moves. Beyond a minimum frequency of observation, a moving observer experiences temporality when viewing a series of/stationary/ images. It is the first demonstration of apparent temporality similar to apparent motion.

### Time Travel in Our Mind Based on System 2

Matthias Rauterberg

Eindhoven University of Technology

[with Xinwei Wang, Eindhoven University of Technology]

There are different time concepts: [1] Real-time (the passage of time) is the continued progress of existence and events that occur in apparently irreversible succession from the past through the present to the future (Wittmann, 2016). [2] Story time refers to the cultural, historical and chronological factors surrounding events of a narrative, which commonly considered with three factors: direction, duration, and frequency (Almeida, 1995, Bakhtin (2002), Ricoeur (1984), Martin (1986)). Unlike real time, narrative time

can be altered based on the narration purpose. [3] Perception of real time refers to the individual subjective perceptual experience of real time (Grondin, 2010; Wittmann, 2016). Different factors (Angrilli, Cherubini, Pavese, & Mantredini, 1997) and hierarchies (Poppel, 1997) can be observed within the perception of real time. Based on Kahneman's architecture of the mind (2003) the system-2 is mainly based on representational constructs of reality and allows time travel in our mind. In contrary system-1 does not allow time travel because it is operating in the presence only. We argue that time travel is only possible through the representational constructs in our system-2. One consequence for the design of interactive products is that time travel can only be achieved by the story time of the narrative structure of the content of this interactive product.

### Metaphysics of Temporal Consciousness

Supriya Bajpai

Department of Philosophy, Faculty of Arts, University of Delhi

A theory of temporal consciousness must specify the distinction between time of consciousness and consciousness of time, must characterize the ways in which contemporary representationalists differs from the retentionalists, and must address the issue of intractability. The metaphysics of temporal consciousness defends three theses, i.e., how the word red can represent the colour red without itself being red, distinction between vehicle and content, and the account of temporal passage. I offer, first-person operationalism as solution to the issue, with a discussion of short term experiences of consciousness with stimulus in the absence of that subject's belief in that consciousness.

Wednesday, June 26, 2019, 17:00–19:00

Brünig 1

## D1: Quantum Consciousness 1

### The Capacitive Properties of Microtubules and Free Tubulin

Aarat Kalra

University of Alberta

[with Jack Tuszyński, University of Alberta]

Microtubules cylindrical tubes that play cellular roles such as maintenance of shape and rigidity, allowing chromosomal segregation and forming a 'railroad' for macromolecule movement. Structurally, microtubules are polymers of  $\alpha$ ,  $\beta$ - tubulin, a globular protein that has an abnormally high negative charge and dipole moment. Microtubules thus realign and translocate in the presence of electric fields. Modelled as nanowires for ionic transport, they are hypothesized as cellular targets of TTFields (tumour-treating electric fields) that reduce the spread of cancer cells. It is thus crucial to electrically characterize microtubules.

Here, we perform dielectric spectroscopy on microtubule and free tubulin solutions and

observe the real and imaginary components of impedance. We show that while microtubules increase solution capacitance at physiological concentrations, free tubulin has no significant effect. Our results indicate that microtubule solutions undergo a quasi-resonant ‘flip’ in resistance between 10-100 Hz, consistent with implications from previous findings. Using association in parallel, we then calculate the capacitance and resistance of a single microtubule. We also study the response of tubulin to biochemical stress to show that tubulin oligomerization in the presence of DMSO (dimethyl sulfoxide). Our work shows microtubules act as potential ‘ionic highways’ within the cell and have interesting bioelectrical properties.

#### **Metabolic Biophotonics, Coherent Energy Transfer and Superradiant Excitonic States in Microtubules**

Travis Craddock

Departments of Psychology and Neuroscience, Computer Science, and Clinical Immunology, Nova Southeastern University, Fort Lauderdale / Clinical Systems Biology Group, Institute for Neuro-Immune Medicine, Nova Southeastern University, Fort Lauderdale

[with Giuseppe Luca Celardo, Mattia Angeli, Philip Kurian, Benemérta Universidad Autónoma de Puebla / International School for Advanced Studies (SISSA), Trieste / Dipartimento di Matematica e Fisica and Interdisciplinary Laboratories for Advanced Materials Physics, Università Cattolica del Sacro Cuore, Brescia / Quantum Biology Laboratory, Howard University, Washington DC / Center for Computational Biology and Bioinformatics, Howard University College of Medicine, Washington DC]

Mitochondrial production of reactive oxygen species generates photons within cells. While low intensity, these energetic photons cover the ultraviolet, visible and infrared spectrum. Structures within the cell absorb these photons via light sensitive molecules such as flavins, porphyrins, or aromatic amino acids (i.e. tryptophan). In the brain, one likely photon absorber is the microtubule cytoskeleton as it spans across the neuron, co-localizes with mitochondria, and shows a high density of aromatic amino acids organized in a manner similar to photosynthetic antenna. The role of photo-excitations in brain microtubules is an open question. Here, we present a theoretical analysis of the feasibility of photonic effects in microtubules. We analyze the ability of tryptophan networks to transfer photon energy within microtubules. Through the use of positions and dipole orientations generated from alignment to absorption spectra, we construct both a tight-binding Hamiltonian for an interacting multi-body system as well as a non-Hermitian Hamiltonian widely employed in quantum optics. We find cooperative effects (i.e. superradiance, supertransfer) are capable of ultra-efficient photoexcitation absorption that could enhance excitonic energy transfer in microtubules. As such, neuronal microtubule networks may traffic metabolically generated photon energy for signaling, or may dissipate such energy to protect cells from harmful effects.

#### **Dynamic Gravitized Quantum Neural Network**

James Tagg

Penrose Institute San Diego

Roger Penrose and Stuart Hameroff propose the brain is an information processing system that harnesses both quantum mechanics and general relativity (gravity) to process information in a way that would solve non-computable problems. This leads to the brain understanding rather than computing. As a first step, several suggestions have been made as to how the brain might form a quantum computer which by a second step collapses to a single state when it exceeds a limit on the allowable local curvature of spacetime. These quantum computing ideas focus on finding a structure in the brain that could form a long-lived qubit which is then subject to gravitational considerations. Because the brain is warm and wet, it is hard to find such a structure. In this abstract an alternative model of quantum computing is proposed inspired by work on classical neural networks by Gabe Silva et al. of the University of California San Diego. In the GS model information in a neural network is stored in the dynamic patterns that evolve rather than the static values. His model can be fashioned in a network where all the gates have the same weights. To visualise this one might imagine Conway’s game of life. The static rules for each cell are the same but dynamic self-sustaining patterns emerge which interact with each other over time. This suggests a solution to the decoherence problem. Rather than store the information in long lived static qubits the information is stored by dynamic patterns of photons in flight. Computation (or something more subtle) occurs through two photon interaction at polar molecule sites along the microtubule. Decoherence is avoided because photons interact briefly and spend most of their time in free flight. Further, dynamic patterns are intrinsically quantum error correcting. The only stable patterns that can emerge are ones that error correct to protect against decoherence errors; patterns that did not have this feature would not be patterns as they would decay into randomness. The two photon interactions distort the dipole geometry in a superposed fashion which leads to the causal structure of the network being undefined. When ‘collapse’ occurs, the network must solve to find a solution for the state and location of all the gates which is conjectured to be both non-deterministic (due to the Kochen-Specker and Conway-Kochen theories) and non-computable (due to Rice’s theorem). Thus, the device is a gravitized quantum non-computer rather than quantum computer modified by gravity.

#### **An Experimental Approach to Chemistry of Microtubules with Reference to Consciousness**

Pushpa Sahni

Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra

Brain areas responsible for higher cognitive functions such as prefrontal, temporal association and parietal association cortices grew disproportionately in humans compared with the same regions in chimpanzees. Scientists also argue that human consciousness involves wide-spread, relatively fast, low-amplitude interactions between the thalamus, a sensory way station in the core of the brain, and the cortex, the gray matter at the

brain's surface. These “thalamocortical loops”, help to integrate information across the brain and thereby underlie consciousness (Scientific American Sep 2018). Deciphering the exact patterns of brain activity that underlie thinking and behavior will provide critical insights into what happens when neural circuitry malfunctions in psychiatric and neurological disorders- schizophrenia, autism, Alzheimer's or Parkinson's. Anesthetics are also known to inhibit neuronal fast anterograde axoplasmic transport (FAAT) in a reversible and dose-dependent manner, but the precise mechanism by which anesthetic prevent consciousness remains unknown largely because the mechanism by which brain physiology produces consciousness is unexplained. Penrose-Hameroff theory also proposes that consciousness is the manifestation of quantum phenomena occurring in neuronal microtubules. In continuation of our previous work, the present study was aimed to see the effect of propofol on the assembly of tubulin with the help of Time of Flight Mass spectroscopy (TOFMS) and probed into the changes of their secondary structures. Our Circular Dichroism experimental data was further compared and confirmed with TOFMS spectrogram. PYMOL study was also carried out to understand the binding sites available in tubulin molecule.

#### **Quantum Mechanics Helps Understand Complex Biological Systems**

Apurva Narayan

School of Engineering, University of British Columbia

[with Runjhun Saran, Department of Chemistry, University of Waterloo]

The “science of consciousness” and quantum physics share many similarities, in particular when “measurements” or “observations” are concerned. In quantum theory, a measurement or observation is an intervention which not only produces a recorded value but also changes the state of the measured system. As a consequence, observations do not “commute”, i.e. the results of successive observations typically depend on their sequence. An additional consequence is “contextuality”: The result of an observation depends on which other observations are (or could be) performed. The mathematical formalism of quantum theory takes this into account. For about twenty years the same formal framework has been applied to areas such as psychology, cognitive sciences, economics etc. In numerous situations the obtained theoretical models match empirical results with astonishing accuracy. In my talk I will sketch the key features of this formalism and point out some similarities and differences between consciousness and quantum physics.

## **E1: Agency**

### **A Neuro-Cognitive Approach to Free Will in Social Interaction**

Hans Liljenström, Agora for Biosystems, Sigtuna Foundation, and SLU, Uppsala  
[with Azadeh Hassannejad Nazir, Alf Linderman, Agora for Biosystems, Sigtuna Foundation, and SLU, Uppsala]

Decision-making is central to cognition and to make conscious decisions of “free will” is an essential part of being human. However, the issue of free will has been much debated in science and philosophy, and a dominant view is that free will is an illusion. According to a series of famous psychophysical experiments, it appears as if the brain knows, up to several seconds in advance, what “you” decide to do. These studies have, however, been criticized, and alternative interpretations of the experiments can be given. In this presentation, we will scrutinize these experiments and their interpretations, and suggest alternatives, as well as use computer simulations to elucidate the apparent enigma of how conscious free will may have causal effects on the material world. In particular, we will investigate how intentions may lead to conscious decisions and subsequently to voluntary action by an individual in a social context. Specifically, this concerns the influence of the experiment leader on subjects in psychophysical experiments. For this purpose, we have developed a neurocomputational model of human decision-making, where both cognitive and emotional aspects are considered, with an objective to explore the relation between intentionality, free will, and an individual's decisions under social influence.

### **Cognitive and Embodied Overflow and the Multiplicity of Choice**

Ken Mogi

Sony Computer Science Laboratories

Artificial intelligence systems are typically characterized by a focus on a specific task, with the computational resources devoted to it (Silver et al. 2012). In contrast, in many cognitive tasks, there are in general more than one locally optimum strategies for resource allocation. The multiplicity of choice seems to be the hallmark of cognitive processes involving consciousness.

Here I present a model of a robust solution to the choice multiplicity by handling the overflow in sensory and embodied input. In addition to the phenomenal overflow in visual awareness (Levitin 2002), I present a model of conscious choice where the different choices of action and attentional choices are presented in an embodied overflow. In this model, there is a symmetrical treatment of the cognitive and motor choices, where the interface between the conscious and preconscious information systems are subserved by common processes. In Libet's time-on model of consciousness (Libet 2005), free will is modelled as the process where the conscious self has the veto for certain actions. Based on the cognitive and embodied overflow model, I analyze how the veto process can be treated on the same footing as attention allocation in visual perception.

## Local and Global Signatures of Volitional Information Sampling Revealed in Human Intracranial Recordings

Xerxes D. Arsiwalla

Institute for Bioengineering of Catalonia

[with Daniel Pacheco, Alessandro Principe, Rodrigo Rocamora, Paul Verschure, Institute for Bioengineering of Catalonia, Barcelona, Hospital Del Mar, Barcelona, ICREA, Barcelona]

Recent advances in human intracranial recordings now offer us a unique opportunity to probe previously inaccessible spatiotemporal scales of brain-wide activity. Here, we investigate neural biomarkers of volitional control in humans sampling information under ecologically-valid conditions. We record intracranial LFPs of human epilepsy patients (N=13) in a Virtual Reality (VR) memory test in which participants memorized discrete images presented at specific locations in an environment. Critically, subjects could control navigation and information intake in one condition (volitional control, active) but were passively transported along the trajectory previously chosen by another participant in a second condition (yoked control, passive). The electrode locations cover frontal, parietal and temporal lobes including sub-cortical structures as the amygdala and hippocampus (even though coverage differs from subject to subject). Our analysis revealed two specific signatures of volitional information sampling: (i) hippocampal theta oscillations (3-7Hz), linked to active navigation and active information sampling, and (ii) network information complexity, which reveals differences in brain-wide functional connectivity between active and passive conditions.

Results from animal literature suggest a critical link between volitional behavior and hippocampal oscillations. In particular, theta activity (3-7Hz) has been linked to active navigation and sampling in rodents, leading to the characterization of hippocampal theta as an 'online' state of the brain. The question then is whether hippocampal theta oscillations are specific to voluntary action. Our analysis revealed significant differences in the patterns of hippocampal oscillatory low-frequency power across conditions. Volitional control and active learning were associated with increased theta oscillations in the human hippocampus, while no difference between conditions was observed in frontal or parietal electrodes. These results reveal a specific local signature of volition in human subjects specific to the hippocampus.

Furthermore, to determine network signatures of volition we analyzed dynamical functional connectivity (FC) networks for each subject in each condition (active or passive) over 5366 time-points. The FC networks ranged from 100x100 to 182x182 dimensions (as mentioned earlier, electrode locations varied from subject to subject). To compute information complexity of these dynamical FCs we used a recent formulation of network integrated information that is based on the Kullback-Leibler divergence between the multivariate distribution on the set of network states versus the corresponding factorized distribution over its parts. Our analysis revealed statistically significant differences between the active and passive conditions in each of the subjects based on our spatiotemporal complexity measure. As a control, we constructed surrogate data mixing active and passive states. This serves as a null model and using this we confirm that the complexity analysis does not spuriously pick up statistical differences.

Our analysis points to a specific local and global neurodynamic signature of an ecolog-

ically-valid behavioral paradigm of volitional information sampling. What our results allude to is a spatiotemporal hierarchy of volitional control in the human brain, where the hippocampus presumably serves as a low-frequency driver of volitional control which subsequently manifests as temporal integrated information across brain functional networks.

## How the Sense of Agency Strengthens the Sense of Ownership

Pietro Perconti

Dept. of Cognitive Science, University of Messina

[with Sonia Malvica, Anna Re, Dept. of Cognitive Science, University of Messina]

Usually we take for granted that we have a body and that it can be used to behave upon the world. This pre-reflective consciousness is made up by two major components, i.e., the sense of ownership (SoO) and the sense of agency (SoA). While the first is the feeling of being the owner of my body parts, the second is the experience of acting and controlling an action. Although SoO and SoA usually come together, they can occur independently and can be selectively disrupted. We investigate the relationship between SoO and SoA by means of the rubber hand illusion procedure, in particular the rubber hand illusion based on active and passive movements. We argue for the idea that, if SoA and SoO co-occur in experience, the first feeling strengthens the second one. We use a cross-modal approach, testing two different conditions in performing a double touch with the index finger, one endowed with an acoustic feedback and the other being completely silent. Furthermore, we test also the onset time of the ownership sensation in the two conditions in order to understand if the sense of agency occurs differently in the case of lack of a perceptual feedback.

## Consciousness and Action – the Empirical Basis of Criminal Responsibility

Ana Bárbara Brito

CEDIS- Law & Society Research Center at NOVA Law Faculty

CEJAE – Center for Economic and Environmental Legal Studies, IDPCC – Institut of Criminal Law and Criminal Sciences at Lisbon's Faculty of Law

The presentation tries to show how important it is for criminal law to have a concept of action based on the empirical studies of consciousness and action.

- The concept of crime entails both empirical (action, causality, consciousness and will) and evaluative (illegal, culpable, punishable) elements. The evaluative elements must have an empirical basis, so that any evaluative difference must correspond to a difference of the basis (or criteria) of evaluation. This paper seeks to demonstrate that consciousness is a paramount empirical basis because there is no action without some kind of consciousness. According to different types of consciousness we have to distinguish:

- Actions with intention
- Actions with knowledge
- Actions with advertent negligence
- Actions with inadvertent negligence



• Neuroscience has concentrated in voluntary actions, i.e. the first three types of actions. Libet (1983, 2002 and 2003) + Soon (2008) + Fried (2011) made experiences in the field of voluntary actions. Daniel Wegner (2002) worked on the conscious control of actions. The inadvertent negligence however does not presupposed consciousness of action but the possibility of such consciousness based on the consciousness of signals of danger.

Wednesday, June 26, 2019, 17:00–19:00

Harder 2

## F1: Perception

### Neonatal Synesthesia, Pattern Perception, Memory Coding, and Conscious Cognition

Stephen R. Deiss

Institute for Neural Computation (INC), Integrated Systems Neuroengineering Lab (ISNL), University of California, San Diego (UCSD)

Since William James spoke of the blooming, buzzing confusion of infancy, research has shown that children have partial synesthesia for nearly a decade (Spector &, Maurer). They slowly learn to differentiate sensory modalities and distinguish among percepts as synaptic hyperconnectivity is pruned in the early years. Recent short term memory (STM) models show how arbitrary multimodal percepts can be encoded as oscillating patterns in STM (Bouchacourt & Buschman), explaining the span of STM. During the same developmental period children learn from exposure to a structured environment to recode and chunk STM items into a hierarchy of categories and keep track of surface and structural similarities that could enable generalization in support of analogy, metaphor, and creative thought as well as rational discourse. This category hierarchy building process has now been successfully modeled in a neural network and is amenable to machine learning (Saxe, McLelland & Ganguly). These developments fit very nicely with a process and STM-based model of consciousness (Deiss). I hypothesize a continuum of hierarchical pattern recognition processes building memories up to ever higher levels of conscious abstraction in STM. This can be modeled with the new NSF funded neuromorphic research infrastructure we are actively developing at UCSD.

### An Actional Intervention into the Cognitivist Problem of Explaining Conscious Perception

Adrian Downey

Institut of Philosophy, Ruhr University, Bochum

I argue that, by accepting a Rylean understanding of conscious perception supplemented with insights from the dynamic and extended cognition literatures, one arrives at an ‘actional’ account of conscious perception which provides a phenomenologically plausible dissolution of the ‘hard problem of perceptual consciousness’. I first introduce

the ‘hard problem of perceptual consciousness’ and argue that cognitivist accounts are inevitably saddled with it. Next, I outline a non-representational Rylean account of conscious perception, augment it with insights from the dynamic and extended cognition literatures, and explain why the resultant account allows for a phenomenologically plausible dissolution of the ‘hard problem of perceptual consciousness’— by allowing for the possibility of extended perceptual action, one can take action to be constitutive of perception without falling into a problematic ‘behaviourist conclusion’ (which conflates the effects of perception with its causes and so is phenomenologically implausible). Finally, I provide a response to the three objections most commonly levelled against my thesis. I conclude that such an (extended) actional account of conscious perception should be accepted because it allows for empirical study of conscious perception which is not dogged by serious metaphysical concerns and, moreover, does so whilst providing a phenomenologically plausible account of conscious perception.

### Knowing is Not Seeing: Disentangling Visual Appearance and Cognitive Inference in Crowding

Bilge Sayim

Institute of Psychology, University of Bern / Sciences Cognitives & Sciences Affectives, University of Lille

[with Henry Taylor, Department of Philosophy, University of Birmingham]

Crowding, the deleterious influence of flanking objects on target perception, strongly limits peripheral vision. In crowded peripheral vision, it is difficult to distinguish what is seen from what is just inferred, because biases and prior knowledge may strongly influence observers’ reports. Here, we sought to minimize these influences by using an unconstrained full report and drawing paradigm with gaze-contingent, peripheral stimulus presentation. In Experiment 1, observers were presented with letters in the peripheral visual field, and asked to freely name and draw what they saw. When 3 identical letters were presented (“identity-crowding”), most observers reported only 2 letters, revealing a hitherto unrecognised effect we call ‘redundancy masking’. In Experiment 2, we used a standard identification task with the same stimuli as in Experiment 1, asking participants to identify the central letter. In contrast to Experiment 1, performance was almost perfect when the 3 letters were identical. Our study revealed a new type of masking (redundancy masking), and shows how it goes unnoticed when using a standard identification task. We discuss how this result has striking consequences for our understanding of the divergence between what we think we see and what we actually see.



## The Neural Representation of the Perceptual Moment – Bridging the Gap Between Modern Neuroscience and Psychophysics Through Computer Simulation

James Isbister

Oxford Centre for Theoretical Neuroscience and Artificial Intelligence, University of Oxford

[with Simon Stringer, Department of Experimental Psychology, University of Oxford]

A 1 millisecond stimulus flash elicits a conscious experience and is enough to enable a perceptual discrimination. Study of the enabling neural representations of such short atomic units of consciousness offers the opportunity to understand the primitives of experience, in a relatively unconfounded manner. Recent neurophysiological research shows that sensory stimuli are represented in early sensory cortices by precise spatiotemporal patterns of single spikes - that is groups of neurons contributing 0 or 1 spikes at a precise time relative to the spike timings of other neurons. Moreover, such patterns of single spikes in early sensory processing areas are enough to activate higher sensory processing areas and elicit experience. Our research uses computer simulation and neurophysiology to understand how the brain learns (through synaptic plasticity) to immediately represent the complex visual structure of novel objects, from such precise spatiotemporal sensory primitives. This work therefore builds towards understanding the neural solution of the feature-binding problem of visual psychology, which asks how the brain simultaneously encodes the presence and rich structure of multiple objects in a scene. Understanding the neural solution to the feature-binding problem is therefore analogous to understanding how the brain encodes the content of our visual conscious experience.

## Knowing How It Feels and Feeling It: Compassion, Empathy, and Epistemology

Luke Roelofs

Philosophie des Bewusstseins und der Kognition, Ruhr-University Bochum

Joel Smith, Dan Zahavi, and Colin Marshall all argue for some sort of special epistemic role for ‘empathy’ or ‘compassion’ in representing others’ conscious states. They suggest that some such process is vital to knowing what such states ‘are like’, or for ‘directly perceiving’ them, or for being ‘in touch with them.

This idea is particularly significant if ‘empathy’ or ‘compassion’ is linked to altruistic motivation. If the same process is crucial both epistemically and motivationally, that might have implications for thinking about the objective status of moral norms concerned with altruism. But the natural worry (explicitly endorsed by some of these writers but denied by others) is that even if there is an epistemic role for something called ‘empathy’, and a motivational role for something else that could be called ‘empathy’, the two are separable. After all, it seems possible both for cruel people to ‘empathise’ in any epistemically relevant sense, and for caring people to admit their ignorance of others’ conscious states.

I compare and contrast the different definitions these authors offer and the different epistemic and motivational claims they make, to evaluate whether there may be any sense of ‘empathy’ that has both epistemological and motivational status.

Wednesday, June 26, 2019, 17:00–19:00

Brünig 3

## G1: Self-Consciousness

### A Comparative Approach of Corvid Self-Recognition

Lisa-Claire Vanhooland

University of Vienna

Since the early 70’s mirror self-recognition (MSR) assessed by the Mirror-Mark Test has been the staple test for investigations of animal self-awareness. Amply studied in humans and in more recent years also used for assessments in robots, MSR seems rare in the animal kingdom. The wide range of species tested in this paradigm reveal a divergence in evolution between monkeys and great apes, and a convergent evolution of this trait in a handful other species. The performances of corvids in this task seem comparably discrepant, raising the necessity to determine the underpinning requirements to be self-recognizing. Here, we investigated visual self-recognition in three more species of corvids with different ecological characteristics: the common raven, the carrion crow and the azure-winged magpie, addressing the question whether corvids have a sense of self and identity and which characteristics might drive the emergence of MSR in a species. Our results show inter-individual and interspecies differences in the approach of and the interaction with the mirror during the mirror exposure phase of the experiment as well as in the subsequent Mirror-Mark Test. However, the birds’ performances in the test do not allow for unambiguous conclusions on these species capacities of MSR.

### Psychological and Kinematic Effects of an Invisible Self-Body on Voluntary Gait

Yuta Nishiyama

Nagaoka University of Technology

[with Hajime Kobayashi, Shusaku Nomura, Claudio Feliciani, Hisashi Murakami, Tatsuji Takahashi, Tokyo Denki University, Nagaoka University of Technology, The University of Tokyo]

This study reports that participants decreased a sense of reality and held a sense of agency when they were walking at a first-person point of view in a certain virtual environment. A sense of reality is a feeling that I am now and here, and a sense of agency is a feeling that I am an initiator of my own action. Both of them have been related to bodily self-consciousness in so far as there is a visible body. Our experimental setup provides one’s own invisible body. Participants wore a head mounted display (HMD) in which a real room live images captured by 360° camera were projected. They took six steps forward in three separate conditions: normal view (Ctl), invisible body view (T1), and discrete optic flow view (T2). The results of questionnaire showed that a feeling of being in the room they saw and a feeling of seeing the present images were weakened in T1 and T2 in comparison with Ctl but a feeling of moving the viewpoint by themselves was decreased only in T2. Moreover, the T1 condition shortened subjective time awareness about walking period. Furthermore, we introduce a characteristic of walking performance in each condition.

### Deflating the Self

Donnchadh O'Connaill

Philosophy Department, University of Fribourg

According to the deflationary approach, the self or subject of experiences is nothing over and above experiences, their properties and relations between them. This approach is traditionally associated with the bundle theory, but it has recently been developed in new ways, including identifying subjects with particular experiences (Strawson 2009) or identifying them with a property of experiences, e.g., their first-personal character (Zahavi 2014).

Having clarified these different deflationary conceptions of the self, I shall outline two distinct criticisms. The first develops what is sometimes termed the having objection: subjects cannot be identical with experiences or properties of experiences, since the subject has the experiences. This objection is usually stated quickly (e.g., Dainton 2008, 44; Guillot 2017, 37; Duncan 2018, 91-92). I shall develop the objection in detail and show how it avoids responses from Strawson and Zahavi.

The second objection concerns various modal truths about experiences, including counterfactuals (i.e., I could have had experiences other than those I have actually had), and the ontological dependence of experiences on their subjects (my experiences could not have been had by any other subject). I shall argue that each deflationary conception cannot accommodate at least one of these modal truths.

### The Dynamics of Reflective Consciousness

Nancy Salay

Queens University, Kingston

Increasingly people are speculating that the defining features of human cognition — language and self-consciousness — are acquired through learning within the complex social/cognitive niches into which we are born. Insightful dynamic systems analyses of what were once taken as incontrovertibly innate capacities (e.g. Thelen & Smith, 1996) add plausibility to the idea, but the devil is in the details and these details are particularly devilish.

The central claim of this talk is that intentionality is a skill which emerges out of a broader social practise of using words, information tools, to describe. Paying attention to interactions between both higher-level — social — and lower-level — neural — dynamics, I argue that self-consciousness (a.k.a. reflective consciousness), is a consequence of, not a precursor to, this skillful engagement with information tools.

### Are We Biased Towards Intentional Attributions?

James Moore

Goldsmiths, University of London

[with Rachel Slavny, Antonia Eisenkoeck, University of Cambridge]

The ability to distinguish between intentional and unintentional movements is integral to our social lives. Despite the apparent ease with which we do this, there is growing evidence that we are actually biased towards intentional attributions for the behaviour of others. To explain this, Rosset (2008) proposed a dual-process model of intention attribution. According Rosset, when analysing someone else's behaviour intentional interpretations are automatically activated. Unintentional explanations are only then considered when higher-level cognitive processes are recruited to inhibit automatically triggered intentional explanations. A consequence of this is that we are biased towards attributing intent to other people's behaviour. This has been termed the 'intentionality bias'.

In the first part of the talk I will present new evidence that supports the idea that we have an intentionality bias. I will also present data showing that this bias is a) correlated with certain individual differences (namely schizotypy and empathy) and b) linked to processing within the right temporo-parietal junction. In the second part of the talk I will present data from experiments that have directly tested Rosset's dual-process model. These experiments fail to provide strong support for the dual-process model, suggesting that this bias is linked to some other neurocognitive process/architecture.

Thursday, June 27, 2019, 17:00-19:00

Club Casino

## A2: Altered States of Consciousness 2

### Connectome-Harmonic Decomposition Reveals Brain's Dynamic Reorganisation after Psilocybin Treatment for Treatment-Resistant Depression

Jakub Vohryzek

Department of Psychiatry, University of Oxford, Oxford / Center for Music in the Brain, Aarhus University, Aarhus

[with Selen Atasoy, Department of Psychiatry, University of Oxford, Oxford, Louis-David Lord, Department of Psychiatry, University of Oxford, Oxford, Robin Carhart-Harris, Psychedelic Research Group, Imperial College London, London, Gustavo Deco, Department of Information and Communication Technologies, Universitat Pompeu Fabra, Barcelona, Morten L. Kringelbach, Department of Psychiatry, University of Oxford, Oxford]

Psychedelic medicine has generated increased interest notably due to reports of clinical effectiveness in neuropsychiatric disorders including addiction, anxiety and depression. A recent fMRI study of psilocybin in treatment-resistant depression has shown promising outcomes with 50% of patients meeting criteria for treatment response 5 weeks after. The underlying mechanism by which psilocybin affects the depressed

brain remains unknown, however. Here, we use a method called ‘connectome-harmonic decomposition’ – a spatial extension of the Fourier transform to the human connectome - to investigate the reorganisation of brain dynamics from pre-treatment baseline to 1-day post-treatment with psilocybin. After the treatment, we observed a reduction in the power and energy of high-frequency connectome harmonics, which was accompanied by a suppression of the repertoire of active harmonic brain states. Remarkably, the harmonic bands in which there was a decrease of energy and power after the treatment coincided with the range which has been found to show an increase in those measures under the acute effect of LSD and psilocybin in healthy individuals. These results therefore speak to a potential post-acute ‘rebound effect’ in which post psilocybin treatment brain changes move in an opposite direction to those seen under the acute effects of psilocybin and LSD.

### **This World, Heaven, and Hell: The Three Basic Psychological Dimensions of Ordinary and Altered States of Consciousness and Their Clinical Implications**

Kurt Stocker

University of Zurich, Department of Psychology, ETH Zurich

Psychological-experimental and psychometric research on ordinary and (psychoactively or psychologically induced) altered states of consciousness (OSC/ASC) support Aldous Huxley’s original proposal that the concepts which in religious language are called this world, heaven, and hell are psychologically true. These three psychological dimensions seem to be organized along (as thus far identified) fourteen continuous conceptual parameters – with each parameter ranging from a) psychological this world (OSC) to either b) psychological heaven (ASC) or c) psychological hell (ASC). One such parameter is for instance a) Connection / b) Unity / c) Isolation/Disintegration – where in OSC one feels to a certain degree connected to one’s environment, whereas in ASC one might feel totally unified (heaven) or absolutely isolated/disintegrated from it (hell). Other parameters are for example: a) Embodiment / b) Positive Disembodiment / c) Ultradense Embodiment, or a) Time and Space Awareness / b) Time- and Spacelessness / c) Time and Space Locked-Inness. Our own current clinical psychometric research with depressed individuals is also presented. In the ketamine-induced temporary ASC, these patients predominantly seem to have experiences that fall within the psychological heaven dimension. We for instance measure if “heavenly” ASC aspects such as Unity, Positive Disembodiment, or Time- and Spacelessness correlate with antidepressant benefits, once these patients return from ASC to OSC.

### **Effects of Auto-Antibodies from Patients with Autoimmune Encephalitis Presenting with Psychosis, Seizures and Altered Levels of Consciousness**

Ewa Andrzejak

German Center for Neurodegenerative Disease (DZNE), Berlin

[with Frauke Ackermann, German Center for Neurodegenerative Disease (DZNE), Berlin, Christian Rosenmund, Charité Medical University, Berlin, Harald Prüb, German Center for Neurodegenerative Disease (DZNE), Berlin, Craig-Curtis Garner, German Center for Neurodegenerative Disease (DZNE), Berlin]

Over the last decade, a growing number of psychiatric and central nervous system disorders have been linked to autoantibodies against synaptic and neuronal cell-surface proteins. These autoimmune encephalopathies present with a wide range of symptoms, from prominent psychiatric and cognitive manifestations, behavioral and personality changes, to severe seizures, abnormal movements and fluctuating levels of consciousness. Studies of patient cerebro-spinal fluid (CSF) revealed that in a population of patients the antibodies recognize an epitope situated within N-methyl-D-aspartate receptor (NMDAR), likely causing receptor cross-linking and subsequent internalization. Of note, the same receptor is a target of several known dissociative and anesthetic drugs, such as ketamine and PCP. Similarly, anti-NMDAR encephalitis patients often suffer initially from psychosis and dissociative states which then progress into reduced consciousness and coma. However, the antibodies’ specific mechanisms of action and how they affect different levels of neuronal and brain function, which could contribute to altered consciousness observed in patients, are not fully understood.

To address these questions, we generated recombinant monoclonal antibodies derived from CSF of a young woman suffering from anti-NMDAR encephalitis. Here, using a combination of in vitro cell imaging assays and electrophysiological recordings, we aimed to investigate the effects of the antibodies on single neuron function and network activity. To this end, we observed that on a single cell level the antibodies selectively decrease NMDA currents, while at the same time dramatically increase activity of neuronal networks. To further characterize this phenomenon, we intend to examine specificity of the antibodies to receptor and neuronal subpopulations. These data could provide more insights into the specific mechanisms of the disease and explain its multimodal symptomatology.

### **Breathing and the Brain – Decelerated Breathing Synchronizes Brain and Body Rhythms**

Thilo Hinterberger

Department of Psychosomatic Medicine, University Medical Center Regensburg, Regensburg

[with Devina Galuska, Heiligenfeld Clinics, Bad Kissingen, Joachim Galuska, Heiligenfeld Clinics, Bad Kissingen]

Due to the high mental demands in complex environments there is increasing interest in the research of the highly sensitive personality (HSP). People with HSP are challenged in a special way. We have developed a novel inventory for the assessment of a person’s

sensitivity and the sensory processing problems separately which might be related to certain aspects of sensitivity. The model discriminates between external, internal, emotional, and social sensitivities as well as the openness for new experiences. The inventory was assessed in a psychosomatic clinic on more than 4000 participants. We found the sensitivity of patients to be correlated with resilience, experience of meaning, positive feelings and success, while mental processing problems were strongly correlated with burnout symptoms, depression, and anxiety and negatively correlated with resilience. These results suggest that psychopathological factors seem to be closely connected to problems in the processing of external, internal, social and emotional perceptions and sensations. In contrast, mental health, happiness and salutogenetic states of consciousness seem to be related to the experience of a rich sensory capability.

#### **A Physiological Examination of Perceived Incorporation During Trance**

Cedric Cannard

Institute of Noetic Sciences, Petaluma

[with Helané Wahbeh, Institute of Noetic Sciences, Petaluma, Jennifer Okonsky, Institute of Noetic Sciences, Petaluma, PhD, MA, RN, Arnaud Delorme, Institute of Noetic Sciences, Petaluma]

**Background:** Numerous world cultures believe channeling provides genuine information, and channeling rituals in various forms are regularly conducted in both religious and non-religious contexts. Little is known about the physiological correlates of the subjective experience of channeling.

**Methods:** We conducted a prospective within-subject design study with 13 healthy adult trance channels. Participants alternated between 5-minute blocks of channeling and no-channeling three times while electroencephalography (EEG), electrocardiography (ECG), galvanic skin response (GSR), and respiration were collected on two separate days. Voice recordings of the same story read in channeling and no-channeling states were also analyzed.

**Results:** The pre-laboratory survey data about demographics, perception of the source, purpose and utility of channeled information reflected previous reports. Most participants were aware of their experience (rather than in a full trance) and had varying levels of perceived incorporation (i.e. control of their body). Voice analysis showed an increase in voice arousal and power (dB/Hz) differences in the 125 Hz bins between 0 and 625 Hz, and 3625 and 3875 Hz when reading during the channeling state versus control. Despite subjective perceptions of distinctly different states, no substantive differences were seen in EEG frequency power, ECG measures, GSR and respiration.

**Conclusions:** Voice parameters were different between channeling and no-channeling states using rigorous controlled methods, but other physiology measure collected were not.

Thursday, June 27, 2019, 17:00–19:00

Ballsaal

## **B2: Metaphysics of Consciousness 2**

### **The Unfolding Argument: Why IIT and Other Causal Structure Theories Cannot Explain Consciousness**

Adrien Doerig

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[with Aaron Schurger, Kathryn Hess, Michael H. Herzog, Laboratory of Psychophysics, Brain Mind Institute, EPFL Lausanne / Cognitive Neuroimaging Unit, NeuroSpin Research Center, CEA-Saclay / Laboratory for Topology and Neuroscience, Brain Mind Institute, EPFL Lausanne]

How can we explain consciousness? This question has become a vibrant topic of neuroscience research in recent decades. A large body of empirical results has been accumulated, and many theories have been proposed. Certain theories suggest that consciousness should be explained in terms of brain functions, such as accessing information in a global workspace, applying higher order to lower order representations, or predictive coding. These functions could be realized by a variety of patterns of brain connectivity. Other theories, such as Information Integration Theory and Recurrent Processing Theory, identify causal structure with consciousness. For example, according to these theories, feedforward systems are never conscious, and feedback systems always are. Here, using theorems from the theory of computation, we show that causal structure theories can be neither supported nor falsified by experiments. Therefore, they are outside the realm of empirical science. We carefully outline the argument and its novel insights, and show how it can guide future research.

### **Predictive Processing and the Content of Consciousness: A Fundamental Limitation?**

Steven S. Gouveia

Philosophy Department, University of Minho

[with Georg Northoff, Brain and Mind Research Institute, Ottawa]

Predictive processing is a fresh and new framework in cognitive and computational neuroscience that have been influenced by several disciplines (A.I., philosophy, psychology, etc.). One of its main ideas is to see the brain as a prediction machine: its goal is to anticipate the incoming sensory data (that is predicted) with the actual sensory data (real). The PP framework has been applied to several distinct functions of the brain including action, perception, attention, cognition, etc. Most recently, PP has also been suggested to serve as framework for consciousness. The main focus in this presentation is on whether PP can properly explain consciousness. Consciousness can be characterized by content, level/state, and form. Based on various lines of empirical data, we argue that PP can well account for the content of consciousness. In contrast, PP remains insufficient when it comes to the level/state and especially the form of consciousness including the subjective experience of the contents of consciousness as characterized by

various phenomenal features. Hence, we conclude that PP remains limited in explaining the association of content with consciousness. Therefore, PP needs to be complemented by a wider and different framework which, as based on the recent temporo-spatial theory of consciousness (TTC), may be spatiotemporal.

### **The Meta-Meta-Problem of Consciousness**

Tobias Schlicht

Institute for Philosophy II, Ruhr-Universität Bochum

Chalmers (2018) introduces the meta-problem of consciousness: the “problem of explaining why we think consciousness poses a hard problem”. The task is to explain our judgments and intuitions about consciousness, e.g. “consciousness poses a hard problem”. But in his presentation, the meta-problem is one of the “easy” problems, it does not itself presuppose the reality of consciousness and is concerned with cognitive phenomena. He says that “to solve the meta-problem, ... we need only explain the fact that we have the problem intuitions; we do not also need to explain their correctness.” (Chalmers, 2018, 21)

This talk introduces the meta-meta-problem, because it concerns how Chalmers sets up his bundle of problems in the first place. My criticism will therefore reach back to his initial contrast between easy problems and the hard problem. This leads to problematic consequences which may be put in terms of a dilemma that I will lay out rather than solve in one direction or another. The dilemma can be treated as a reductio of the initial assumption that we can carve up problems of consciousness in this way. Either consciousness plays a role in bringing about the problem intuitions, but then it is real and its causal role makes it either part of the cognitive (physical) realm (which is causally closed) or leads to interactive dualism. Chalmers (1996) rejects both positions in favor of his epiphenomenalist dualism. Or consciousness does not play such a causal role, it may not even be real (illusionism), and the intuitions arise even in Zombies which lack subjective experience, having a cognitive origin. The claim that Zombies are capable of these behaviors and develop (grasp) the phenomenal concepts needed for such judgments without ever having had the relevant experiences, is hard to sustain. At least no existing account of phenomenal concepts can illuminate this. But this situation arises only because the Zombie has been defined based on the (allegedly) clear separation of the easy (cognitive) from the hard problems (experience). Giving up this distinction can avoid this dilemma and paves the way for a cognitivist account that takes consciousness seriously.

### **Mental Monism: An Interface Model Consistent With Relativity Theory and Quantum Theory**

Peter B. Lloyd

School of Computing, University of Kent, Canterbury

There has been a resurgence of interest in panpsychism and mental monism (aka subjective idealism) as candidate solutions to Chalmers’ Hard Problem of consciousness.

Lloyd (2006) has argued in favour of mental monism as a surprising but internally consistent model of consciousness and its place the world. Chalmers (2018) has said there is a “non-negligible probability that idealism is true”. There are, however, severe technical difficulties in reconciling mental monism with basic physics such as relativity theory (especially the impossibility of instantaneous physical communication) and quantum theory (especially the Extended Wagner’s Friend problem). This paper proposes an interface model for the interaction between the conscious mind and physical world, within the framework of mental monism. It is shown that a reconciliation is possible, albeit at the cost of a profound dislocation of mental time and physical space-time. If mental monism is to be taken seriously as a candidate solution to the mind-body problem then these ramifications have to be worked out and accepted.

### **What Descartes Didn’t Know: The Reverse Knowledge Argument**

Jonathan Dorsey

University of California, Davis

The problem of consciousness is a problem for physicalism. But a new thought experiment (Super-Descartes and the Epystomite) and a new argument (The Reverse Knowledge Argument) advance a companion problem equally problematic for non-physicalist views. By appreciating this---and avoiding any claim to physicalist retribution---one may see that no one escapes ‘the’ problem of consciousness or the mind-body problem ‘contemporary’ or otherwise.

Thursday, June 27, 2019, 17:00–19:00

Harder 1

## **C2: Language and Evolution**

### **On the Unsuitability of Language as a Tool in the Exploration of Consciousness**

Sydney Lamb

Linguistics, Rice University, Houston

The inability of language to accommodate basic questions concerning consciousness has long been noted (e.g. Nagel 1974), and it becomes more apparent with greater understanding of the nature of linguistic structure (e.g. Lamb 2016). This paper treats several reasons for this inadequacy, not least of which is the support that language provides for faulty perception and faulty distinctions and faulty categorization of the phenomena distinguished.

A case in point is the term consciousness itself, which covers different phenomena and thus tends to make people conflate them. For one thing, we need to distinguish focused consciousness, focused on one phenomenon at a time, from the domain of consciousness, which covers the large area to which focused consciousness has access. We need also to consider the vast domain of the unconscious. Progress will require expanding the domain of consciousness into areas that are now unconscious (for most people). For



this task, language is thoroughly unsuited, except insofar as it can be used to give instructions for mental exercises, such as meditation, that lead to expansion of the domain of consciousness.

Lamb, Sydney. 2016. Linguistic structure: A plausible theory. *Language under Discussion*. [www.ludjournal.org/index.php?journal=LUD&page=article&op=view&path\[\]=30](http://www.ludjournal.org/index.php?journal=LUD&page=article&op=view&path[]=30)  
Nagel, Thomas. 1974. What is it like to be a bat?

### **Modularity and Flexibility Quantify Unique Perceptions of Music and Speech in the Human Brain**

Melia E. Bonomo

Rice University, Houston

[with Christof Karmonik, J Todd Frazier, Michael W Deem, Houston Methodist Hospital, Houston / Weill Cornell Medical College, New York]

Modularity and flexibility are two quantifiers of functional brain activity that have been demonstrated to predict the relative performance of subjects on cognitive tasks of varying complexities (Yue et al., 2017, *J Cogn Neurosci* 29(9):1532-46; Ramos-Nunez et al., 2017, *Front Hum Neurosci* 11:420). Modularity measures the degree to which functional activity within a module of brain regions is more highly correlated than activity between modules, and flexibility measures the likelihood that brain regions change their module allegiance. Here, we investigated the relationship between whole-brain network modularity and flexibility while subjects actively listened to a variety of auditory pieces that varied in cultural familiarity and emotivity. Our results suggest that the inverse relationship between modularity and flexibility previously seen in resting-state data (Ramos-Nunez et al., 2017) remains important during speech perception and becomes less essential during music perception. Furthermore, when comparing the whole-brain network of subjects perceiving culturally unfamiliar music versus emotional speech, there was heightened modularity during the speech, which had a meaning and tone that were relatively simple to understand, and there was heightened flexibility during the unfamiliar music, which was more complex to process.

### **Inner Speech and Robot Consciousness**

Antonio Chella

University of Palermo and ICAR-CNR, Palermo

Inner speech is tightly linked to self-consciousness, as claimed by Morin and by Fernyhough, among others. Simplified computational methods have been proposed by Steels and by Clowes. The paper discusses a cognitive architecture for robot inner speech developed at the RoboticsLab of the University of Palermo. Briefly, the working memory system of the robot includes a phonological loop as the main component for storing spoken and written information and for implementing the cognitive rehearsal process. The inner dialogue is modeled as a loop in which the phonological store hears the inner voice produced by the hidden articulator process. A central executive drives the whole system. By retrieving linguistic information from the long-term memory, the central

executive contributes to creating the conscious thoughts whose surface form emerge by the phonological loop. Once a conscious thought is elicited by inner speech, the perception of the new context could take place, repeating the cognitive cycle. Relationships with the current theories of consciousness are examined, as the global workspace theory, the information integration theory and the higher-order theories of consciousness.

### **Can Consciousness Influence Our Epigenetics and Can Epigenetics Influence Our Consciousness?**

Ingrid Fredriksson

University of Palermo and ICAR-CNR, Palermo

Epigenetics is a mechanism for regulating gene activity independent of DNA sequence that determines which genes are turned on or off: in a particular cell type, in a different disease states or in response to a physiological or even psychological stimulus.

There is a microbiota-gut-brain axis communication in health and disease. Under healthy conditions, the predominance of symbiotic bacteria, an intact intestinal barrier, a healthy innate immunity controlling pathobiont overgrowth inside the intestinal barrier.

The molecules that constitute epigenomes have no resemblance of DNA. While DNA is a double spiral, similar to a twisted rope ladder, the epigenome is a system of chemical markers that sits on the DNA. The molecule markers either engage or disengage the genes depending upon the cell's needs and environmental factors, such as diet, stress and poisons. Of late, the discoveries surrounding the epigenome have caused a revolution in the field of biology now being able to prove a connection between the epigenome and certain illnesses, including aging.

The Nobel Prize in Physiology or Medicine 2018 showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer.

Keywords consciousness, epigenetics, DNA, cells, genes, microbiota, gut and brain

### **On Full Correspondence, the Placebo Effect, and the Mental Life of Sea Snails**

Andre LeBlanc

Concordia University and John Abbott College, Montreal

According to the theory of full correspondence, all physiologically measurable placebo effects are accompanied by psychological experiences to which these effects correspond (LeBlanc, 2014). If true, full correspondence would provide a way of explaining the nature of the placebo effect and of unifying the various approaches to the phenomenon, including expectancy theory, meaning theory, and conditioning theory, under a common theoretical umbrella. Taken to its logical extreme, however, full correspondence would seem to imply that all instances of classical conditioning are accompanied by conscious experiences. It so happens that even sea snails are subject to classical conditioning, and since few people believe sea snails possess consciousness, the theory of full correspondence seems to rest on shaky grounds. As I count myself among the few who believe in the mental life of sea snails, however, I will argue that the more scientifically plausible

assumption is that they have consciousness rather than not. My arguments will consider the theory of evolution, the concept of emergence, anthropomorphization, panpsychism and other metaphysical claims for and against attributing consciousness to non-human animals.

LeBlanc, A. (2014). "Feeling what happens": Full correspondence and the placebo effect. *The Journal of Mind and Behavior*, 35(3), 167-184.

Thursday, June 27, 2019, 17:00–19:00

Brünig 1

## D2: Quantum Consciousness 2

### Introspection and Superposition

Paul Skokowski

Oxford University and Stanford University

David Albert claims that the linearity of operators that represent observables in quantum mechanics leads to cases where a single eigenvalue can be elicited from a superpositional state, yielding potentially puzzling results. Though this is true due to the mathematical properties of linearity, there are problems with the examples Albert chooses to illustrate what is puzzling about these properties. Understanding the problem with the first, simple, example that Albert gives of a particle in a box helps us to understand the deeper and more interesting problem of the second example: the nature of an observer's mental states when she is observing a superposition. In both cases it turns out the eigenvalues necessary for obtaining the results Albert claims for the superpositions in question require additional eigenstates, and additional operators that are specific to those additional eigenstates. This analysis raises the question of whether an observer of a superposition is radically deceived in the way Albert claims.

### Consciousness in Quantum Bayesianism

Shiroman Prakash

Philosophy Department, University of Toronto

The mind-body-problem is usually presupposes a deterministic objective reality (or view-from-nowhere). However, classical mechanics has been proven incorrect and the only theory consistent with all experiments recorded by the scientific community to date is quantum mechanics. Quantum mechanics, in essence, is a pragmatic theory that presupposes an scientist with the free will to choose what experiments to perform (or actions to take), and provides a rule for calculating probabilities (or consistent sets of beliefs) for the various possible outcomes (or experiential feedbacks) of those experiments. Thanks to various contextuality theorems, we know that there are fundamental obstructions to reconciling the predictions of quantum mechanics with the existence of an observer-independent objective reality.

Nevertheless, quantum mechanics is the most successful theory ever proposed, and scientists have learned that a view-from-nowhere is not needed to do science. The "interpretation" of quantum mechanics called QBism makes this point clear and makes the pragmatic approach to quantum mechanics used by working scientists philosophically precise.

In the talk, we will ask to what extent we need a view-from-nowhere to do philosophy? To what extent is the hard-problem-of-consciousness still a problem in QBism?

### The Self of the Observer: Time, Altered States of Consciousness and the Quantum-to-Classical Transition

Heinrich Päs

TU Dortmund

[with Marc Wittmann, Institute for Frontier Areas of Psychology and Mental Health, Freiburg]

Is the Quantum-to-classical transition related to the way consciousness works? We discuss this question from the viewpoint of a universal validity of quantum mechanics. Under this assumption the Universe is fundamentally quantum mechanical and the quantum to classical transition is a consequence of decoherence, i.e. the loss of information into an unknown environment, and thus tied to the perspective of the observer or measurement device.

Crucial ingredients in this description are the "quantum factorization" into observer, object and environment, and the interaction between these constituents defining the preferred basis the quantum mechanical state decoheres into. Since any experience of the outside world is realized within the consciousness of the observer, the boundaries of the physical degrees of freedom constituting the conscious self are instrumental in this approach. If the physical degrees of freedom constituting the conscious self and/or the interaction of these degrees of freedom with the outside world are altered in altered states of consciousness, this will affect how the quantum-to-classical transition proceeds.

A particular interesting phenomenon in this context is the experience of time in such states of consciousness, i.e. the feeling of timelessness coupled with a loss of the sense of self. We compare this experience as reported in psychedelic and in meditative states to the emergent nature of time in many scenarios of quantum cosmology adopting universal quantum mechanics

### A Gauge Field Model of Attention-Mediated Emotion-Memory Interactions

Peter Raulefs

QIQCS, Santa Clara

A substantial number of experimental findings show that emotionally charged stimuli and attention interact to influence how information is encoded in consolidated memory, and how behavioral responses are induced.

The gauge field model builds on the dissipative many-body brain model by Freeman, Vitiello et al., addressing the KIII/KIV level within the range from microscopic neural dynamics to whole brain behavior.

Using tools from Quantum Field Theory, we show consistency with published results of 28 experiments with assays using EEG/ERP/MEG/fMRI and eye movement data to (1) derive ERP components from EEGs to correlate emotionally charged memories and attention levels, and (2) used fMRI/BOLD signals to place and relate attention and emotional stimuli at en- and decoding.

In quantum fields, spontaneous symmetry breakages generate massless Nambu-Goldstone bosons that, when condensating, create long range coherence patterns and information transmission with amplitude-modulated neural firing patterns.

The model makes quantitative predictions on scenarios that extend from visual and auditory stimuli charged with positive/neutral/aversive emotions, to then attenuating and focusing attention, influencing neural encoding in working memory, and consolidation in long-term memory observable in recall characteristics and behavioral responses.

#### **Photobiomodulation-Induced Fast Brain Oscillations Can Elevate Consciousness and Cognition**

Lew Lim  
Vielight Inc.

Until recently, knowledge about the brain operating beyond 35 Hz (gamma) have been scant. Part of the reason has been that most affordable EEG equipment were only able to measure below that frequency. Another reason is that gamma brainwaves are largely endogenous, transient, and difficult to entrain or induce. For these reasons, treatment techniques such as neurofeedback do not normally cover gamma brain waves. That will change because technology is now able induce/entrain oscillations of known gamma rates and beyond easily - through photobiomodulation (PBM) delivering pulsed near infrared (NIR) light, which can be sensed by advanced meditators.

Induced at 40 Hz and asynchronously, early evidence has shown that PBM at NIR wavelength could profoundly improve dementia conditions, raise acute cognitive performance and immediately help experienced meditators to quickly enter altered states. Induced at higher oscillations, synchronously to even 10,000 Hz, advanced meditators have been able to expand consciousness that were not experienced previously. Researchers of meditation and consciousness who have extolled the virtues of 40 Hz will now be able to test their hypotheses at that frequency and beyond.

My presentation will cover recent discoveries in detail and how what the future could hold for induced high frequency oscillations.

Thursday, June 27, 2019, 17:00–19:00

Harder 2

## **E2: Mind-Body**

### **Embodiment and Psychosomatics**

Sophie Witt

Collegium Helveticum, ETH Zurich and University of Zurich

In the last two decades theories of Embodied cognition claimed that consciousness has to be understood as bodily practice and as enacting in specific situations or environments. I'd argue, that one of the fields in which these discussions are foreclosed and reverberated is Psychosomatic Medicine. Firstly, the paper outlines that while psychosomatics has a likewise young history as part of clinical medicine (dating from the early 1920s), its cultural history dates back to around 1800; seen from this perspective psychosomatics clearly exceed biomedical pathology and gives insights in the rather uncanny relation between nature and culture, body and language, soma and cognition, including various attempts towards holistic 'reunion'. Secondly, the paper aims at drawing special interest to the productive relation between psychosomatic discourse and theatre literature with its mind-soma-union and -translations. And thirdly, the paper asks how the more recent theories of embodied cognition could be made productive for the interdisciplinary study of psychosomatics' cultural history and theoretical impact; for embodiment is not only an abstract philosophical question, but a rather concrete methodological challenge in both medicine/psychotherapy and theatre studies.

### **A 'Ghost in the Shell'? The Challenge of Locked-In Syndrome and the World-Body-Brain Relation as Predisposition of Consciousness**

Federico Zilio

Department of Philosophy, Sociology, Education and Applied Psychology,  
University of Padova

The Locked-in Syndrome (LIS) is characterized by a massive de-efferentation with preserved consciousness, cognition and perception of the environment, but also with extreme limitation in interaction and communication: the mind in LIS seems literally 'locked' inside the body. In this sense, the idea of an extended, embodied, embedded and enactive consciousness (see 4E cognition) is called into question by this concrete exemplification of a brain in supposed isolation from body and environment.

However, contrary to what is usually thought, I will argue that LIS is a counterargument against the claim that a well-functioning brain is the only necessary and sufficient condition for consciousness. Through both neurological and phenomenological insights on LIS, I will show that afferentation – the sensory processing of stimuli from world to brain – and the world-disclosing activity of intentionality are, respectively, empirical and existential conditions of consciousness.

Then, comparing various theories of consciousness – Temporo-spatial, Integrated information and Global neuronal workspace – I will describe consciousness as neuro-ecological (rather than merely neuronal), temporo-spatial (rather than merely cognitive or

integrative) and characterized by world-body-brain relation (rather than by either body or brain alone). I will conclude that this relation between world, body and brain is a necessary predisposition of possible consciousness.

### **Phantom Sensation and Prosthetics in Transgender Bodies Through the Free Energy Principle**

Simon J. Langer

School of Visual Arts, New York University

Phantom sensation in transgender subjects has been barely researched. My clinical experience as a psychotherapist and preliminary research confirms that this is a phenomenon which warrants deeper inquiry. Transgender phantoms share more similarities with aplasic phantoms than with amputee phantom sensations: a feeling of what should have been present on the body but is missing. Phantoms (breasts, penises, vaginas, etc.) in transgender people will be understood utilizing my application of body matrix and predictive processing theories to explain gendered experience.

My theoretical construction of core gender is composed of gendered hyperpriors and the sensational afferent signals flowing up from the interoceptive, exteroceptive and proprioceptive systems. The feeling of gender dysphoria and gender-congruent phantoms are a type of surprisal. We will explore how prosthetics function as a blanketed system as a means of active inference. What are the Markov blankets related to gender? How do prosthetics make these blankets malleable? How does this process enable transgender people to accommodate for their bodies to reduce free energy? This presentation will propose answers to these inquiries using theoretical and practical approaches from neuroscience, physics, & psychology.

### **The Body Language of Emotion: A Role for Congruent Bodily Arousal on the Awareness of Emotional Words**

Nicolas Vermeulen

Université catholique de Louvain

Considerable research has shown that bodily states shape affect and cognition. Current theories of embodied emotion suggest that knowledge about an emotion concept involves simulations of bodily experienced emotional states relevant to the concept. Here, in different experiments, we examined whether transient (increased or reduced) states of bodily arousal influence the accurate identification (Study 1, Attentional Blink) or the categorization speed (Study 2, constructive “unfolding” recognition) of high arousal, low arousal, and neutral words. Participants realized two blocks of computerized tasks, once after a cycling session (increased arousal), and once after a relaxation session (reduced arousal). Collectively, the studies revealed that increased physiological arousal led to improved processing of high arousal words, whereas reduced physiological arousal led to improved processing of low arousal words. Importantly, neutral words remained unaffected. Results revealed overall that congruent bodily states of arousal promote the recognition of stimuli matching one’s current arousal state. These findings

highlight the importance of the arousal dimension in emotional processing, and suggest the presence of arousal-congruency effects in the emergence emotional awareness.

### **Impugning the “Theological” Rationalism and Classical Cognitivism – In the Light of Embodiment and Heideggerian Phenomenology**

Navneet Chopra

University of Delhi

Rationalism claims to find the stable, absolute and indubitable truths about the nature of world including nature of human mind and language using certain a priori, essential ‘intuitions’ (Husserl) or ‘ideas’ (Plato, Frege) which exist independently of the structure, processes of mind/brain and experiences of human mind, human existence (anti-psychologism) and embodiment. For such beliefs, it adopts essentially an “anti-scientific” and “anti-naturalistic” character, under which it ridicules the empirical truths to be merely contingent ones and inferior to those ‘absolute’ truths attained by rationalistic inquiries in terms of abstract, a priori ideas processed under abstract logical-deductive thinking, without entertaining the need to get empirical verification for them. This attitude attains a kind of ‘theological’ dogmatism for a steadfast rejection of the role of experience and emergence in meaning-formation, based on a wholesale rejection of psychologism, and postulating mysterious elements (e.g. existence of “third” realm by Frege) for ascertaining objectivity of ‘thought’, e.g., of timeless mathematical truths. This paper tries to show such views to be exaggerated, unnecessary and thwarting the growth of genuine knowledge, using the insights gained from embodied cognition and Heideggerian phenomenology. It also suggests that analytic philosophy and its offshoots ‘classical cognitivism’ and (machine) functionalism suffers from the same mistaken metaphysical and epistemological presuppositions (following Dreyfus) as held by rationalism, and hence, are misdirected accounts of human mentality. Further, it suggests that the ‘hard problem of consciousness’ mistakenly assumes that human (and not of robot) cognitive functions, like language, perception, social cognition, memory, etc., can be accomplished by ‘dry’ computational approach leaving only the problem of qualia unresolved. It neglects the role of affect and embodied experience in the execution of such functions, and mistakenly ignores the presupposition of consciousness (to whom the experience happens) which a zombie lacks in principle, thereby rendering the notion of zombie (a computational robot lacking qualia) and successful computational functioning in zombie to be problematic. Such problems arise from the mistaken cognitivist presuppositions and can be resolved in the light of Heideggerian phenomenology and embodied-enactive-situated cognition paradigm. Embodiment exists at two levels - analytic embodiment and phenomenological embodiment, where the latter grounds the former by providing the ‘conditions of intelligibility’ as foundations for the constitutive program of meaning. Further, this paper also documents several empirical studies showing the role of body and situated action in social perception, language comprehension, concept representation, etc. defying the rationalist and classical cognitivist views. Only after abandoning the ‘theological’ rationalist views and classical cognitivism, as exemplified by the scientific embodied-enactive-situated-affective studies and Heideggerian phenomenological insights, we can make a real progress to understand mind, world, language and meaning in them.

## F2: Digital Consciousness

### AI, Embodiment, and Consciousness — What We Talk About When We Talk About Machine Consciousness

Lucian Leahu

IT University Copenhagen

This talk presents an analysis of research from the fields of robotics, AI, and digital art that is relevant for the topic of machine consciousness. The analysis highlights common ground, misconceptions, as well as highlights novel avenues for approaching the question of consciousness with and through machines.

### On Attempting to Reify a Few of the Things we Mean by Consciousness with Code

Dhaval Adjodah

MIT Media Lab, Cambridge

[with Josh Joseph, Joichi Ito, MIT Media Lab, Cambridge]

Understanding “consciousness” is both one of the most important problems of our time and one of the biggest suitcase words in common usage. While there is an enormous amount of work in Philosophy, Neuroscience, and Psychology which attempts to unpack it, we believe that novel and complementary insights can come from building, in code, communicable, concrete, and executable prototypes in order to reify aspects of what we might mean by “consciousness”, similar to the approach taken by [Muehlhauser, 2017]. We additionally find great inspiration for our approach from [Bengio, 2017] - not in the sense that we believe the paper has a sufficient definition and approach to consciousness - but in the sense that we imagine follow-on papers and experiments which serve as the foundation for meaningful and concrete discussion and progress. We will discuss some of our approaches and lessons learned from reifying concepts such as brain states and mental states.

### I Am Not a Robot. Or Am I? Digital Depersonalization:

#### Existential Dasein vs Cyber Design

Elena Bezzubova

New Center for Psychoanalysis, Los Angeles

Life in the cyber world fundamentally challenges experience of self. A person is perceived as a bot, and a bot is perceived as a person. Nonexistent illusions of virtual effects cause real existential feelings. Troll factories create codes that manipulate political elections. Personalization merges with depersonalization. The proposed workshop explores this cyber shift in self-consciousness. Based on my research and clinical experiences, I introduce a notion of digital depersonalization as a framework for understand-

ing self-consciousness in the situation of mixed traditional reality and virtual reality. The central problem is concerned with the dialectics of personalization as the experience of freedom and authenticity of existential Dasein, in contrast to digital depersonalization as the experience of the simulation and “fakeness” of cyber design. Related notions of selfie-selfconsciousness and virtual self are described. Digital depersonalization is considered to be a spectrum of four types: 1. On-line roleplaying, which contains three subtypes: adaptational, defensive and maladaptational. 2. Digital withdrawal. 3. Digital ontological insecurity. 4. Clinical digital depersonalization. The presentation concludes with exploration of the characteristic double “as if” quality of digital depersonalization. It is as if consciousness of as if reality that is rooted in dissociation between perception of factual reality with simultaneous cognition of effectual imagery.

### Artificial Selves

Andrew Bailey

University of Guelph

Machine ethics, the field of research devoted to the project of designing AIs which possess moral competence, is quite well-developed. Similarly, there is a burgeoning literature on the various kinds of threat that future AIs might pose to human beings. Less well-advanced is the philosophical examination of when and how Artificial Intelligences might themselves have moral standing. When this issue is addressed in the literature, the focus is typically on the question of whether and to what extent future AI’s might have genuine sentience and/or powers of thought. Other approaches propose an account of moral responsibility for AIs that is strongly deflationary about their prospective moral standing. In this paper I investigate a third avenue towards the moral standing of AIs, drawing on the connection between personal identity, selfhood and ethical status. I consider what it might be for an AI to be a self and propose this as a criterion—and a constraint—for that AI to have similar moral standing to other selves, such as human beings. I consider psychological continuity views but also bodily views, and argue that well-known accounts that work well for human beings ought to apply in a parallel manner to sufficiently complex AIs.

### Towards Machine Intelligence in Business Decision Making

Prem Sewak Sudhish

SAP Labs, Walldorf

[with Harsh Satsangi, Aarti Gupta, Swanti Devguptapu, Dayalbagh Educational Institute, Agra]

Business organizations around the world are deploying machine learning to automate decision-making. In this paper we consider emerging technologies that allows these organizations to innovate and provide efficiency in business functions such as personalization of customer service, automation of finances such as accounts payable, prediction of supply chain disruptions such as stock-outs, and hiring the right talent etc. While making procurement decisions, the intelligent agent can provide business decision-mak-



ers the ability to make conscious choices not only on economic considerations but also through application of policies such as social and environmental sustainability scores of suppliers. Similarly, at the time of hiring, the agent provides better opportunity for specially-abled individuals. We explore the theoretical basis for building such agents along with several case studies.

Thursday, June 27, 2019, 17:00–19:00

Brünig 3

## G2: Phenomenal Consciousness 1

### What is the Phenomenal Contribution of Attention in Introspection?

Julien Bugnon

University of Fribourg

In addition to the renewed interest that introspection is receiving lately, numerous contemporary debates – e.g. concerning the phenomenology of action or conscious thinking – seem to assume that we can consciously attend to the phenomenal character of our experiences. Do we genuinely have such a capacity? In this paper, I explore an affirmative answer by addressing two further questions that haven't yet been much discussed. First, what is the phenomenal difference between an introspective state and its corresponding introspected state? Second, what is the phenomenal contribution of attention in introspection? I put forward an account of the transition between having an experience and introspecting it inspired by the notion of a Gestalt switch. This account provides an attractive compromise between two prominent yet unsatisfactory models of introspection, the perceptual and the cognitive models. I investigate the second question in light of recent accounts of attention, especially Watzl's (2017), who argues that the phenomenal contribution of attention is not exhausted by its effects of how features of the worlds appear to us. I discuss an iteration of this "replication argument" at the level of introspection and explore the claim that introspecting a phenomenal feature partly consists in making it phenomenally more salient.

### Phenomenal Consciousness Must Be Sharp

Joshua O'Rourke

Princeton University

Consider the case of a mosquito. It is difficult to say whether a mosquito is conscious or not, but one thing we can say for sure, even in our present state of knowledge, is that the answer is determinately yes or no. The lights are either on or off. This shows that, if a physicalist theory of consciousness is to succeed, it cannot identify being conscious with falling under a vague physical concept. However, two broad classes of physicalist theories, those that attempt to pick out consciousness in functional terms and those that attempt to do so in neuro-biological terms, fail to satisfy this condition. This is because these theories use inexact concepts drawn either from folk discourse or

from the non-fundamental sciences rather than perfectly precise concepts built up out of fundamental physical and metaphysical concepts. These two classes cover all the major physicalist theories of consciousness that have been offered so far, so the physicalist must return to the drawing board. She must abandon the concepts of psychology and neuroscience in order to find a perfectly precise property that is even a candidate for being identical to consciousness. I think that project is unlikely to succeed.

### The Relation Between Higher Order States and Target States in Higher Order Theories of Consciousness

Sinem Elkatip Hatipoglu

Istanbul Sehir University

A major criticism of higher order (HO) theories of consciousness involves empty higher order states, viz., a higher order state without a target state. This objection feeds from there being no well articulated description of the relation between the higher order state and the so-called target state. I posit something called the history of the subject (SH) in an attempt to articulate this relation. SH is mainly information. SH is similar to memories only broader. While memories are typically of experiences that the subject is aware of while having, SH includes the totality of the subject's interactions with the world whether or not she is aware of these interactions. To use an analogy, SH is the kind of thing that would need to be uploaded if transhumanism as discussed by Olson was possible. SH is always and essentially present in the way things seem to a subject, in other words in phenomenal consciousness. When applied to HO theories, the content of higher order states is always partially determined by SH. Therefore higher order states are never really empty even when it may seem to a subject that she is in some mental state that she is not in.

### From the Inside: Brains, Bats, and Bottle-Tops

Liam P. Dempsey

Kwantlen Polytechnic University

In this paper, I begin to sketch a naturalistic account of experiential privacy with the intention of navigating a channel between mysterianism and deflation. Neither should experiential privacy lead us to "quine" qualia nor to treat them as mysterious by-products of brain activity. I begin with a brief historical refresher on privacy and the modern mind-body problem. From its roots in the struggle to reconcile mechanism and mind, we trace the development of emergence accounts, accounts suffused in mystery, to a different sort of approach based in nineteenth century German parallelism. In the second part, we see how one version of parallelism influenced the development of a twentieth century monistic account of consciousness, one that preserves a duality of perspectives, Herbert Feigl's twofold-access theory. I further explicate Feigl's view with a thought experiment concerning Bottle-Tops, creatures a lot like us except for their transparent skulls and colourful brains. I argue that this identity account of consciousness helps elucidate experiential privacy, which, on my view, turns out to be a

natural consequence of a creature's unique relationship to – and acquaintance with – at least some of the vicissitudes of its own brain and body.

### **Varieties of Phenomenology in Infants**

Claudia Passos Ferreira

New York University – Center for Bioethics

Two questions about infant consciousness are especially central. First: are infants conscious? Second: what is infants' conscious experience like? In previous work, I have addressed the first, arguing that newborn babies are conscious at birth and that it is possible to know something about what infants' experiences are like. In this talk, I address the second, investigating the phenomenal structure of infant consciousness. I discuss whether infants have a rich or a minimal phenomenology. The current consensus is that infants have perceptual experiences and experiences of pain and pleasure. But, do they have other types of phenomenology? Using Kriegel's framework from *The Varieties of Consciousness* (2015), I explore whether infants have sensory phenomenology, cognitive phenomenology, imaginative phenomenology, emotional phenomenology, and agential phenomenology. I also address the question of what is the phenomenal background of infants' first-person experiences, and whether or not they have a minimal pre-reflexive structure of consciousness.

Friday, June 28, 2019, 17:00–19:00

Brünig 1

## **A3: Modalities of Knowing in Zen**

### **Consciousness Is an Artifact**

Richard Baker

Crestone Mountain Zen Center

Can the teachings and practices of Zen Buddhism conceptualize and functionally articulate consciousness, awareness, and other modalities of knowing in ways that are useful to the scientific study of consciousness and knowing?

There are many forms of meditation and related teachings: Buddhist, Hindu, Christian, others, and also, of course, personal forms of meditation. There are also many forms of specifically Buddhist practices.

Each form is a craft, each craft is a path, and each path leads into the mystery of our aliveness – in somewhat different ways and with somewhat different results. Each craft and path enhances integrative aliveness, or not. When regularly practiced, the craft of meditation changes us mentally and physically. We become a mental, physical, and energetic aliveness, in ways we were not, when we started to practice.

Consciousness is an interior experience. Our experience of the exterior world is also an interior experience: a conscious, interiorized-externalization of a sensorial, culturally and experientially habituated – and partially imagined – externality.

So while consciousness is a biological and subjective fact, it is also a cultural artifact, an experiential artifact, and an artifact that can be shaped by meditation.

### **Three Overlapping, Yet Distinct Domains of Knowing**

Richard Baker

Crestone Mountain Zen Center

**Consciousness.** The mentation, the mental field, we wake into every morning that imagines and plans, functioning through assumptions of continuity and predictability.

**Awareness.** The bodily-awakeness that catches us when we trip and fall, faster than consciousness can think. The bodily-awakeness that does most of the driving of a car – while partnering with decisional-consciousness. The bodily-awakeness that lucidly dreams, which also can awaken us precisely, without an alarm clock. The bodily-awakeness developed and evolved within stillness. This bodily-awakeness is the basis of adept meditation.

**Illimitable Knowing.** The encompassing, knowing, field-of-mind, which functions within parameters of associativity, not limited to the perimeters of consciousness. It is a field of fluid, accumulating, probabilities, actualized through transformative mindfulness, still-sitting, and within durative immediacy. Illimitable Knowing is also the source of intuitions.

The Historical Buddha stated:

Consciousness is constructed from four domains of knowing: a knowing-experience of phenomenality (form); knowing nongraspable feeling; knowing, experiencing, independently, the six sensorial realms; knowing an associative field of mind not bound by consciousness. Together these four are the constituents of and bases for synergetic consciousness.

### **Mind Changes Mind**

Nicole Baden

Dharma Sangha Buddhist. Studienz. Johanneshof

Buddhist Meditation and Mindfulness practices are ways of intentionally opening the door of a stilled consciousness to all our ways of knowing.

While there has been organized academic study of Buddhism in the West for a couple of hundred years, it is only recently that adept meditation practice has developed. And an understanding of the consequential cultural differences, and a development of the essential conceptual tools and experiential distinctions and terms, is still underway. Zen practice functions within and depends on four basic assumptions. 1. Personal transformation is possible. 2. It is possible to be free from mental and emotional suffering. 3. It is possible to live in accord with how things actually exist. 4. And it is possible to live beneficially.

In this workshop, we will explore the necessary distinction, for a Zen practitioner, between 'consciousness' [the mind you wake-up into in the morning], and 'awareness' [the bodily knowing that pervades all we do].

While the empathetic incentive and the yogic observational skills required to transform the mind were developed long before MRIs, CTs, and widely shared statistics, the motivation and many of the questions have long been the same.

### **The Spectrum of Consciousness and Kundalini Experience**

Gerald Weischede

University of Erfurt, Zen Center Göttingen

Since the early '80s, I have been studying, as a Zen practitioner and as a psychotherapist, my own, my students, and my clients modes of consciousness and knowing. I find still-sitting-zazen on the cushion is the most powerful, effective, and complete way to study consciousness and the many modalities of knowing.

Several years ago my Zazen practice opened into a spinal and bodily kundalini-awakening – and a new kind of consciousness. This was not my choice or my expectation – it just happened, and I have had to live it, while it incrementally and dramatically transformed and extended my bodily experience of knowing and consciousness – and my knowing of others.

The kundalini-awakening experience can be very painful, and once in motion, it follows its „own“ rules, awakening a new consciousness and a new clarity and alertness throughout the body.

### **Western Psychotherapy and Buddhist Zen Practice**

Ravi Welch

Institute for Psychology Mainz

Western psychology often defines consciousness as all that we know through an experience of self. In this regard, psychotherapeutic practice explores 'self' as constituted by consciousness through memories, associations, traumas, and childhood and subconscious experience.

However, Zen Buddhist meditation and mindfulness practice focus on the experience of an observing-self and the immediacy of our experience in the world independent of self-referencing personal history. This attentional focus outside of self-referencing can be a useful counterpoint in transforming traumatic patterns rooted in memory and identity. Especially this is the case, if the client has a direct experience, a yogic intervention, of content-free consciousness (bhavanga). This knowledge that it is possible, this direct experience of content-free-consciousness, is often a transformative new lease on life.

In this way, through the practices of meditation and mindfulness, directly experienced immediacy can balance, open up, and transform identity patterns embedded in consciousness, patterns discovered and loosened through Western psychotherapeutic practice. It is a good balance.

Friday, June 28, 2019, 17:00–19:00

Ballsaal

## **B3: Metaphysics of Consciousness 3**

### **Phenomenal Relationism and Neutral Monism**

Andrea Pace Giannotta

University of Florence

In this paper, I shall argue for a view called phenomenal relationism. I shall develop this view in contrast to the two main options concerning the epistemological and ontological status of phenomenal qualities: phenomenal externalism and phenomenal internalism. According to phenomenal externalism, phenomenal qualities are external properties of mind-independent objects. According to phenomenal internalism, phenomenal qualities are internal to the experiencing subject's mind and they are not constituents of the external world. Both these views have problems. Phenomenal externalism has difficulties in accounting for the capacity of the mind of being directed towards non-existent objects. Phenomenal internalism gives rise to sceptical objections concerning the existence of the external world and of the other minds. I shall argue that phenomenal relationism is a better option. I shall develop this view by combining together the enactive view and Husserlian genetic phenomenology, with its analysis of the temporal structure of phenomenal consciousness. In the light of this analysis, I shall argue that phenomenal qualities are primal elements out of which the "internal" and the "external" are co-constituted in reciprocal dependence. I shall also liken this view to Ernst Mach's doctrine of elements and his form of neutral monism.

### **A Dual-Aspect Monism in Kant**

Irmgard Scherer

Loyola University Maryland

I claim that Kant's phenomenal/noumenal dualism, underscored by his severe critique of Spinoza's monism, is subject to reassessment from the perspective of the *Opus Postumum* (O.P.) where Kant employs Spinoza's monism to overcome a "fatal gap" he perceived late in life in his entire critical system. Kant describes the gap as having given him "pains like that of Tantalus". It seems in plain view, for ex., in the refutation of (Cartesian and Berkleyan) idealism (CPuR, B275ff) when he affirms that "consciousness of my own existence, requiring the condition of the time-determination, proves the existence of objects in space outside me." Kant claims this proof has turned the game played by idealism against itself; idealism assumed that the only immediate experience is inner experience and from that outer things can be inferred, but only in an untrustworthy manner. Obviously Kant's dualism of the outer/inner dichotomy remains entrenched. Turning to passages in Kant's late manuscript of the O.P. I will show his groping to overcome the gap left in his philosophy by explicit references to Spinoza's monism of immanence and finding within it a transition from the "doctrine of thought" to a "doctrine of the body."

### Exceptional Experiences as Empirical Support for Dual-Aspect Monism

Wolfgang Fach

Institut für Grenzgebiete der Psychologie und Psychohygiene e.V., Freiburg i.Br.

According to Wolfgang Pauli and Carl Gustav Jung, mind and matter are complementary aspects of an underlying psychophysically neutral reality. Structural correlations form the basis for robust and replicable psychophysical relationships (mind-brain correlations, psychosomatics, etc.). Exceptional experiences (EE) are elusive and non-reproducible deviations from this baseline induced under special conditions. As a logical consequence of our phenomenal reality model, four classes of phenomena can be derived as basic EE components in terms of their location (internal vs. external) and relation (coincidence vs. dissociation) in the epistemic categories of self and world. Statistical analyses of 2500 EE reports collected at the Institute for Frontier Areas of Psychology and Mental Health (IGPP) in Freiburg, Germany, and a series of surveys with the revised “Questionnaire for the Assessment of the Phenomenology of Exceptional Experiences” (PAGE-R) developed at IGPP confirm this classification system. Data from various samples, including clients asking for advice because of EE (n=272), people reporting near-death experiences (n=176) or sleep paralysis (n=385), experienced meditators (n=59), German students (n=600), the Swiss general population (n=1351) and the US population (n=148), indicate that EE are part of the human constitution and that their phenomenology is based on fundamental principles which correspond to dual-aspect monism.

### Does Mind Reading Refute Dualism?

Daniel Marvan

Department of Philosophy, Faculty of Arts, Masaryk University

Last year, researchers from The University of Toronto Scarborough published interesting results in an article called “The Neural Dynamics of Facial Identity Processing: Insights from EEG-Based Pattern Analysis and Image Reconstruction”. They managed to reconstruct the faces their participants were thinking of using EEG brain scanning. In popular magazines, it was usually described as “mind reading”. The results can be interpreted in a way that threatens dualism. If we can read mind content out of brain activity, it seems we have localized mind within the brain.

I argue that the results cannot be labeled as mind reading or used as an argument against dualism. I will demonstrate why this is so by trying to attack one of Swinburne’s arguments for dualism using those results. First, I will enhance his argument to be capable of being taken into consideration as an argument for pure substance dualism. Then, I will show what the core of this argument towards which its critique should be aimed is. Finally, I will show that arguments based on these new technological possibilities fail to refute the argument.

I argue that these so-called mind reading experiments only prove some kind of deep relationship between mind and brain. Using them as an argument against dualism would require the rejection of interactionism. This however I see as a kind of *petito percipii*. They do not read mind contents from the brain but only their correlates in the brain.

At a general level, my aim is to describe what such experiment needs to accomplish to be considered a real threat for dualism.

### Neutral Monism: A Surprisingly Non-Viable Option

Itay Shani

Department of Philosophy Sun Yat Sen University, Zhuhai Campus, Guangdong

Neutral monism (NM) is an interesting and, arguably, attractive metaphysical stance on the mind-body problem. Whether one likes the position or not, there is, *prima facie*, little reason to doubt its coherence. Yet, I shall argue that on a close examination the coherence of NM threatens to dissolve. I begin by stressing that NM faces a trilemma in that variants of it are either (i) non-neutral (typically mental); or (ii) clearly unsuitable to serve as a ground for concrete mental and physical manifestations (e.g., abstract entities such as information); or (iii) irremediably obscure (as in the case of a hypothesized concrete *tertium quid*). I will focus in particular on the surprising inability to identify a concrete *tertium quid* which isn’t hopelessly obscure. This is surprising because, *prima facie*, there is no reason why concrete reality, and its apprehension, should be limited to physical and mental attributes alone. Yet, the puzzle is resolved if it is granted that “mental” and “physical” are complementary attributes such that the dichotomy between them is exhaustive, and therefore exclusive of any alternative concrete “third thing”. I conclude by motivating the idea that the reason for such exclusiveness lies in the structure of ordinary experience itself, which, in turn, raise interesting metaphysical questions.

Friday, June 28, 2019, 17:00–19:00

Club Casino

## C3: Subliminal and Unconscious Processing

### The Memory of Subliminal Stimuli in the Phase Amplitude Coupling of the LFP of the Human MTL

Paul Verschure

SPECS, IBEC, Barcelona

[with Diogo Santos Pata, Riccardo Zucca, Cesar Rennò-Costa, Giovanni Maffei, Alessandro Principe, Rodrigo Rocamora, ICREA - Univ. Pompeu Fabra, Barcelona, Hosp. del Mar Med. Res., Barcelona and Federal University of Rio Grande do Norte]

Endogenous rhythmicity has received attention as a relevant coding and communication regime and it plays an essential role in orchestrating neural activity. Among the forms by which such rhythms are manifested, the notion of Phase-Amplitude Coupling (PAC) has gained ground as revealing relevant coding modes. In this case, the coupling between the phase of a low-frequency oscillation and the amplitude of a higher frequency oscillation are considered to have particular significance to distinct neural

processes such as memory and decision making. A hypothesis is that PAC reveals a neural code, binding items or events within the same context. If so, this coding scheme builds task-related representational states by recruiting specific frequencies revealed as frequency pairs in a PAC analysis.

We have obtained intracranial sEEG data from the medial temporal lobe (MTL) of drug resistant epileptic patients performing a well-studied induced blindsight experimental protocol that requires sensory encoding, discrimination, working memory, memory retrieval, conscious processing, response selection and confidence monitoring. Our results show that the coupling between different PAC frequency pairs is modulated depending on the epoch of the task, reflecting distinct processing stages and displays both temporally broad and punctuated tuning occurring at varying time scales from tens of milliseconds to several seconds. This suggests that the processing and memory of subliminal stimuli can be recovered from the temporal dynamics of the MTL.

#### **How Well Do Findings in Blindsight Patients Generalize to Neurologically Healthy Individuals? Review of TMS-Studies**

Henry Railo  
University of Turku

Blindsight patients have a lesion in their primary visual cortex (V1), which makes them blind in specific parts of the visual field. What makes blindsight patients interesting is their ability to use stimuli that are presented to their blind hemifield to guide behavior. This finding suggests that conscious visual perception and visually-guided behavior rely on different networks in the brain. However, because neural plasticity changes the wiring of the patients' brain after the lesion, it is difficult to make generalizations to the neurologically healthy population based on the findings in blindsight patients. Transcranial magnetic stimulation (TMS) can be used to suppress the visibility of visual stimuli in neurologically healthy observers, and examine if blindsight-like behavior can be observed in them. I will review findings from TMS-studies that have attempted to replicate blindsight in healthy observers. The results suggest that participants can process the location of a stimulus that is rendered completely unconscious by V1 TMS. There is no convincing evidence that healthy individuals can process motion or color without the V1.

#### **A Contribution to the History of Consciousness Science: The Encounter of Freud's Psychoanalysis with America**

Vera Saller  
Psychoanalytisches Seminar Zürich

The idea that belief in magic was overcome by the Enlightenment had been revealed as a myth by historians of science like Ludwik Fleck and Thomas Kuhn. Magic, religion and the struggle for a scientific ethic are mutually intertwined in the history of science. The methodology of science itself can be considered as a modern myth. Sigmund Freud's visit to America in 1909 has generally been considered as the primal

scene of an encounter that led to the success that psychoanalysis experienced in America during the first half of the last century. The examination of the hopes which American East-Coast intellectuals like William James, Stanley Hall and James Jackson Putnam connected with psychoanalysis shows three specific forms of the above mentioned conflicts.

In addition, the expectations of the American intellectuals were defined by the requirements of their practice as therapists. Meanwhile the philosophical tradition of the two continents suggested different forms of conceptualizing the structure of mind.

I hope to show that the conceptualizations that James and Freud found for the rational and unconscious working of the mind can be considered as highly relevant in the contemporary debate.

#### **Naive Realism for Unconscious Perceptions**

Ori Beck  
University of Cambridge

Unconscious perceptions (i.e., person-level perceptions that lack phenomenal character) have recently become a focal point in the debate for and against naive realism. I defend the naive realist side. Building on an idea of Martin's, I develop a new version of naive realism - neuro-computational naive realism. I argue that neuro-computational naive realism offers a uniform treatment of both conscious and unconscious perceptions. Moreover, I argue that it accommodates the possibility of phenomenally different conscious perceptions of the same items, and that it can answer a further empirically-motivated challenge raised by Berger and Nanay (2016).

#### **Time and the Gorilla: How Time on Task Impacts Inattentional Blindness**

Jason Ford  
University of Minnesota, Duluth

I examine how changing various features of Simons and Chabris's famous gorilla-themed inattentional blindness experiment impact the rates at which subjects report seeing the person in the gorilla suit. These results provide evidence that subjects are paying significantly more attention to the task at the outset than they are as it progresses (with higher rates of inattentional blindness), that inattentional blindness is a genuinely perceptual phenomenon - not a memory effect, and that if subjects are peripherally aware of the person in the gorilla suit, they are not seeing her as a gorilla.



### D3: Varieties of Consciousness

#### **Dreaming as a Variety of Spontaneous Cognitive Processes – From Dream Bizarreness to Waking Thought**

Manuela Kirberg  
Monash University, Melbourne

There is a long tradition in dream research to conceptualize dreaming as a somehow cognitively deficient conscious state. This view emerges from comparing the phenomenology of dreams with certain kinds of waking states, whereby the dream world seems to be incongruent, discontinuous or vague. This is referred to as dream bizarreness, understood as the result of a deficient simulation process by the sleeping brain. At the same time, this “distorted” phenomenology excludes the analysis of dreams from the consciousness debate as bizarreness brings together dreams with pathological waking states. I combine a theoretical analysis with empirical findings to develop a new perspective on dream bizarreness and so the usefulness of dream research for consciousness studies. I will present the results of a quantitative bizarreness analysis of dream reports collected in Tanzania in February 2018. By relying on this data, I challenge the deficient view on dreaming and dream cognition as well as the methodology of bizarreness research. I propose that dreams are best described as a variety of spontaneous cognitive processes and should be analysed together with non-pathological waking states, such as mind wandering episodes. Furthermore, I will provide an argument for extending bizarreness research into the whole domain of spontaneous cognition.

#### **Lucid Dreaming as a Technique in Psychotherapy and Sleep Coaching (e.g. in Nightmare Disorder)**

Brigitte Holzinger  
Institute for Consciousness and Dream Research, Medical University Vienna

Lucid dreaming (dreaming while being asleep with full awareness of the dream state and of choice) has great potential for the field of psychotherapy as well as basic research as well as spiritual disciplines as well as creativity and every day life. Regarding the field of psychotherapy, we were able to show in several research projects that lucid dreaming is a very potent approach to treat e.g. nightmare disorder. Other sleep disorders and other psychological disorders also might improve by the technique of lucid dreaming, if exercised with care and probably also with guidance. This session will start with a brief introduction of lucid dreaming, its definition and physiology as far as known and emphasize on how lucid dreaming could be integrated in psychotherapy and how already is a part of Sleep Coaching (@Holzinger&Klösch).

### **Mental Imagery and the Mind-Body Connection**

Elena Walsh  
The University of Sydney

Over the past thirty years, a growing body of evidence has shown that prolonged psychosocial stress - especially in childhood - can somehow “get under the skin” in a way that persists across multiple decades and influences risk for later disease. This phenomenon is mysterious because these early learning events appear to entrain the individual into habitual emotional response patterns (e.g., anger) that persist once the original cause is removed, and eventually produce physiological patterns typical of disease (e.g., hypertension and heart disease). This presentation provides a framework that demystifies this phenomenon, using principles from machine learning and dynamical systems theory, combined with a novel account of emotion. A key part of the framework is the role that memory and imagination play in sustaining the feedback loop concomitant with habitual emotional patterns. An interesting implication of the framework is a hypothesis about how the mind can influence the body: inasmuch as memory and imagination can sustain negative emotional patterns into adulthood, deliberate construction of positive mental imagery may facilitate the development of positive emotional patterns, which may in turn enable more successful homeostasis of physiological function.

#### **Microdreaming and Hypnagogic Imagery: A Case for Introspection**

Ivan M. Havel, Center for Theoretical Study at Charles University, Prague

Recently I proposed a way of studying conscious experience conceived as an alternative to the introspective methods as understood by phenomenologically oriented cognitive scientists. The proposed approach, called Introspection Plus, is aimed at learning directly from first-person subjective experiences [I. M. Havel, Notes by the Introspector (in Czech), Prague 2018]. It focuses on extremely short, snap experiences, exemplified by microdreams that occur during microsleep. This approach resembles the contemporary research in microdream phenomenology, for instance of Tore A. Nielsen [Microdream Neurophenomenology. Neuroscience of Consciousness, 2017, 1–17]. I will first give an overview of the specifics of Introspection Plus, and then discuss the commonalities and differences of my approach as compared to Nielsen’s treatment of microdreams. In my case microdreams are spontaneous events, at times even unpleasant, that occur during normal waking hours, while Nielsen restricts himself to fleeting episodes of hypnagogic imagery that occur at sleep’s onset. My research also draws attention to the epistemic validity of direct introspection, while Nielsen’s aim is more specific: to test empirically how much our hypnagogic images are causally induced by our episodic memories.

### Experimenter Effects in the Replication of Psi Experiments: A Global Initiative

Arnaud Delorme

University of California, San Diego

[with Daryl Bem, Marilyn Schlitz, Institute of Noetic Sciences, Sofia University / Cornell University, Ithaca]

The research seeks to study the replication problem in science through the examination of experimenter belief in psi. The meta-study involves an international collaboration of teachers, experimenters, and experimental volunteers, who are making use of a standardized psi protocol developed by Daryl Bem that has been the focus of several recent replication attempts and that allows for a systematic collection of data under well-controlled conditions. In particular, Bem's studies were designed to be simple and transparent, requiring no instrumentation beyond a desktop computer, taking less than thirty minutes per session, and requiring statistical analyses no more complex than a t-test across sessions or participants. We tested a total of more than 1,500 participants and 96 experimenters – 1000 in laboratory settings and 500 using an online task over 6 years. We tested if the experiment was reproducible and if explicit and implicit beliefs of both experimenters and participants influenced the outcome of the experiment. We are presenting here the results of this large scale replication experiment.

Friday, June 28, 2019, 17:00–19:00

Grimsel

## E3: Mind-Brain

### Cortex Is the Organ of Mind

Bernard J. Baars

Society for MindBrain Sciences, Washington D.C.

[with Natalie Geld, MedNeuro, Inc, New York]

“Cortex is proposed to be the organ of mind” (Penfield & Roberts, 1959) - for conscious and unconscious functions. (Baars et al, 2013)

Is it true? This debate has lasted because cortex is the most adaptable organ in the body. Its development can vary enormously at any choice point in its trajectory. Cortex is a kind of “species.” In waking cortex, adaptive neuronal signaling is also constantly changing, using moments of conscious “integration and ignition” as the major adaptive event. (Dehaene, 2014)

The term “mind” was brought back in the 1950s, after a long behavioristic exile circa 1900. But the new psychology missed crucial aspects of mind: the role of conscious cognition (Cs) and at least three kinds of unconscious (Ucs) brain computations: we can call them cognitive, Freudian and Jungian. Each brain process can emerge derivatively in fleeting consciousness, in a long dialogue between Cs and Ucs processes - or sometimes in fringe experiences (James, 1890; Mangan, 2000). In the face of greater challenges, fleeting, serial, and limited capacity Cs/Ucs streams emerge in recurrences over time. (Baars, 1988; Baars et al, 2013).

Penfield thought that “cortex is the organ of mind” based on 1,200 surgeries in conscious, intractable epileptics. Waking surgeries have been revived, with over 2,000 new articles. This vast wellspring of evidence began to be better understood in the last half century.

Cortex adapts to psycho-physiological injury. The earlier that anomalous deviations occur in development, the more healing adaptations can intervene. (Edelman and Tononi, 2000). In rare cases of altered early developmental disorder, as in an/encephaly, the visible cortex seems to visibly disappear from its normal cranial space - which is taken over by cerebrospinal fluid. This makes it seem as if the newborn (and later) brain can be conscious without a cortex. (Bjorn Merker)

This important discovery - in the light of G. M. Edelman's Neural Darwinism - has a plausible explanation: the “missing cortex” comes from an unusual, functional, developmental trajectory.

Today's “neuroscopes” show that many Cs/Ucs functions are performed by the cortex - our first brain region for learning. Izhikevich and Edelman (2008) made a 3D animation based on all available neuronal evidence from many species. This model is viable due to cross-species similarities. Active neuronal signaling in cortex includes both neural spiking and mass action waves. These findings suggest a new understanding of Cs/Ucs cortex.

Much evidence shows that cortex is the “organ of mind” - as Penfield found over 30 years of waking surgeries. These ideas have been presented by Baars et al. Global Workspace Theory (GWT) has grown into Global Workspace Dynamics (GWD) to incorporate decades of new insights, particularly about the waking cortex.

Penfield surgeries gave the best early evidence that Csns crucially involves cerebral cortex. Cortex is the most hyper-adaptable region of the brain, and reflects evolutionary, ontogenetic, epigenetic, and Cs-mediated learning and adaptation. The story of Cs cognition is the story of cortex . in dialogue with Ucs cortico-thalamic and extra-cortical functions.

### Neural Darwinism and Waking Consciousness: A Natural History of the Brain in Real Time

David B. Edelman

Dartmouth College

[with Natalie Geld, Bernard J. Baars, Society for MindBrain Sciences, Washington D.C / MedNeuro, Inc, New York]

How do biological systems confront and survive an ever-changing world? This is the central question that defined Charles Darwin's scientific journey. 160 years after *On the Origin of Species*, Natural Selection provides a framework for understanding adaptation at many different scales of biological organization, from protein translation, to the immune response, to organismal development, to the origin of species and dynamics of vast ecologies (e.g., rainforest canopies, grasslands, island biogeography, etc.). At nearly every observable scale, biological systems are shaped by processes analogous to those guiding the emergence and persistence of species over the course of evolution. In any given biological system, certain elements (i.e., cells, cell populations, organisms)

of the vast heterogeneous repertoire which constitutes that system are favored over others by environmental circumstances. Elements selected are then propagated over time (through either differential reproduction or amplification) while others disappear or fall silent, and the character of the entire system is shaped accordingly. Here, we argue that the very same selectionist principles that shape complex adaptive systems as diverse as the immune response, speciation, and rain forest ecology can be extended to the generation and function of complex nervous systems. The Theory of Neuronal Group Selection (TNGS), or Neural Darwinism, was proposed by the neuroscientist Gerald Edelman to account for the development and function of the human brain. TNGS holds that the functional circuitry of the brain is determined by selective forces operating during development and throughout the life of an organism. First, genetically specified populations of neurons and their synaptic connections are generated during embryogenesis. Certain cellular events (e.g., division, differentiation, movement, death) act on these populations, preserving some synaptic connections while pruning others. This gives rise to a 'primary repertoire' of synaptic connections (e.g., neuronal groups) which is then shaped by salient external stimuli over a lifetime. The synaptic connections that respond most robustly to salient stimuli encountered during experience are selectively strengthened, while those that don't are weakened. The resultant 'secondary repertoire' constitutes the familiar functional circuitry that characterizes different regions of the adult brain, particularly cerebral cortex. Finally, richly interconnected groups of neurons whose activations are temporally correlated during experience eventually become causally linked to one another. Such dynamic reentrant neural mappings within cortex and between cortex and thalamus are the basis of bound, unitary percepts, i.e., conscious states.

TNGS provides a biological framework for understanding higher brain function and consciousness. It explains these processes at different levels of organization, from molecular to cortical and behavioral. Here, we unpack TNGS and make the case that this theory lays out tractable biological 'first principles' for building a brain that learns, remembers, and experiences.

### The Mind-Object Identity and the Relative Object

Riccardo Manzotti  
IULM University, Milano

The traditional mind-brain identity (Armstrong, Smart) suggested a very neat solution to consciousness. Unfortunately, it collapsed both because of Kripke's argument and because of adverse empirical evidence. Here, I will defend a mind-object identity hypothesis that challenges Kripke's argument (elsewhere called the spread mind). To defend the hypothesis, I will take advantage of the notion of a relative object that will allow reducing subjectivity to relative existence, as is the case with relative velocity. I will then consider the traditional objections based on the variability of individual subjective experience and the argument from illusion. I will propose a realist solution: a relative object is a physical object (external to the nervous system) identical to one's experience. Its existence is relative to one's body. By adopting such an identity, I will claim that it is indeed possible to solve traditional puzzles that have plagued the traditional

identity theories. In particular, I will maintain that the common kind assumption is valid without invoking epistemic delusion as is done by disjunctivism. I will show that in all cases of experience (dreams, illusions, hallucinations) it is possible to locate a physical object not differently from what it happens in standard perception.

### Quantifying Irreducible Consciousness: Coupling the Mind-Body Powers Model of Neural Correlates and the Integrated Information Theory

Matthew Owen  
Gonzaga University, Spokane

It is often thought that if consciousness is physically reducible then it is theoretically measurable, but if it is irreducible then it is immeasurable. To the contrary, I argue that the Mind-Body Powers Model of neural correlates of consciousness (for brevity NCC) that is informed by Aristotelian causation and a hylomorphic human ontology can ground the theoretical possibility of reliably measuring irreducible consciousness (Owen 2018). The Mind-Body Powers Model is combined with a minimal version of the Integrated Information Theory of consciousness (IIT) concerning the full-NCC to demonstrate that the neural correlate of being conscious can be a reliable measure of consciousness that is not physically reducible (Tononi et al. 2016). This work builds on prior work exploring common ground between IIT and Aristotelian metaphysics (see Owen 2019).

#### References:

Massimini, M & Tononi, G. (2018) *Sizing Up Consciousness*, Oxford Press.  
Owen, M. (2018) *Aristotelian Causation and Neural Correlates of Consciousness*, Topoi.  
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### Consciousness, Mental States, and the Destruction of the Brain

Lukas J. Meier  
University of St Andrews

The destruction of the brain ('brain death') is the criterion of death in most countries around the world. When the entire brain has irreversibly lost function, all mental attributes are absent from the neuronal substrate. Often, however, not all parts of the brain are affected at the same time. Two constellations are of particular interest: the destruction of the cerebrum, while the brainstem retains function (persistent vegetative state); and lesions in a certain area of the brainstem (the ascending reticular activating system), while the cerebrum remains oxygenated and intact. In the former case, wakefulness persists, but it is devoid of any content; in the latter case, the neuronal correlates of mental states continue to be present in the cerebral tissues, but they lack the potential for becoming part of a conscious process. How are we to interpret these real-life scenarios? What does it take for a centre of consciousness to persist through time? In this talk, I approach these questions by combining empirical data with philosophical concepts.

### F3: Consciousness and Arts

#### Painting the World with Fractals: How the Arts Reveal a Hidden Order of Consciousness and Reality

Nick Day

Conscious Pictures

The emergence of communication through creative expression – the visual arts, language, storytelling, music, dance – can be considered fundamental to our becoming human. Art not only reflects our connection to nature and the world around us, but also symbolizes our relationship to the cosmos. Storytelling favors survival by activating a powerful inner world of association and meaning, enabling us to more successfully navigate the world, empathize with others, and develop complex abstract ideas.

Thinkers such as Plato and Aristotle have described features common to these forms of expression as archetypes: characters, images, motifs and scenarios that recur over time. Archetypes suggest the existence of a bridge to a more fundamental order.

In this talk, I will explore the possibility that particular archetypes may also be understood in terms of fractal theory. I shall illustrate this with examples from the visual arts and story theory that contain fractal structure, and explore whether this points to consciousness itself comprising a fundamentally fractal nature.

#### Conscious Unconscious Social Media

Sascha Seifert

This will pick up where my previous talks at TSC on the wider subject had to break off. Again, given what is going on around the world, I'm taking a closer look at the current situation in the universe of computerised Social Networks, aka "Social Media" globally. If you visualise any computerised Social Network, the similarity of its computer network structures to neural networks is obvious and striking. Just like the constantly growing influence of computerised Social Networks on the globally perceived human consciousness in every field, like banalities or gossip or health or science, is obvious and striking in so many ways. So, first of all, this similarity is worth a closer look at in terms of sheer data handling, e.g. the way algorithms distribute information compared to conscious and unconscious decisions made by human consciousness. As computerised Social Networks continue to influence massively how information reaches humans, how and what we believe, how we build opinions and POVs, how we connect, how we love or how we hate. Constantly, there is new evidence coming on the table about how computerised Social Network content (= data input) put into peoples minds clearly influenced peoples offline behaviour about decisions very relevant to society (= most of all: Voting). At the same time, computerised Social Networks also are becoming the dominant form of online communication. With growing user numbers day by day and computerised Social Network platforms such as Facebook, Instagram, Twitter, WeChat or WhatsApp increasingly being considered a commodity, while from a mainstream

perspective rather cutting edge services such as Telegram, Slack, Tinder or Bumble are pushing the efficiency of such systems to new heights constantly. My talk will give an overview about the situation in general, present what the state of science is in the field by presenting selected studies from around the globe on the subject matter (e.g. "Social impact in social media" – Pulido, Redondo-Sama, Sordé-Martí, Flecha 2018). By this, I will show where I see connections between human conscious and its current expression and the computerised Social Networks.

#### The Equalizer – Amplifying Artistic Resonance and Reducing Mental Dissonance in Artistic Processes

Anna-Karin Gullberg

Luleå University of Technology, Arts, Communication & Education, School of Music [with Susanna Leijonhufvud, Luleå University of Technology, Arts, Communication & Education, School of Music]

Understanding of cognitive strategies in supporting artistic expressions, reducing stress, performance anxiety and emotional blockings are of paramount importance to empower students' and prepare for a sustainable work life as musicians.

How can we aid musical artists to cope and master their emotional and mental dissonances in order to empower creative and artistic progressions in a sustainable way within higher music education?

This pilot has several aims including investigating possibilities for higher education to interact with societal artistic communities as well as students' DIY culture using available technology in order to analyse and co-create a professional development including artistic competence, holistic awareness and personal balance.

The project will explore transformative technologies; HRV, Muse (EEG), Soma Mat & Breathing Light (heat and breath feedback), and the ARK-crystal, which differ regarding presented data (biofeedback) and function. Further, how these devices relate to research theory and methodology. We pose the critical question: Can these applications contribute to the identification, interpretation, and organization of the First Instrument, the students' own aesthetic sensory information, embodied behaviours and cognitive strategies?

This presentation will include methodological challenges discussed and interpreted in the transdisciplinary research group SANE – embracing researchers in art, quantum physics, medicine, sustainability learning, and biology.



### The Expanded Consciousness of the Artist

Monica W. Cooper  
Independent

The artist's mind engages in an inquiry through symbolic representation. We posited that artistic work requires a particular state of consciousness. To study the artist's state of mind, we designed an investigation with a bio-developmental approach. Using portraiture as a research method, we obtained a portrait of the state of mind of a theater director and his successive casts of first-time actors over the course of three years. Analysis revealed that the artists adopted several "mind attitudes" (mind/body dispositions) that led to high artistic expression in a state of consciousness they metaphorically described as "filling up with spirit." This "expanded consciousness" was confirmed in an investigation of artists across various arts. In artistic consciousness a still mind is focused on an idea brought to life by the powerful contents and faculties of the unconscious mind. Consciousness of the live felt-experience opens through symbolization and embodiment in art's material. This is an altered state of consciousness, unique to the artist, which is the source of the aesthetic impact. We describe in detail the mental attitudes conducive to the expanded consciousness that enables artistic cognition. The artist's state of consciousness reveals fundamental capacities of the human mind not commonly exercised.

### The Record: Replicating That One Night in August

Marianne Neill  
York University, Toronto / Independent Artist and Author

Exceptional experiences (altered perception, synchronicity, sense of *unus mundus*) surrounding creation of performance art inspired a search for a form of expression that would engage readers in a bidirectional interaction between mental and physical to produce an altered awareness and replicate a fragment of the original experience. The outcome is a dual modality, visual / linguistic form of expression, or 'meaning matrix' – a network of explicit meaning 'nodes' and an implicit meaning 'ground' that lends itself to validation in terms of cognitive science. Aspects of relevance are numerous but include: 1. A foundation for analysis of twentieth century art as a laboratory of strategies for emptying and sometimes reconstructing meaning / being (indistinct in a concept of meaning as both ontic and epistemic) is relevant to cross-disciplinary study of transitional processes from potential to actual. 2. When a phenomenological artistic process arrived at an intersection with science, this suggested a role for art in a holistic science such as Bohm's implicate order, which I compare to the 'order' underlying late twentieth century artistic reconstruction. Inclusion of the experiencer means inclusion of art at the core of discovery.

Friday, June 28, 2019, 17:00–19:00

Brünig 3

## G3: Phenomenal Consciousness 2

### Are We Acquainted with Our Experiences?

William S. Robinson  
Department of Philosophy and Religious Studies, Iowa State University

Experiences are generally understood to be episodes of consciousness. Acquaintance is standardly regarded as a relation between ourselves and our experiences. Acquaintance is also often said to explain how or why we can be justified in holding phenomenal beliefs (or, making judgments in which we apply standing phenomenal concepts to our experiences or their properties). It thus appears that we have three items: experiences, instances of being acquainted with experiences, and phenomenal beliefs. Chalmers, however, suggests that this ontology may be unnecessarily complex, and BonJour offers a simpler account (although he retains the term 'acquaintance'). This paper notes and repairs a shortcoming of BonJour's account, and explains that the work supposedly requiring acquaintance as a distinct relation to our experiences can be done instead by experiences and the conditions that are required for applying standing concepts to them (which must be recognized in any case). The latter involve many instances of ordinary relations such as correlation and causation, but there is no need for a special relation of acquaintance.

### The Element of Surprise

Benedicte Veillet  
University of Michigan-Flint, Institut Jean Nicod

The Knowledge Argument remains a thorn in the physicalist's side. How can Mary, the omniscient cognitive neuroscientist raised in a black-and-white room, still learn something substantial when she finally sees color? After all, according to the physicalist, experiencing color is just a matter of being in the right broadly physical state – a state that Mary can therefore know everything about while in her black-and-white room. Underlying the thought that Mary learns something substantial is the persistent intuition that Mary will experience surprise when she first sees color. This intuition is overwhelmingly taken for granted without examination. The goal of this paper is to think carefully about Mary's surprise reaction, specifically by drawing on the way surprise is operationalized in the psychological and cognitive sciences. As we'll see, there are several possible cognitive models of surprise, not all of which will support the idea that what Mary feels when she first sees color is actually surprise. In fact, careful reflection may give us reason to think that what Mary experiences instead may be astonishment or a feeling of novelty. All this, I will argue, has implications for the Knowledge Argument that the physicalist should welcome.



### **Why Qualia Matter**

Jan Dalkvist

Department of Psychology, Stockholm University

[with Joakim Westerlund, Department of Psychology, Stockholm University]

In this paper, we have attempted to show that a large body of evidence suggest that qualia do not only exist as real phenomena, but also have the capacity to act causally on matter. In essence, the evidence advanced in this paper consists of five major arguments:

1. Contrary to what many people believe, basic physics does not forbid qualia to affect physical events causally.
2. All major philosophical attempts to show that qualia do not exist as real phenomena, or lack causal power, have failed.
3. Qualia have such properties, and are organized in such a way, that it makes perfect sense to assume that qualia have had – and still have – crucial roles to play in evolution by being critically involved in various adaptive functions.
4. Attempts to depreciate qualia as being epiphenomena are inconsistent with the way the brain works. Most notably, considering qualia as epiphenomena cannot explain why only a tiny minority of brain processes are associated with qualia.
5. Qualia are integral parts of conscious intentions.

### **Conscious Experience and Cognitive Ability**

Sona Ahuja

Dayalbagh Educational Institute, Agra

[with Sant Pyari Saxena, Ovidiu Brazdau, Deemed University Dayalbagh, Agra]

Conscious experience is the state of wakefulness or state of knowing oneself or something within oneself and or being aware of external objects. Conscious experiences are mysterious and subjective in nature. Recent studies in the field of consciousness suggest that conscious experiences can help in better understanding of feelings, emotions of oneself and others and thus improve the rate of development and quality of life. It may also enhance the emotional and cognitive abilities. Cognitive abilities are related to mental skills and brain based functions which play a vital role in growth and development and are needed to carry out any task from the simplest to the most complex. These have more to do with the mechanisms of how we learn, remember, problem-solve, and pay attention, rather than with any factual knowledge. The present study examines the relationship between conscious experience and cognitive abilities. Consciousness quotient and general mental ability of participants (N=270) were assessed. Pearson's correlation was used to identify the relationship between conscious experience and cognitive ability. The study also determined the influence of conscious experience in the prediction of cognitive abilities using linear regression analysis. The relationship between different dimensions of the consciousness quotient and cognitive abilities are discussed.

### **Experiential Parts**

Philippe Chuard

Department of Philosophy, Southern Methodist University (SMU)

Several disputes about phenomenal consciousness operate under the assumption that experiences have parts, including temporal parts. Such parts are the bearers, for instance, of whichever relations explain how experiences – and their parts – can be phenomenally unified. There's also the widely held view, when it comes to temporal experiences, that we should follow James' exhortation that such experiences aren't mere successions of their temporal parts, but something more. And there's the question of whether it is the parts of experiences which determine whole experiences and their properties, or whether the determination goes instead from the whole to the parts, as holists have it.

But what are parts, or temporal parts, of experiences—what does it even mean to say that an experience is “part” of another? And are the participants in those disputes talking about the same thing—is there a univocal notion of “experiential part” available – rather than past one another? Are there different kinds of experiential parts? And, if so, is there a systematic way of carving them out? These are some of the questions the paper aims to answer.

# Abstracts

## Poster Sessions

Poster sessions are scheduled for the evenings of Wednesday, June 26, and Thursday, June 27. There will be more than 200 posters in total, about 100 each evening. Poster spaces will be numbered, and poster presenters will find their poster number on the following pages. Posters offer excellent opportunities to get in touch with their presenters on an informal basis. A fraction of the selected poster presentations provides space for independent scholars without academic affiliation, thus offering a forum for a “citizen science of consciousness”.

**1. Meditation Reimagined from the Becoming Framework**

Guruchran Khalsa, Chapman University, Orange

Meditation prepares our mind and body to refine and access our deep inner experiences and clarify our actions and decisions in the world. A central part of its effectiveness is a dynamic awareness that integrates the complementarity of parts and wholes, bottom up and top down processes and time on time interactions. This creates a NOW from the present moment that is sensitive to the future and past. The traditional use of prana and kundalini is reimagined as the experiences of bottom up complexities in synergy with the experiences of the dynamics of irreducible wholes. Together this is awareness seen as the very process of Becoming.

**2. Neutral Monism vs Mental Monism: Mental and Material Properties as Epistemic Perspectives**

Marta Santuccio, Central European University

Neutral monism is the view that ‘the stuff of the world is neither mental nor material, but a “neutral stuff”, out of which both are constructed (Russell 1921). The strength of the view is that it characterizes fundamental reality by removing the chasm between mental and material properties, which gravely frustrates the consciousness debate. If this works out, the neutral monist would be in the position to produce a more adequate account of consciousness than dualism and traditional forms of monism. To succeed, however, the neutral monist must provide a satisfactory story as to how mental and material properties arise from the underlying neutral base. I argue that in order to secure success the neutral monist needs to adopt the view that mental and material properties arise as a result of casting different epistemic perspectives upon the neutral base. I defend the view from the claim that it may be collapsed into a form of mental monism on the grounds that neutral reality is mind-independent, while simultaneously clarifying that it is the very distinction between mental and material properties that depends on a subject’s act of casting an epistemic perspective on the neutral base.

**3. The Mother or Caregiver and the Child in Us**

Fatima Alaoui, Ecole le Chemin vert

Last year at TSC 2018 I tried to give some ideas on how I conceive the first relationship between the human baby and his mother or caregiver. I spoke about my insight and how I understand consciousness. The communication outside between the mother and her baby creates the communication between the two entities that are the mother and the child in us. The dialogue becomes possible and gives an impression of unity and it is this process that we will try to understand together this year.

**4. Para-Psychology, N,N-Dimethyltryptamine and the Pineal Gland**

Tania Simona Re, UNESCO Chair “Health Anthropology, Biosphere and Healing Systems”, Genoa

[with Nicola Luigi Bragazzi, Hicham Khabbache, Marco Perduca, Bruno Neri, Fabio Firenzuoli, Gabriele Penazzi, Mário Simões, Riccardo Zerbetto]

In the last decades, one of the psychedelic substances which has gained high attention for its implications in several para-psychological phenomena (including out-of-body states, deep changes in sensory perception, mood, and thought, travels in “hyperspace”, and meetings with disincarnate entities, as well as other “breakthrough experiences”) is dimethyltryptamine (N,N-DMT, or simply DMT). High dose DMT-containing plants (like *Psychotria viridis*, in Quechua language Chacrana or Chacrona) are one of the two principal ingredients of the Ayahuasca, the visionary Amazonian brew reported to induce a range of paranormal experiences, but it can be found as well in a huge number of different natural sources, even some of animal origin - e.g., the Sonoran desert toad, in the form of 5-methoxy-N,N-dimethyltryptamine or 5-MeO-DMT. It was Rick Strassmann (born 1952), a medical doctor, psychiatrist and clinical psycho-pharmacologist, who had the virtue of giving a second birth to the academic interest in scientific research of psychedelics after the post-70’s age of obscurantism lead by the American prohibitionist position on this field. Strassman is also the person who named this compound “the spirit molecule”, in order to suggest the deeply psycho-spiritual implications concerning this substance. Here, we overview the scientific basis and evidences supporting the association between DMT and the pineal gland.

**5. Mental Imagery and the Mind-Body Connection**

Morgan Hopson, California Institute of Integral Studies

Over the past thirty years, a growing body of evidence has shown that prolonged psychosocial stress - especially in childhood - can somehow “get under the skin” in a way that persists across multiple decades and influences risk for later disease. This phenomenon is mysterious because these early learning events appear to entrain the individual into habitual emotional response patterns (e.g., anger) that persist once the original cause is removed, and eventually produce physiological patterns typical of disease (e.g., hypertension and heart disease). This presentation provides a framework that demystifies this phenomenon, using principles from machine learning and dynamical systems theory, combined with a novel account of emotion. A key part of the framework is the role that memory and imagination play in sustaining the feedback loop concomitant with habitual emotional patterns. An interesting implication of the framework is a hypothesis about how the mind can influence the body: inasmuch as memory and imagination can sustain negative emotional patterns into adulthood, deliberate construction of positive mental imagery may facilitate the development of positive emotional patterns, which may in turn enable more successful homeostasis of physiological function.

### 6. Heartfulness Based Meditation and Training as a Predictor of Self-Esteem, Social Belongingness and Spiritual Well-Being of Physically Challenged Children

Astha Upadhyay, Dayalbagh Educational Institute, Agra

[with Namrata Singh, Archana Kapoor, Dayalbagh Educational Institute, Agra]

In our modern busy lives where we have to constantly multitask to keep ourselves at par with the ever increasing competition, living with physical disabilities is a bane which exposes one to personal limitations on the economic, emotional, physical, physiological and social fronts. This is especially difficult for children as they become easy targets for ridicule, discrimination, and mockery. This almost always has extreme effects like depression, anxiety, social alienation, etc. With time, this ruins the self-esteem and attitude of such children towards life. Although it is not easy to shield them from mockery, damaging remarks and unfair treatment, the effects of such unpleasant experiences and feelings can be alleviated with assistance from parents, teachers and community on the whole. Heartfulness is an approach and a technique of relaxing, meditating, rejuvenating and discovering the unlimited resources and powers of the heart. The present study focused on studying the effect of Heartfulness Based Meditation and Training on the Self-esteem, Social Belongingness and Spiritual Well-being of Physically Challenged Children. The Training programme consisted of relaxation exercises, meditation and some simple yoga poses aimed at tuning focus and concentration towards the heart. The results showed considerable increase in the self-esteem, and sense of belongingness of the students towards the society. The spiritual well-being was also enhanced which maybe a result of improved inter-connections between the mind and the heart. The students reported a sense of increased inner strength. This research suggests the importance of heartfulness as a restorative and rejuvenating technique not just for children with disabilities but for human beings of any age, profession, or workload who go through anxiety, stress, or depression leading to reduced self-esteem and confidence.

### 7. Effect of Brain-Based Learning on Stigma Consciousness and Resilience of Dyslexic Students

Namrata Singh, Dayalbagh Educational Institute, Agra

[with Astha Upadhyay, Archana Kapoor, Dayalbagh Educational Institute, Agra]

Being identified with a learning disability makes students vulnerable to experiences of stigma consciousness, which can be associated with negative academic and emotional effects. “Individuals’ perceptions of the probability of being stereotyped” (Pinel, 1999, p. 114) that is, their stigma consciousness, vary, and this variation is associated with differences in the degree to which stigma and stereotypes have a negative impact. There is no validated instrument in India for measuring stigma consciousness of dyslexic students. In present study the researcher has developed a ‘Stigma Consciousness Scale’ to measure the level of stigma consciousness of the dyslexic students. A ‘Resilience Scale’ was also developed by the researcher to evaluate the level of students’ resilience. The

students identified with high level of stigma consciousness and low level of resilience were taught with brain-based learning which consisted of lessons and activities based on the three instructional techniques- Orchestrated immersion, Relaxed alertness and Active processing. All the lessons and activities focused upon achieving high level of self-worth and self-consciousness. Results showed that brain-based learning help in lowering down the levels of stigma consciousness of the dyslexic students. Furthermore, the results reported improved levels of resilience in students implying that they could now adjust with the changing situation and outgroup people in much better ways. This research highlights the importance of brain-based learning as an exploratory learning support system thus enabling students to tackle with the stereotypes prevalent in our society.

### 8. The Energetics of Physical Inference

Kirill Popov, University of California, Berkeley

[with Aamod Shanker, University of California, Berkeley]

The epistemic effort serves to link the real events of the universe with their mental symbolic representations in a coherent, consistent and computable paradigm. The main outcome of such effort is obtaining information about parts of the universe inaccessible directly, and it is realized by performing local measurements and dissipating free energy from structured useful form into noisy form called heat which injects new information into the local environment of the thinker. A simple argument shows that effective and useful representation is realized via enrichment of thermal equilibrium within thinker with high energy states in order to represent the state of external world, or conversely, depleting the population of low-energy states. Efficient coding hypothesis and free energy principle are linked to the necessary properties of embodied mind via matching the energetics of mental representation to the information in the universe. The representation has to be updated pre-emptively as the environment changes in order for the thinker to survive efficiently, hence providing the incentive to do inference and closing the loop between information gathering, instantiation and epistemic effort.

### 9. A Study on the Dispositional Self-Awareness of Students – Cooperative Training In the Industry in Northern India

Shalini Nigam, Dayalbagh Educational Institute, Agra

[with Purnima Bhatnagar, Neha Sinha Mehta, Dayalbagh Educational Institute, Agra]

The world is changing and so are requirements of the industry. However, this changing industrial environment has not resulted in an equally fast changing education system aligned with the needs of industry. As the gap between the needs of industry and academia increases, we hear from more and more employers about the “skill gap” and lack of employability of students from professional institutes. Dayalbagh Educational Institute, a deemed university in Northern India is one of the few Universities in India which has started the “Cooperative Education” model so as to provide a solution to the

current problem. Mentors from industry and academia join hands to make students of Management as Industry ready.

This study is aimed to advance understanding of dispositional self-awareness of the students who go for cooperative training in the industry for six months. Self-awareness is about understanding who you are, why you do what you do, how you do it, and the impact this has on others. Self-awareness is directly related to both emotional intelligence and success. It allows making positive behavioral changes that can lead to greater personal and interpersonal success. To explore further, quantitative research involving 98 MBA students who had undergone internship was conducted by developing a self-structured questionnaire to measure its outcomes and correlations. A holistic study was undertaken taking feedback from industry and academia on certain attributes of students like relationship building with others, problem-solving and few others.

#### 10. The Effect of Raag Yaman on Depression

Dayal Pyari Srivastava, Dayalbagh Educational Institute, Agra  
(with Ashima, Sudha Saigal, Dayalbagh Educational Institute, Agra)

To study the effect of raag Yaman on Depression patients between the age group of 30–40 years subjects. The researchers have selected five subjects from Saran Ashram Hospital for the study of varied socio economic status of moderate level depression patients. The present study will be having three parts, in first part the subjects will be exposed to raag Yaman being recited without instruments, where as in second phase vocal recitations will be added and in the third phase devotional songs will be used along with musical instruments. After each phase, the level of depression will be measured by Beck Depression Inventory and EEG will be used to measure the brain waves. The results will be compared and concluded.

#### 11. Conscious Multimodal Perception and Cross Modal Experience Inspired Deep Neural Framework

Sandeep Paul, Dayalbagh Educational Institute, Agra  
(with Dhruv Bhandari, Dayalbagh Educational Institute, Agra)

We consider the world around us to be a continuous stream of events. Hence it is intuitively appealing for us to identify information from multiple senses to be a continuous stream of percepts. But, experiments have shown that perception seems to operate in a discrete manner. When two stimuli are presented in rapid succession and repetition, they are perceived simultaneously i.e. within one snapshot [1]. This ability is enhanced over time and we learn to experience these cross modal events and build our unified consciousness [2]. One such real life evidence is the wagon wheel illusion where the rotating wheel appears to be rotating backwards due to discrete sampling. Another famous cross-modal effect is the McGurk effect where illusion occurs when an auditory component of one sound is paired with the visual component of another sound, leading to the perception of a third sound, where all of them are discrete perception events.

It has been illustrated that humans evolve when it comes to sensory integration as they grow. The multi sensory convergence zones in our brain such as superior colliculus evolve with time which is why humans are getting better at handling complex tasks as they grow [3] [4]. This is in line with the McGurk Effect - people who are better at sensory integration have been shown to be more susceptible to it. Hence, our multimodal perception capabilities along with the ever-evolving cross modal experiences which we have in our life result in a stream of discrete moments of consciousness which are unified in nature.

Inspired by the above-mentioned theories, we propose a deep learning framework which gradually simulates human perception capabilities and also includes local experiences to give a unified view of the events. We propose two models as a part of this framework. The first model illustrates the significance of multimodal perception whereas the second model builds on the first one to include local experiences and enhances its learning capabilities. We use a benchmark multimodal dataset to test our proposed model. Experiments have been conducted using various modalities and the results have been compared with other techniques. We demonstrate that the proposed model is able to produce better results in most and comparable in some case since it is inspired by the unified nature of human consciousness.

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- [2] M. Overgaard, L. Lemus, and L. Mudrik, "Editorial : Perception – Cognition Interface and Cross-Modal Experiences : Insights into Unified Consciousness," Front. Psychol., 22 November 2016, vol. 7, no. November, pp. 22–25, 2016.
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#### 12. An Analysis of Machine's Creativity

Sandeep Paul, Dayalbagh Educational Institute, Agra  
(with Soniya, Lotika Singh, Dayalbagh Educational Institute, Agra)

Artists create aesthetically pleasing paintings based on their unique style. This unique style can be characterized with the elements of artwork such as line, shape, space, colour, pattern, texture, and contrast. All these elements contribute towards the creativity of artist. The way artist represents an object or a scenario, it reflects the state of mind of the artist. Each of the artwork's elements plays a pivotal role in appearance of painting and also affects human perception. For example, contrast is one of the visual aspects which affects the aesthetic evaluation of paintings. As studied in [1], moderate contrast in the evaluation of paintings is appreciated more but at the same time it is remembered less than high contrast.

Inspired by creativity of artists, deep neural networks are now capable of generating paintings with the models such as convolutional neural network and generative adversarial network [2, 3]. Convolutional neural networks consist of multiple convolutional and pooling layers. Each convolutional layer consists of number of filters which are responsible for extracting features from given input. The study of [2] used convolutional neural networks to merge the style of painting with the content of another painting. This technique is known as neural style transfer. While capturing the style



of painting, it also captures the colour used in the style painting. The work done in [4] discusses about techniques for colour preservation, spatial and scale control in style transfer. In this procedure of generating paintings, the selection of style and content paintings play an important role. This procedure also poses many questions like are the generated paintings aesthetically pleasing? How can we combine two paintings in order to have a new painting which should be perceptually pleasing? Does the generated paintings include all elements of artwork? Is it possible to control the effect of artwork's elements in generated paintings?

### 13. Challenging the Quantitative Nature of Experience

Florian Habermacher, University of St. Gallen, Switzerland, University of London

It is agreed that practically, it is difficult to quantify, or compare, in absolute terms, the 'amount' or intensity of conscious experience. However, prevalent is the view that overall amounts of suffering or pleasure beings experience could be expressed meaningfully in quantitative terms – if measurement permitted. Rational, consequentialist decision-making within society relies on such (intuitive) quantification and trade-offs across individuals' presumed experiences.

Beyond the accepted practical difficulty of quantification of conscious experience, this study challenges the notion of an absolute quantity of experience on a fundamental level. For intuition, we use the idea that brain cells and accompanying elements could – space permitting, theoretically – be duplicated multiple times within the same brain, creating a parallelized version of the brain at the exact same place. This single, fortified brain represented as one unit the same experience multiple separate individuals could have if the duplicates were instead spread to different geographical locations, yet, neurological knowledge suggests the single person with the fortified brain could experience – feel to experience – at an intensity no different from the original brain.

We demonstrate why the notion of absolute quantities of consciousness leads to inconsistencies, and discuss challenges implied for other-regarding preferences, consequentialist views, and consciousness more generally.

### 14. The Evolution of Consciousness and the Psychological Individuation of Humanity

Chad Harris, California Institute of Integral Studies

We can recognize a developmental pattern in evolution; from our primal hunter-gatherer environmentally embedded, less differentiated sense of "self"-awareness, through a radical ascent of critical "self-reflective" capacities, 1st person philosophical perspective, and the beginning of scientific reasoning during the Axial Era religious transformations from the 8th to the 2nd century BCE, then to the radical differentiation between self and world that unfolded from the Copernican Revolution and mechanistic paradigm, with an existential crisis of meaning left in its wake – now symbolized by the hard-problem of consciousness. Can we see the possibility for an individuated human

species to emerge from our current crisis of meaning? Interestingly, at every stage of its evolution humanity's understanding of the celestial motions played an essential role in each successive worldview. First tracking the seasons and the lunar cycles in the primal perspective, then the perceived erratic motions of the planets led the way from Plato's "problem of the planets" directly to the heliocentric revelation. Can the evolution of world views be recognized as analogous to the stages of childhood development from infancy through childhood and adolescence to adulthood? Do Jean Gebser's "structures of consciousness" provide insight into this development?

### 15. Consciousness for Success in Leadership – West and East Perspectives

Deepak Ohry, Deloitte and Exxon Mobil

[with Mahesh Ohry, Deloitte and Exxon Mobil]

The aim of this qualitative research was to gain an understanding of the awareness of consciousness by Leaders to influence leadership success in organizations.

Meditation practice used to develop consciousness. A Leaders' use of meditation practices can play a vital role in ensuring organization success by enabling Leaders to handle the emotional processes of themselves and others effectively.

The study investigated responses from a sample of Leaders from various businesses regarding their use of meditation practice and consciousness in order to enhance leadership success, and to examine the different views towards meditation from East and West perspectives. Leaders' experience of meditation practice for conscious awareness is subjective and open to interpretation.

Analysis showed that the Leaders understanding of the concepts of meditation practice and consciousness varied widely. There were variances between leaders from East and West organisations in their views of meditation in relation to consciousness and how it could benefit their performance as Leaders. Western leaders see meditation as a stress relief; Eastern leaders viewed meditation as a means of attaining higher levels of consciousness e.g. followers of Radhasoami Faith.

A Leaders consciousness could have a positive and sustainable impact on individuals, organizations and society at large.

### 16. Consciousness as Utopia and a Powerful Leverage Point?

Kaidi Tamm, Karlsruhe Institute of Technology

Consciousness is a phenomenon that enables us to be aware of the world and ourselves. However, it is elusive, difficult to describe or measure. In the society characterized by excessive focus on external, quantitative and collective aspects, the subtler, invisible, inner and qualitative aspects have received undeservedly little attention. In its elusiveness consciousness could be described as a utopia – a place that does not exist. As such it is a goal longed for in many teachings as a final destination for attaining freedom, reconnecting to unity or returning home.

In my empirical research on sustainable development rhetoric and practices I encountered many case studies where people plead for transformation of consciousness as the

primary solution for solving both personal as well as societal challenges. There has been little research on how inner and outer dimensions interrelate and influence each other. To contribute to this field I explore the potential of consciousness as a powerful leverage point (Meadows 1999) helping to transcend paradigms.

I hypothesize that increasing the proportion of conscious awareness is the key to building up inner literacy and freedom. Realizing one's interconnectedness with nature and utter dependency on one's consciousness is also relevant as well as openness for experimental and experiential knowledge as possible sources of valuable insights.

#### 17. CRIT: Towards a Cognitive Foundation for Quantum Mechanics

Konstantin Anokhin, NRC "Kurchatov Institute", Moscow; Lomonosov Moscow State University, Moscow; P.K. Anokhin Research Institute of Normal Physiology, Moscow, Russia

Quantum mechanics is a theory. As such it is a cognitive construct developed in subjective realm. The importance of consciousness in quantum mechanics has long been a matter of discussion, but mainly from the side of physicists. Here I will argue that substantial progress in interpretation of quantum mechanics can be achieved by the reciprocal movement from the side of neuroscience and cognitive theory. I will propose a novel framework for interpretation of cognitive aspects of quantum mechanics – the Cog-Relational Information Theory (CRIT). Cog stands for cognizance – an element of individual knowledge. As a cognitive element each cog is characterized by a purview – the distribution of past and future states of the world, that correspond to its activation. By various forms of cogs an organism can represent an infinite number of objects in the world. At the neural level, cog means neuronal Co-Operative Group. The key postulate of CRIT is "no cog – no bit" principle. It asserts cog-relativity of any information, including information carried by an elementary system in a quantum measurement experiment. In the presentation I will compare CRIT and its predictions to other cognitively enriched interpretations of quantum mechanics: the Copenhagen Interpretation, Relational Quantum Mechanics and Quantum Bayesianism.

#### 18. A Conceptual Approach to the Hard Problem Through the Tool of Attribute Space

Paul Hurren, Symtegra Limited

Establishing the fundamental physical principles behind how subjective experience arises from brain activity (the hard problem), still represents arguably the biggest conceptual challenge in consciousness research. The tool of Attribute Space, an abstract space of the attributes of physical objects, might help shed new light on the problem.

Each material object in physical space can be described by a number of attributes, such as its shape, size, colour and texture. These attributes, while they map to real material objects and are intimately connected with them, are also abstract in nature. Attribute Space is the space of all such object-related attributes which while bound with the phys-

ical world, can also be demarcated from it within their own space or layer.

This paper takes as its axiom that the processing/manipulation of attributes plays a central role in the interaction between brain/body and the environment. Attribute Space provides an alternative framework for the analysis of what gives rise to subjective experience and the feeling of self. It sets the brain's mental processes, together with the abstract attributes of the wider physical world, within an "extended continuum" which is tightly coupled with matter.

#### 19. Technology, Art and Consciousness

Andrew Buchanan, Purdue University, West Lafayette

This presentation will discuss the use of new technologies to extend the practices and methods of artistic movements focused on the investigation of consciousness. These movements are typically premised on the prevalent scientific and cultural understanding of their time, and as such, there is a tendency to relegate the methodologies of interior inquiry to history as the related premises are superseded. The specific artistic practices represent the intersection of perception, embodiment, visualization, introspection and first-person experience.

Emerging digital technologies present the opportunity to revive and re-imagine many of these practices that may yet be fruitful ways of investigating and recording consciousness.

Artists have new opportunities for developing meditative, yogic or improvisational practices as well as new formats for their output. Virtual reality represents an explosion of possibilities for embodiment relations with artistic tools. Brain and body entrainment and interfaces are opening possibilities for more direct artistic investigations of consciousness.

This presentation will include a historical trace of these issues, survey recent works in digital art that best represent the influence of technology on art as a mode of inquiry into consciousness and examine issues related to technology which will impact this sub-discipline of consciousness research.

#### 20. Traumatic Memory Engram Cells Replay in the Resting State of a Conscious Mouse

Ksenia Toropova, Lomonosov Moscow State University, Moscow; NRC "Kurchatov Institute", Moscow; Anokhin Institute of Normal Physiology, Moscow; Institute of Higher Nervous Activity and Neurophysiology of RAS, Moscow

The activity of the brain at rest is often suggested to reflect conscious processing of past experience. Here we show that past experience can shape the resting-state networks of a conscious mouse. We modeled post-traumatic stress disorder (PTSD) and imaged c-Fos cellular resting-state networks in PTSD and non-stressed mice. PTSD affected subsequent resting-state activity all over the brain and caused global changes in the resting-state network structure: PTSD network was less clustered and had longer routes than in non-stressed mice. While in naive animals cortical connectivity was high, in

PTSD mice thalamus, striatum and amygdala was the most connected. PTSD induction also shifted the main network hub to amygdala. Finally, in fos-Cre-dTomato mice stress-activated neurons were also preferentially active during rest. Thus, we showed that cells previously involved in the consolidation of an impactful memory are predominantly reactivated in the resting state. Supported by RSF 16-15-00300.

## 21. Engineering Artificial Consciousness: The Case of Objectivistic Ontology and Synthetic Phenomenology in AI

Mona Rawal, Foothill College, Los Altos Hills, California

Computers will soon be able to simulate consciousness of some kind but can consciousness arise from non-organic circuits? By 2029 computers will have human level intelligence (Ray Kurzweil). This prediction ignites a debate as to, “Will humans be able to engineer and harvest synthetic phenomenology; evolutionize self-awareness? These issues related to machine consciousness will be analyzed in this paper, while drawing insights from interesting ‘Real’ technologically driven projects in machine consciousness in the area of AI, such as CRONOS, SIMNOS, Cog (The humanoid Robot), CyberChild (A simulated infant) and Cicerobot.

AI promotes the theory that an emotional response and consciousness is a game of data analysis. This paper explores responses to the questions like, “Is consciousness produced by mathematical algorithms any different from the one produced by biological reactions? Why should we plant consciousness in machines? For what functional benefit is it to humans?”

The aim of this paper is to understand why it is arduous to approach the problem of subjectivity from an engineering point of view and to propose alternative groundwork that could work with the design and implementation of a conscious subject.

## 22. The Combination Problem for Russelian Monism Arises Only If One Does Not Believe in the Existence of Quantum Waves

Nikolaus Stillfried, Phenoscience Laboratories, Berlin

The combination problem is seen by many authors as a major obstacle for constitutive pan(proto)phenomenal approaches toward a theory of consciousness, including Russelian Monism. This presentation aims to point out that the evaluation of how difficult it is for a Russelian Monist to conceive of a combination mechanism for (proto)phenomenal entities hinges on ones assumed theory of the physical world. Specifically, I argue that under some of the available interpretations of quantum theory, no combination problem arises for Russelian Monism. This is because these interpretations postulate that when quanta interact, this involves not only changes in trajectories of discrete quantum particles but also a seamless fusing of quantum waves into a combined wave. Importantly, these waves are thought to continue to ontically exist even when they are for all practical purposes immeasurable, i.e. epistemically inexistent, after decoherence and collapse processes have taken place. If it is true that the interaction of quanta entails

a fusing of certain physical entities into new wholes, it comes a no additional cost for a Russelian Monist to propose the parallel fusing of the (proto)phenomenal quiddities which according to Russelian Monism are the intrinsic properties underlying some or all physical structure.

## 23. Preliminary Physiological Observations of a “Kundalini” State

Ashley Carroll, The University of Virginia, Division of Perceptual Studies  
[with Streett Davida, Ross Dunseath, Kelly, Edward]

A subject with self-reported ability to produce and control Kundalini states voluntarily was studied using electroencephalographic (EEG) and autonomic measures. Autonomic measures consistently showed sympathetic arousal. Specifically, during self-identified Kundalini ON periods, heart rate, pulse amplitude, skin conductance level, and non-specific skin conductance responses significantly increased. Respiration became markedly non-rhythmic and was overall diminished during the Kundalini ON periods. EEG power spectra became smooth 1/f curves starting a few seconds before Kundalini ON, with the pronounced alpha peak and smaller beta peaks seen pre-Kundalini disappearing. Further, EEG tended to show progressively decreased connectivity and activation, especially in the default mode network during Kundalini ON, in parallel with previously reported default mode network deactivation in psilocybin-induced and other altered states.

## 24. Hallucinatory Experience of Extra Spatial Dimensions

Ivana Franke, Studio Berlin  
[with Bilge Sayim, University of Bern and University of Lille, CNRS]

We perceive space as 3-dimensional. Vivid perceptions of 3-dimensional space also occur in closed-eye hallucinations, for example, under the influence of psychedelic substances, or when presented with flickering lights of adequate intensity. Here, we report findings from an experiment in which 42 observers (architecture students) were exposed for 6’24” to flickering light of different frequencies while their eyes were closed (<http://www.ivanafranke.net/work/we-close-our-eyes-and-see-a-flock-of-birds>). After the exposure to the light, participants were asked to draw 2- and 3-dimensional representations as well as time sequences of what they saw to capture their experiences. Furthermore, participants filled out questionnaires inquiring about their perceptions and experiences. When asked about the number of perceived spatial dimensions, a large proportion of participants reported that they experienced more than 3 dimensions. While it is unclear to what extent the additional dimensions are of perceptual or cognitive origin, our results indicate a notably different experience of space that diverges from the common perception of 3 spatial dimensions. We discuss our results in regard to the nature and limits of conventional and hallucinatory visual experiences, and suggest that the hallucinatory experience of spatial dimensions could be more variable than previously assumed.

## 25. Personality and Personal Values as Predictors for Beliefs in Substance Dualism

Gunne Grankvist, Department of Social and Behavioral Studies, University West, Trollhättan  
[with Petri Kajonius, Department of Social and Behavioral Studies, University West, Trollhättan]

Substance dualism states that two sorts of causally related substances exist: The mental and the physical.

In the current study we used a self-report inventory to investigate in what degree lay-people ( $n = 80$ ) and professional philosophers' and neuroscientists' ( $n = 123$ ) beliefs in substance dualism relate to their personality and personal values.

Laypeople who held stronger substance dualistic beliefs were found to be more agreeable and attached more importance to values of benevolence. These individuals are kind, warm, and considerate and strive to help and encourage people with whom they are in frequent contact.

Professional philosophers and neuroscientists were, on average, more skeptical towards substance dualism. Their personality traits weren't associated with beliefs in substance dualism. Personal values were however clearly related. Those more inclined to conform to social expectations and norms, and to strive for security, safety, and stability of society and relations generally held stronger substance dualistic beliefs.

Since personality and personal values are more or less stable over time, it is reasonable to believe that these factors, at least partially, influence degree of beliefs in substance dualism. The current study showed that such an effect can be found both for laypeople and professional philosophers and neuroscientists.

## 26. Shape of the Association Between Cognitive Complexity and the Intensity of Hedonic Experiences – An Evolutionary Framework

Wladimir Jimenez Alonso, Laboratory for Human Evolutionary and Ecological Studies, University of São Paulo  
[with C. Schuck-Paim, Center of Welfare Metrics (CWM), Madrid]

In the tree of life, is the evolution of cognition in any way associated with the capability of experiencing pain, joy and other hedonic states? We propose that advancements in the resolution of this and related questions can be achieved with a framework that organizes existing hypotheses into categories, defined by the shape of the association between the potential of a species to experience emotional states of different intensity and cognition: Type I. the capability of experiencing hedonic states of greater intensity would already be present in neurologically simple animals; in addition to sensory perception, these organisms would possess fundamental cognitive components enabling these states (e.g. memory and learning); Type II. the intensity of hedonic experiences would be constrained by specific cognitive abilities, which would unlock the possibil-

ity of experiencing hedonic states of greater intensity; Type III. although responses to positive and negative sensorial stimuli emerged early, they would not lead to highly intense hedonic states without the cognitive components needed to cross a threshold of consciousness, required to be aware of the experience as negative/positive; Type IIIb. advanced cognition would enable 'buffering' extremely negative experiences to some degree. By organizing existing knowledge, this framework can foster progress.

## 27. Conscious Awareness as the Basis for the New Paradigm

Ingvar Villido, The School of Practical Awareness, Human LLC

In the face of serious societal problems, the relevance of inner change is largely underrated. Although the inner processes inform and guide human actions in the outer world, we focus on the external phenomena and know much less about the inner dimensions of human life. People lack skills for dealing with thoughts and emotions, causing intra- and interpersonal tensions.

I argue that the common view of human being as a biological robot or survival machine is too limiting. This view of human identity rests on the "old" mental-emotional paradigm, which tends to distort reality. Being constantly engaged with emotions and thoughts, we are too busy to notice consciousness as the space where they occur.

What is needed is a paradigm change to conscious use of awareness. This lends peace and neutrality, creating a stable basis for daily life. Deepening the skills of staying aware, differentiating, understanding, going deeper, having insights, using intuition and inspiration supports this paradigm change. The resulting deeper understanding of reality also helps to solve external challenges.

The difficulties science has with consciousness stem from its limited understanding of legitimate knowledge. For moving forward, its scope needs to broaden to include also the experiential and intuitive knowledge.

## 28. Conscious Perception – Gift or Burden? A New Approach For Studying Sensitivity and Sensory Processing Problems

Thilo Hinterberger, Research Section of Applied Consciousness Sciences, Department of Psychosomatic Medicine, University Medical Center Regensburg  
[with Devina Galuska, Joachim Galuska, Heiligenfeld Clinics, Bad Kissingen]

Due to the high mental demands in complex environments there is increasing interest in the research of the highly sensitive personality (HSP). People with HSP are challenged in a special way. We have developed a novel inventory for the assessment of a person's sensitivity and the sensory processing problems separately which might be related to certain aspects of sensitivity. The model discriminates between external, internal, emotional, and social sensitivities as well as the openness for new experiences. The inventory was assessed in a psychosomatic clinic on more than 4000 participants. We found the sensitivity of patients to be correlated with resilience, experience of meaning, positive feelings and success, while mental processing problems were strongly correlated with burnout symptoms, depression, and anxiety and negatively correlated with resilience.



These results suggest that psychopathological factors seem to be closely connected to problems in the processing of external, internal, social and emotional perceptions and sensations. In contrast, mental health, happiness and salutogenetic states of consciousness seem to be related to the experience of a rich sensory capability.

### 29. Mathematics of Indian Classical Music

Guru Prasann Satsangi, DEI Prem Vidyalaya Girl's Intermediate College  
Dayalbagh Educational Institute  
[with Gautam Tiwari, DEI Prem Vidyalaya Girl's Intermediate College  
Dayalbagh Educational Institute]

The experience of rhythmic harmony between man and nature is the fundamental of conscious awareness and this has been the focus of study in the ancient Indian literature. This beautiful synergy was explored, understood and was presented through compositions that were coherently knit to rhythms and beats.

The styles adopted by the Indian classical musicians are impressive and versatile, and one of the reasons behind it is mathematics. The performance of these singers have a mathematical aspect, for example, the 'swar samuha' sung in the beat cycle is in the binary form where in two 'swaras' can be sung, with every beat having a single or combinations of two. The combination of swaras of one and two are related to the fibonacci numbers.

This paper is an attempt to find the relation between Indian classical music and mathematics.

### 30. Gut Microbes, Microbial Endocrinology, the Chakras and the Concept of Satvik Diet

Prem Saran Tirumalai, Dayalbagh Educational Institute, Agra

Bacterial population colonizing our intestine have been reported to have a role in the development and maturation of our endocrine system. It has also been observed that, gut bacteria can produce and secrete hormones. The crosstalk between microbes and hormones can affect behavior. A gnotobiotic animal for instance has an altered cognitive function and social behavior. This clearly indicates the influence of gut microbiota on the human emotional states. These surprising findings show that the microbiota can modulate host behavior, raising the question of how these effects work functionally. This work is an attempt to explore the relevance of the ideology of the Chakras and the concept of Satvik Diet to the context.

### 31. Evidence for Structured Exponents in Temporal Evolution Equations

Christian Flender, TBA

How levels of description relate to each other is subject to the study of emergence. Emerging properties at a higher level are causally reducible to properties of a lower level if their evolution equation is separable. Components of a combined evolution matrix are exponential functions and if their exponents are structured in a specific way it is possible to factorize the matrix into constituents of a Tensor product. There are no constituents to factorize if an evolution equation is inseparable. However, there are matrix components at different levels of description relating to each other instantaneously. Their equiprimordially dissolves with their exponents becoming structured. Causality and chronological order come into play. How this turns out empirically appears to be a mystery. How to bring forth causal relations prior to causality and chronological order? I suggest stable perception of the Necker cube is a case for observing causation and chronological order entering the stage on purpose: an act of free will without randomness. Usually, multi-stable perception of the Necker cube is a case for stochastic events in which the predominant side of the cube emerges spontaneously. A random event switches between two mutually exclusive perspectives. I claim that an act of free will and the blink of an eye structures exponents towards perception to switch causally and chronologically from one side to the other without randomness. Lessons to be learned for conscious machines may derive from evidence for structured exponents in temporal evolution equations.

### 32. Crosstalk of Amyloid Beta and the Alzheimer Disease

K. S. Daya, Dayalbagh Educational Institute, Agra  
[with Prem Saran Tirumalai, Komal Saxena, Anirban Bandyopadhyay,  
National Institute of Material Science, Tsukuba]

The impaired consciousness and cognitive decline in Alzheimer Disease (AD) has been associated to the aggregation of extracellular Amyloid  $\beta$  ( $A\beta$ ) and the associated intracellular hyperphosphorylation of twisted microtubules, called the tau protein. Close interplay of  $A\beta$  and tau protein is a hallmark signature of AD. Therefore, there is a consensus amongst researchers that addressing one of these is not the solution for the treatment of AD. There has been debate on 'what triggers what'? How the extracellular  $A\beta$  communicates with intra-neuronal tau protein?

This paper is an extension of an ongoing experimental work on  $A\beta$  and presents a theoretical model to understand the wireless signaling pathways between  $A\beta$  and tau protein based on the high frequency response of  $A\beta$ . The electromagnetic response shows ability of  $A\beta$  to respond at microwave, near terahertz and optical range. Based on this, we propose that the fractal geometry of  $A\beta$  is a system of multiplexed oscillators emitting signals from GHz to far terahertz region. This property could be a potential factor for the crosstalk between intracellular twisted tau proteins and the distant extracellular  $A\beta$ . This understanding can unfold a new horizon in understanding the metastasis of AD and therefore, in developing methods of treatment.



**33. Ethical Implications of Theory and Discovery in Consciousness Science**

Whit Blauvelt, Independent

The modern ideal of value-neutral scientific practice parallels that of value-neutral business practice, each encouraging practitioners to see virtue in ignoring the virtue of the consequential costs. A successful theory or product, measured in terms of consumption, may nonetheless have externalities which compromise the health of the community of consumers, the larger society, and our environment. Meanwhile an unsuccessful theory, in terms of the current market success (even among first adapters, in this case the scientifically literate), may have positive implications which impart a duty to engage in better, more creative marketing. Often, successful marketing will frame a product as conjoining with the self-image of the consumer. This cannot be less so when the self-image is of how oneself is conscious, in whatever aspect and degree. Implications for identity, ideology, and spiritual scope follow from any claim by consciousness science. Yet currently, explicit consideration of such externalities is banned from the fashion of our discourse. It can be otherwise; there are obvious directions to pursue.

**34. Spiritual Intelligence and Emotional Intelligence as Predictors for Augmented Work Environment**

Toran Talwar, Sharda University, Greater Noida &amp; Alumini Dayalbagh Educational Institute, Agra

[with Neeti Rana, Gautam Buddha University, Greater Noida]

Spiritual Intelligence and Emotional intelligence are essential components of organizational development. Ability to recognize, understand and respond to other's emotions demands a level of emotional literateness, which can only be acquired by self-awareness i.e., learning to identify one's own feelings and emotions. This falls exactly in the arena of emotional intelligence. However, there is another layer beneath, which is the "source" of the emotions. People tend to understand that the causes of our feelings and emotions are outside the individual i.e. caused by external events and other people's activities. But they are not. It is ultimately the "self" that causes all emotions. Realizing the original cause behind emotions, and understanding what it means, is the territory of spiritual intelligence.

For healthy relationships, empathy is considered as a major component. The building of an empathic relationship is difficult for many managers as it challenges them to reach beyond the facts and functions of a task, and into the feelings and emotions of the person carrying out the task. It is only in the last ten to fifteen years that relationship building has been perceived as an increasingly essential part of a manager's responsibility. In what is now a much more fluid job market, where more people acknowledge that they do not leave the organization, they leave their manager, retaining staff is one of many purposes why modern managers need to understand their subordinates at a deeper level. This paper explores the impact of emotional intelligence and spirituality on workplace

efficacy. The sample frame was Automobile sector in India. Employees from Automobile Companies in India were taken as the sampling unit. These employees were matched in terms of their education, job experience and job profile and then included in the sample.

Result concluded that spiritual intelligence and emotional intelligence are positively related to workplace environment i.e. if employees feel good at workplace, they ought to perform their best.

**35. Psychophysiological Study of the Effect of Yoga-Meditation using Electro Photonic Imaging and Infrared Thermography**

Sant Saran, Dayalbagh Educational Institute, Agra

[with Sukhdev Roy, Dayalbagh Educational Institute, Agra]

The effect of the advanced ultra-transcendental Surat-Shabda-Yoga meditation on the psychophysiological state has been presented, using Electro Photonic Imaging (EPI) and Infra-Red Thermography (IRT). 35 meditators and non-meditators, in the age group of 15-50 years, were studied. EPI measurements showed high functional energy at psychophysiological levels in meditators. Significant improvement in the integral area was also observed, with decrease in integral entropy, indicating lower disorder after meditation and correlating well with recent EEG/MEG study [D. M. Mateos et. al., Cogn. Neurodyn. 12, 73, 2018].

IRT for meditators showed positive normalized energy with increased mean temperature of the forehead, as a result of increased blood flow in the cerebral cortex of the brain and cutaneous vessels of the face. The study identifies correlations between the two techniques and highlights the importance of integration of different techniques to determine and differentiate states of consciousness. The results have also been compared with the recent study of mindfulness meditation using IRT [Singh et. al., Infrared Physics and Technology 95, 81, 2018] and g-Tummo meditation using IRT and EEG, which determines the neurocognitive and somatic components of temperature increase, i.e., increase in alpha, beta and gamma power [Kozhevnikov et. al., PLoS One 8, e58244, 2013].

**36. Musical Consciousness Test based on Indian Classical Ragas**

Sukhdev Roy, Dayalbagh Educational Institute, Agra

[with Pritam Pyari, Saran Pyari Roy, Satugur Saran, Sant Saran, Dayalbagh Educational Institute, Agra]

A musical test has been designed to ascertain the consciousness level of an individual. Musical flute compositions of four Indian classical Ragas, namely, Ahir Bhairav, Jaijaiwanti, Bhupali and Darbari, known to affect four different states of consciousness, according to Indian classical musical tradition, were carefully chosen. 52 male and female meditators and a non-meditator group of 250 college/university students were chosen. Responses were recorded by noting the order of preference and the qualitative effect in terms of feelings, imagination and color perception. The meditator group

clearly showed higher states of consciousness after meditation and also in comparison to students. The subjective experience pertaining to the perception of feelings and colors also corresponded to those empirically attributed in the Indian musical tradition. Psychophysiological analysis through electro-photonic imaging by measuring activation coefficient, integral area and integral entropy that reveal stress, energy, yin-yang balance and chakra alignment also provided good correlation.

The study highlights the age-old Indian traditional knowledge of the impact of ragas on consciousness and the usefulness of music to not only measure but also tune consciousness to higher states. It also facilitates honest responses, simultaneous group testing, avoids language limitations, makes testing enjoyable and is most suited for illiterates.

### 37. Imaginary and Perceptual Experience

Guo Yu Syuan, Institute of Philosophy of Mind and Cognition, National Yang-Ming University, Taipei

What is the difference between imaginary experience and perceptual experience? David Hume argues that these three phenomena are different in vividness and detail, and in accompanying beliefs about the existence of empirical objects. Today's scholars advocate that they are not different in degree but in kind, however, the issue remains a matter of debate. This paper addresses this debate and argues for an account that appeals to different modes of epistemic agents. Current views on this topic will first be reviewed: They explain the difference in terms of some kind of phenomenal difference, the contents of these mental states or the source of determinacy. Drawing a connection with self literature and recent theories on episodic memory, I will show how focusing on the epistemic agency will help elucidate the issue.

### 38. Applications of Topology in the Study of Tubulinopathies

Amla Chopra, Dayalbagh Educational Institute, Agra  
[with Gunjan Agrawal, Raag Saluja, Dayalbagh Educational Institute, Agra]

The tubulin heterodimers polymerise to form hollow, cylindrical structures called microtubules, which have been shown to play a key role in learning and memory, intracellular transport, cell division and cancer. Mutations in tubulin genes, commonly called tubulinopathies, have been associated with complex cortical malformations. Topology is a branch of mathematics which classifies spaces on the basis of the possibility of continuously converting one space to another, in such a way that the original space is continuously retrieved by reverting the process (e.g., a donut and a coffee mug have mathematically the same topology). Protein topologies are compact and highly abstract descriptions of protein geometry. They reduce the protein fold to a sequence of Secondary Structure Elements (SSEs), hydrogen bonds, spatial adjacencies and the chiralities of selected supersecondary structures.

The aim of this work is to study the effects of mutations in a tubulin heterodimer found resulting in tubulinopathies, on tubulin's topological properties.

### 39. Evolutionary Drivers of Phenomenological and Behavioural Diversity

Brad Buhr, Yorkville University, Fredericton

Human phenomenological experience supervenes upon diverse phylogenetic drivers. Furthermore, the emerging complexity of human societies create many social micro-environments which select for new adaptive strategies. Consciousness is the primary mechanism of human social adaptation, and consciousness mediates both phenomenological self-regulation and behavioural modulation in interpersonal environments. Systems of social regulation coalesce as organizational rubrics including ideologies, religions, and customs. Previously, the underpinnings of social adaptation were presumed to be simplistic and based upon aggression. However, the processes of self-domestication, epigenetic transference, multiple attachment styles, continuing evolution of gender expression, and a biologically based diversity of sexual experience create a complex set of possible social futures. One metaphor for this is a contemporaneous superimposition of multiple possible social microsystems. Given the current social connectedness of human societies, there is an opportunity to consciously intervene to leverage an understanding of the complexity of human evolution into diverse, phenomenologically healthy, and behaviourally inclusive social systems.

This presentation examines evolving primate gender interactions, evolutionary drivers of heterogeneous attachment styles in small groups, the opportunities and challenges posed by self-domestication and epigenetics, and the natural diversity of sexual experience in the context of understanding and guiding emergent systems of conscious phenomenological self-regulation and interpersonal behaviour.

### 40. Does Shabda Recitation Impact Daily Spiritual Experience? A Comparative Study of Adolescents across Gender

Geet Satsangi, Dayalbagh Educational Institute, Agra  
[with Shabd Kumar, Sumita Srivastava, Dayalbagh Educational Institute, Agra]

Music interconnects spiritual and sensual life. It touches the inner voice and lifts spirits by realigning oneself back into life's balance. Students following religion of saints are engaged in Shabda recitation in melodious tunes along with musical instruments at a very young age. This paper investigates how this has an impact on their spiritual experiences. Students between the age group of 3 years to 10 years who regularly participate in Shabda recitation were selected as the experimental group (n=65). Daily Spiritual Experience Scale (DSES), Underwood (2013) was used to measure and compare their spiritual experiences with the control group (n=50). Data analysis across gender provides useful statistical comparison between the two groups and data on the relationship between the Shabda recitation and spiritual experiences. This research reinforces the existing theory of inherent connection between music and consciousness.

#### 41. Development and Application of a Specific Instrument to Measure Being Values of Young Students Practicing Musical Religious Folklore: Finding a Possible Connect with their Daily Spiritual Experiences

Sumita Srivastava, Dayalbagh Educational Institute, Agra

[with Nazm Prasad, Anjul Dayal, Dayalbagh Educational Institute, Agra]

Maslow's deliberation on religious and mystic experiences accounts that such individuals report elements of their realization of being in the world. This B-cognition deepens one's perception about the world surrounded and indicates a higher inter-connectedness. Researchers prove that music and spiritual experiences have profound relationship and individuals with spiritual experiences are expected to be high on being values. This work is based upon this premise of Maslow, and develops a being value questionnaire and analyses its psychometric properties including reliability and validity of the scale. The scale is then administered on young students practicing musical religious folklore on frequent basis and investigates the possible connect between the two. Daily Spiritual Experience Scale (DSES), Underwood (2013) was used to measure and compare the spiritual experiences of the experimental group (n=65) with the control group (n=48). Structure equation modelling is used to validate the relationships. Relevant insights on various sub sets of experience questionnaire and being values are significant contribution of this study to the psychology of being, music and spirituality.

#### 42. Peak Experiences and Being Values

Nazm Prasad, Dayalbagh Educational Institute, Agra

[with Sumita Srivastava, Anjul Dayal, Dayalbagh Educational Institute, Agra]

Abraham Maslow's concept of peak experience inspires from positive human experiences from a more positive, phenomenological, humanistic perspective. Maslow defines peak experience as the most joyous, happiest, most blissful moments in life. Maslow's most important finding in peak experiences is the Cognition of Being, which is also called B-Cognition. He found out that people in peak experience reported elements of their realization of being in the world. The experience with B-Cognition deepens one's perception and helps one move away from ethnocentric points of view. There is no judgment, feelings of deficiency, approval, or anything that involves comparison with another human being. This research further builds on this background and develops a being value questionnaire and analyses its psychometric properties including reliability and validity of the scale. The scale is then administered on 56 employees alongwith peak experience questionnaire (Privette 1991) to investigate possible connection between the two. Structure equation modelling is used to overcome previous research limitations. The role of peak experience in explaining being values has been specifically considered. Relevant insights on various sub sets of experience questionnaire and being values are significant contribution of this study to the psychology of being.

#### 43. Placebo Analgesia in Virtual and Augmented Realities

Jasemine Ho, University of Zurich

[with Peter Krummenacher, Peter Brugger, Bigna Lenggenhager, Brainability GmbH and University Hospital Zurich]

The feeling of ownership over our bodies and a sense of our physical localization in space constitute fundamental components of self-awareness that have opened research avenues exploring the modulatory effects of altered body states on pain perception (Hänsel et al., 2011). A recent study demonstrated that application of a sham analgesic to an embodied rubber hand significantly decreases pain sensitivity and unpleasantness, thus highlighting the intricate interaction between corporeal awareness and placebo analgesia (Coleshill et al., 2017). The current and ongoing study is examining whether placebo analgesia can be experienced in virtual and augmented realities. These realities enable the precise control of sensory manipulations in an immersive environment and could thus constitute promising potential therapeutic devices. Participants (n = 8) are informed that the efficacy of a physical, pain-reducing glove in physical reality (PR) would be compared to the analgesic effectiveness of its purely virtual counterparts in virtual reality (VR) and augmented reality (AR). Although data collection is still ongoing, preliminary results evince significantly higher pain thresholds ( $p < .05$ ) in placebo condition participants. Interestingly, placebo analgesic responses from placebo are significantly greater ( $p < .05$ ) in augmented than physical reality.

#### 44. Measurement of Consciousness in Laboratory Conditions: Limitations and Possibilities

Sant Prasad Peddada, Dayalbagh Educational Institute, Agra

[with Bhakti Prasad, Meeta Prasad, Prem Prasad, Dayalbagh Educational Institute, Agra]

Consciousness has been the subject of interest, ever since humans became conscious of their existence. Although consciousness has been explained along philosophical and spiritual perspectives since ages, the recent scientific advances require it to be studied through veridical inner experiences, based on the scientific methodology of observation, report and analysis. The primary focus at present is on the determination of neural correlates of inner experiences through modern imaging techniques and modelling approaches wherein the results are still being discussed and comprehended. The paper attempts to develop a scientific understanding of consciousness with the inner experiences elucidated in major religious scriptures. It also attempts to highlight the limitations of physical scientific instruments to verify inner experiences and proposes possible ways by which such scientific verifications can conclusively be accepted through indirect measurements, considering the current scientific understanding of matter and energy.

**45. The Relationship Between Emotions and Consciousness: A Meta-Analysis**

Neeti Rana, Gautam Buddha University

[with Toran Apoor Talwar, Sharda University, Greater Noida]

Many Psychologists and Philosophers have focused on the study of the relationship between human intellect and emotions for a long time however; quite a few studies have dealt with the intersection of these two human powers. The present paper reviews the role of emotions in understanding consciousness. Emotional intelligence refers to the ability to identify, assess, and control one's emotions, the emotions of others, and that of groups. Goleman (1998) believes that individuals are born with a general emotional intelligence that determines their potential for learning emotional competencies. The five emotional competencies are namely: self awareness, self management, social awareness and relationship management.

The relation between consciousness and emotions in the thought of Wojtyla (2005) concentrates on self knowledge as a power, which can act as an enabling or disabling agent in emotionalization of consciousness. The two components of consciousness: receptive function and interiorizing function during emotionalization may weaken consciousness in registering emotional facts as well as interiority of subject.

Holub (2015) presents the role of understanding and command of language, which can make self-knowledge a more efficient tool. The research discusses the three aspects of the theory of language: semantic, syntactic and pragmatic. The ability to properly describe the internal states depends on the person's good understanding and knowledge of vocabulary, grammar, and practical usage of the language. However, enhanced self-knowledge drives a person from interiority to exteriority, i.e., to the encounter with persons, ideas, objects during inter-subjective exchanges and reverse.

**46. Rethinking Leadership and Leadership Development Through the Lens of Consciousness Science**

Dan Caprar, The University of Sydney

There is increasing concern that leadership is failing – both in organizations, and in the society in general. This is in spite of extensive research on the topic, along with massive spending on leadership education and development. In order to address this conundrum, I explore the usefulness of integrating insights from the science of consciousness in the study of leadership and leadership development. I review work that shows that consciousness is not only relevant, but rather essential to the understanding of leadership, while also identifying two current problems in this endeavor. The first problem is that leadership studies explicitly relating leadership to consciousness often use conceptualizations of consciousness that are inconsistent with current developments in the science of consciousness. The second problem is that studies that arrive close to recognizing the usefulness of a consciousness perspective on leadership, often do so only implicitly, using instead frameworks and theories that

have historically gained more legitimacy in the field (e.g., constructive-development theory, identity frameworks, etc.). Based on this review, I propose a reconceptualization of leadership by relating it directly to the study of consciousness as currently understood, and discuss implications of this conceptualization for redefining leadership theory and practice.

**47. Different Levels of Awareness in the Context of a Decompositional Dual Aspect Monism**

Tobias Widdra, University of Osnabrück

The target of the study of consciousness are often our common everyday wakeful states, but there is also increasing interest in other states like dreaming, mind wandering, or deeply altered states experienced, for instance, during peak experiences or in deep meditation.

This poster introduces a phenomenological model of three different states of consciousness and their relation to one another. The states are conceptualized as different levels of awareness about (1) everyday experience of what we call 'reality' according to majority views and statistical norms, (2) dreamlike states, including night as well as day dreams, fantasies, and mind wandering, and (3) deeply altered states of experienced unity beyond categorical differentiation.

The model is taken from Process Work, an applied method used for individual and collective transformation processes, applied in a wide range of situations like psychotherapy, group or ethnic conflicts, or organizational development.

The poster will outline the model, distinguish dimensions where differences between the levels can be highlighted, relate them to key concepts of philosophy of mind, and discuss the model in the context of a decompositional dual aspect monism like proposed by Bohm or in the Pauli-Jung conjecture.

**48. Impact of Yoga and Meditation on Bio-Mechanics of Human Respiratory System**

Jyoti Kumar Arora, Dayalbagh Educational Institute, Agra

[with Sherry Arora, Ankur Das, Dayalbagh Educational Institute, Agra]

The Human Respiratory System is one of the most indispensable and functional systems of the human body, and is majorly responsible for the functioning of human brain by consistently providing it with oxygenated supply of blood. Enhancement in the functionality of respiratory system necessitates the use of subliminal and non-invasive exercises that promote healthy and relaxed breathing and keep the respiratory rate normal. These objectives are achievable only through yoga and transcendental meditation based on techniques given in the oriental philosophy of Saints. The work presented in this paper has been aimed at improving the bio-mechanics of human respiratory system of university students through yoga and transcendental meditation. The participants in this study were students in the age range 17 to 23 years ( $M=20.5$ ,  $SD=8.35$ ), who underwent Yoga and Transcendental Meditation for 30 minutes daily for three months.



The study showed that yoga and meditation based exercises resulted in an overall improvement in the well-being of the participants. Improved breathing control, better cognition and increased focus was also observed in the participants, that was evaluated based on their responses to various stimuli.

#### 49. The Machine to Be Another

Marte Roel Lesur, Department of Psychology, University of Zurich  
[with Philippe Bertrand, Daniel González Franco, Christian Cherene, JJ Deveraux, Arthur Pointeau, Norma Deseke, Daanish Masood]

The Machine to Be Another is a collection of methods, techniques and technologies that draw ideas from research in neuropsychology, to create the illusion of embodying another real person. Participants will experience the multisensory embodied perspective of another person.

#### 50. Comparisons of Biological Effects of Healing Touch With Electromagnetic Exposure on Human Cells

Anders Rydberg, Uppsala University, Uppsala  
[with Patrice Humblot, Mats-Olof Mattsson, and Myrtil Simkó, Swedish University of Agricultural Sciences, Uppsala, SciProof International AB, Östersund]

We will present and discuss a comparison between changes in the response of human cells exposed to healing touch (HT) and electromagnetic field (MF), respectively. The objective is to gain a better understanding of how the alleged human bio-field influence the cells compared to a pure biophysical field. Such a comparison can provide guidance for which kind of therapy should be the best choice for different diseases. Preliminary research has been done in collaboration between UU and SLU on MF exposure of SAOS-2 cells and is the basis for this work [Rydberg, A. et.al. DOI: 10.23919]. Complementary and alternative medicine therapies like healing or therapeutic touch are part of the so-called human bio-field therapies shown to provide the highest benefit compared to other complementary and alternative medicine therapies [S. N. Garland, et.al., DOI:10.1089/acm.2012.0964]. In vitro cell exposure using HT has resulted in elevated cytokines with significantly reduced IL-1-a, MIG, IL-1b, and MIP-2, IL-6 [[Gronowicz G., et.al. ID:926565],[Trivedi M.K., et.al. doi:10.4172/1948-5956.1000358]]. Preliminary data obtained from cell models will be used to set up a protocol with defined MF parameters (e.g. frequency, strength, modulation format) and compare the results with those from HT and the human bio-field parameters (e.g. distance to cells).

#### 51. Dynamical Changes in Brain Functional State Transformation Induced by Vigilance Task Performance

Almira Kustubayeva, Kazakh National University  
[with Altyn Kamzanova, Kazakh National University, Gerald Matthews, University of Central Florida]

**Introduction:** The study of dynamical changes in brain functional states measured by EEG signals may provide understanding of the mechanism of transitions between stressful states induced by task performance. This research aimed to study nonlinear dynamics in EEG brain activity by using the Lyapunov exponent (LE) metric recorded during vigilance tasks with high and low workload.

**Methods:** Eighty-two volunteers (41 female), aged 18-29 years, were randomly allocated to the no-cue (high workload) and cue (low workload) vigilance task conditions. EEG was recorded with Neuroscan\_Spectrum-1 from 16 electrodes during 40 min (4 stages of 10 min). The Dundee Stress State Questionnaire (Matthews et al., 2002) measured subjective state and workload.

**Results:** The impact of vigilance performance on conscious awareness was shown by task-induced decreases in energetic arousal, concentration, and internal motivation in both groups. Tense arousal increased in the uncued condition. There were significant stage and electrode effects in both conditions showing a decrease in LE during the second stage followed by gradual increase to the end of performance in Cz, Pz, Fz, and whole brain. There was no significant difference between groups.

**Conclusion:** Increase in brain signal fluctuation corresponds to the transformation of conscious awareness induced by vigilance task performance.

#### 52. Consciousness, Robotics, and the Hard Problem: An Exploration from the Perspective of Dual Aspect Monism

Jeffrey Beck, Paradigm Research LLC

The past fifty years have seen a progression of ideas to abstract and automate physical systems and intelligence. There are mathematical algorithms that can self-tune and adaptively control a wide range of physical systems without the need for consciousness. The need for what we experience in consciousness seems only to arise for more complex problems with multiple solutions or no computable solution. In a competitive cyclical environment with survival of the fittest, there is a need for directed action, even in the absence of concrete optimal solutions. Consciousness serves this function in my view.

Dual aspect monism is the most helpful perspective I've found for understanding the conscious and non-conscious processes controlling us. Conscious experience in tandem with non-conscious adaptation leads to a brain conditioned under the influence of conscious experience. Consciousness is needed for learning. Once learned, consciousness is mostly unnecessary, and only serves a supervisory role.

For this dual aspect monist perspective to work there must somehow be a correspondence between some physical aspect of the body and each quale activated in consciousness. Thus, it should be possible to find a system of mapping between the physical



body and conscious experience. It seems likely that such a map would open a wide range of opportunities for improving human well-being and for implementing synthetic intelligence that navigates and learns consciously.

### 53. Evaluating the Role of the Prefrontal and Parietal Cortices in Top-Down Driven Metacognitive Visual Awareness with Theta-Burst Transcranial Magnetic Stimulation

Antonio Martin, Graduate Institute of Mind, Brain and Consciousness, Taipei Medical University  
[with Tzu Yu Hsu, Graduate Institute of Mind, Brain and Consciousness, Taipei Medical University]

The functional roles of dorsal lateral prefrontal cortex (DLPFC) as well as posterior parietal cortex (PPC) in conscious perception has been long debated. Although many prefrontal and parietal lesion patients' studies have addressed this issue, a conclusion cannot be made from inconsistent findings. To provide causal evidence, transcranial magnetic stimulation (TMS) studies over DLPFC and PPC have been done to investigate whether offline theta-burst TMS temporal interruption in these two brain regions affects metacognitive visual awareness. Intriguingly, they provided conflicting results. The aim of this study is to revisit this question. More importantly, to elevate the influence from DLPFC and PPC on metacognitive visual awareness, Kanizsa illusory contours, which has been found strongly constrained by top-down control, will be applied to examine whether theta-burst TMS over DLPFC and PPC affects metacognitive visual awareness while at relative high demanding top-down control condition. We hypothesize that different level of demand on top-down control may alter the weight of DLPFC and PPC on metacognitive visual awareness and further reflect on theta burst TMS effect.

### 54. Non-Locality in Communication Can Entail Quantum Logic Like Structure

Yukio Pegio Gunji, Intermedia Art and Science, School of Fundamental Science and Engineering  
[with Mai Minoura, Kyoko Nakamura, Intermedia Art and Science, School of Fundamental Science and Engineering]

Non-locality can be found in human communication without quantum mechanics, and is defined by getting information at other places in influencing the very state at that place. If the relationship between objects outside a brain and representations inside of the brain is expressed as a binary relation, context is defined by a diagonal sub-matrix in the binary relation.

Since the non-locality in the binary relation is defined by the presence of relation outside a context, if the communication happens, then the relation outside sub-contexts communicated with each other become present.

In our scheme, given a binary relation, one can obtain a lattice structure and the proba-

bility space corresponding to the underlying binary relation. Thus, before communication, there is no relation outside of contexts, and that represents Boolean algebra. Once a communication happens, the relation outside of contexts can be present, and then the logical structure is transformed from Boolean to Orthomodular lattice. By the transformation of the binary relation, probability space is also changed, and that can entail some linguistic fallacy such as guppy effect and/or conjunction fallacy.

### 55. Why True Perceptions Die Out and how Embodiment Helps: Modelling Evolution with Genetic Algorithms

Tine Kolenik, Department of Intelligent Systems, Jožef Stefan Institute, Slovenia  
[with Urban Kordeš, Center for Cognitive Science, Faculty of Education, University of Ljubljana]

The relationship between mind and world has been the focus of consciousness studies, especially of cognitive science. Perception has been identified as one of the main sources of knowledge about the world. Evolutionary scientists claim that natural selection optimises perception so that it accurately mirrors the outside world. In opposition, the interface theory of perception [1] proposes that perception is a non-veridical interface between an organism and the outside world, evolutionarily fitted to the organism's fitness and not the objective truth. It has been studied using genetic algorithms (GAs), which show that non-veridical perception offers more survival value to the modelled organism than veridical perception. However, the theory is based on cognitivist presuppositions about the mind, claiming that perception does not require action. We successfully replicated the GA model, then replaced cognitivist presuppositions with embodied-enactivist presuppositions, coupling action and perception by adding a sensorimotor loop. The sensorimotor loop bootstraps evolution, with organisms needing less information to perform better due to knowing how to perceive by taking appropriate actions.

[1] Donald D. Hoffman, Manish Singh, and Chetan Prakash. 2015. The Interface Theory of Perception. *Psychon Bull Rev* 22, 6 (2015), 1480–1506.

### 56. Hypercomputation of the entangled state optimal loss function performed by quantum neural networks as a correlate of consciousness and wavefunction collapse

Luis Javier Camargo-Perez, Center of Frontier Research and Philosophy, Sidera Science  
[with Daniela Munoz-Jimenez, Graduate Institute of Mind, Brain and Consciousness, Taipei Medical University, Center of Frontier Research and Philosophy, Sidera Science]

The recent development in artificial intelligence driven by the neural networks as also arose the questions of whether these systems may be used as a model for the study of consciousness. Nonetheless, the theoretical non-trivial effects of quantum mechanics on the biological systems including the human nervous system have barely been studied

on digital analogs. Having a model of propagating wavefunction entanglement neural network as a premise, we hypothesized that a neural network state can be formalized as a wavefunction and therefore describing its properties. With this basis, a quantum neural network in superposition will collapse into the most efficient state at the lowest computational time complexity. This hypercomputation of the optimal loss function could explain the capacity of human cognition to solve non-computable problems outperforming artificial neural networks, hence, we devised that having a certain threshold of wavefunction superposition complexity, a subset of wavefunctions will collapse into a single eigenstate producing the observation induced collapse by a conscious agent. From a many-worlds interpretation, among the spectrum of states coexisting in superposition, the verse where the state of a neural network performs with the highest thermal efficiency is the one of which the conscious agent is aware or arises of.

### **57. The Paradigm of Allostatic Orchestration: Connecting the Placebo Response, Anticipatory Regulation, and Neural Criticality**

Sung Lee, University of Arizona, Phoenix, School of Medicine

Physical effects from placebos, the influence of psychosocial stress on disease, and other findings point to a role for consciousness in biomedicine. To advance understanding, an integrative model may be helpful. Allostasis (stability through change) explains how the brain orchestrates functionalities across organ systems, through anticipatory regulation, to produce optimized behaviors with respect to the changing and complex natural environment. Some researchers have understood “allostasis” only to indicate the shifting of set points under conditions of stress, and have doubted whether it provides significant advantage over the classical principle of homeostasis. A stronger version of allostasis places sharper emphasis on the role of the brain as the organ of central command, and its implications appear to be sufficiently substantive to constitute a Kuhnian paradigm shift. The paradigm of allostatic orchestration (PAO) can explain domains of biology poorly accommodated by homeostasis, and it encourages refined thinking about consciousness in biomedicine, as well as new lines of experimentation. Concepts associated with the PAO will be presented including its hypothesis that the brain’s proximity to the state of criticality is crucial to the facilitation of whole-person health (which is itself operationalized as a capacity for optimal anticipatory oscillation).

### **58. Completion of Perfection Process or Methodology of Reaching the Limit of Unlimited**

Tatiana Ginzburg, Center for Humanistic Technologies

[with Gennadi Shirokov, Center for Humanistic Technologies]

According to the Russian philosopher, V.S. Stepin, there are three approaches to scientific rationality: Classical, in which the subject and the object of cognition are separated; non-classical, where the connection between the subject and the object appears; and post-non-classical, where I, as the subject, takes full responsibility for cognition

(the conceiving process). This talk will be given in a post-non-classical context, a system that allows us to cover the entire spectrum of consciousness. It is based on the Hinduism chakra model in which 49 (7x7) basic states of consciousness are identified. In the same way that the chakra model allows us to create/envision a complete system of anthropological practices, a post-non- classical scientific approach opens the door to a new formulation of a number of fundamental psychological and epistemological problems/issues.

### **59. Beyond Epicureanism: Why Music Matters to Consciousness Studies**

David Clarke, University of Newcastle upon Tyne

According to the Russian philosopher, V.S. Stepin, there are three approaches to scientific rationality: Classical, in which the subject and the object of cognition are separated; non-classical, where the connection between the subject and the object appears; and post-non-classical, where I, as the subject, takes full responsibility for cognition (the conceiving process). This talk will be given in a post-non-classical context, a system that allows us to cover the entire spectrum of consciousness. It is based on the Hinduism chakra model in which 49 (7x7) basic states of consciousness are identified. In the same way that the chakra model allows us to create/envision a complete system of anthropological practices, a post-non- classical scientific approach opens the door to a new formulation of a number of fundamental psychological and epistemological problems/issues.

### **60. Meditation Coupled with Pro-Social Behavior as a Means to Achieve Human Well-Being and Happiness**

Saatviki Gupta, Jawaharlal Nehru University, New Delhi

[with Nandita Gupta, Arun Kumar Gupta, India Institute of Medical Sciences, New Delhi]

In modern society, chronic physical diseases and negative psychological states generated by diverse forms of social adversity (stress, depression, loneliness) are widespread and there is a desperate quest for happiness.

Psychological well-being is positively associated with current physical health and forecasts future physical health. Adverse psychological and social environments influence disease risk by activating a conserved transcriptional response to adversity (CTRA) which up-regulates expression of pro-inflammatory genes and decreases the expression of innate antiviral response and antibody producing genes. Chronic activation of the CTRA genes by actual or anticipated social threats, stress may promote inflammation mediated cardiovascular and neurodegenerative disease, Type II diabetes and impair host resistance to viral infections.

Studies show chronic activation of CTRA genes to be suppressed either by self-regulating Mind- Body Therapies (MBT) or by purposeful, self-transcendent engagement in pro-social behavior. Incorporating these in our lifestyle may promote positive mental and physical health and be the best means of attaining happiness.

As evidence for the success of such a lifestyle, we describe the 100 year old community of Dayalbagh in Agra, India whose members practice meditation and pro social activities like voluntary selfless community services as a part of their daily lifestyle.

### 61. Towards the Theory of Consciousness Through Concepts and Their Situation Relevancy

Viljo Martikainen, Aalto University, The Finnish Society for Natural Philosophy

SENSORY INFORMATION + CONCEPTS > CONCEPTBASEDNESS IN AGENTS' MENTAL STATES AND EXPERIENCINGS = CONSCIOUSNESS

The above describes the dynamics in all agents' and especially human agents' or SUBJECTS' mental states of experiencing and understanding the situation relevant meanings of the sensed entities in their environments.

According to Landman Gunnar (1920, p. 79), already Socrates, Plato and Aristoteles (384–322 BC) needed concepts to understand the sensed information. Plato named his concepts also to ideas. Somehow these old philosophers had a right idea of the necessity of concepts to know and understand the values and meanings of the on-line flow of visual, auditive, olfactory, gustatory, tactile and motor sensations. They could not explain what concepts were.

In my dissertation work ( Martikainen Viljo, 2004, p 69 and 92 ) I pre-sented the system model and theory of human concepts an mind. I found its structure by asking: What do we remember about entities we know very well?

The elements of concepts, knowledge, and in fact of any theory can be seen as collections of attributes on three lines, namely: base and value-line, time-line-, and theory-line. All good theories must describe their objects understandably, explain their structure and functions in a logical way and forecast their future in a reliable way. On the base- and value line there are in the center all the information we can get through the six senses including names and all linguistic information and information mediated by different signs and symbols. Important in this line are the value and classifying attributes because they enable the rapid reaction of the agent. By using names and linguistic expressions the number of human attributes of any entity is limitless.

Attributes on the time- and theory lines are so called structural attributes built by using other concepts. On the time-line we usually know the history or more deeply the genesis of the entity, today's situation, and usually some features of its possible future. On the theory line the first question is the ontological status of the entity. Is it existing or in time-space dimensions manifesting entity or only subsisting memory structure or just a quality in subject's mental experiencing. The other areas in the theory line concern the structure and functions of the entity. They often play the main roles in scientific research.

The above described concept based and very fast memory process is explaining the values and meanings of the received information flow and creating our experiential mental state of CONSCIOUSNESS in which we are aware and live through the cognitive, emotional, volitive, motivational, and sometimes also erroneous areas of experiencing like illusions, hallucinations or paranoid delusions.

We have in our brain hundred billion neurons, ten thousand synapses, and about hundred neurotransmitters to make the very fast and continuous memory process of consciousness possible. This continuous awake time flow of sensory information and its immediate concept based and situation relevant interpretation is and has been fundamental -as David Chalmers says in his TED-presentations- for all agents' wellbeing and survival in the evolutionary processes. Along with the evolution of agents' size and structure there must have been the evolutionary processes of peripheral and central nervous systems for perceiving, remembering, and interpreting the information from agent's environment.

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### 62. Kinesthetics: The Key to Spatial Perception in Hindu Temple Architecture

Nirakh Parmar, Dayalbagh Educational Institute

[with Renu Singh Parmar, Mehar Parmar, Dayalbagh Educational Institute

Architecture, described as thought behind form, is the most appropriate vehicle, for carrying the messages addressed for human mind. Architecture communicates through spatial tools, whether they be the space sequences and their organization; elements of space making and their scale and form; or the symbolism of surface articulation. It is this aspect of encoding and decoding, that sets off an instantaneous dialogue between the user and the architecture product.

Architectural spaces can potentially nourish both emotionally and spiritually. A typical Hindu Temple best illustrates this phenomenon, where communication takes place at three levels- sensorial, experiential and associational. Together they mark the complete communication – a wholesome experience integrating the spiritual and the corporeal, as in the Hindu temple the three worlds meet viz. the physical universe, the mental plane of existence and the spiritual sphere.

Traditional Indian architecture is the story of movement and pauses where Kinesthetics of a space is fundamental to its experience and perception. The study of Meenakshi Sundareshwara Temple at Madurai, Kailash Temple at Ellora and Sun Temple of Modhera unravels that KINESTHETICS, the dynamic perception of space through movement with ever-changing points of view and the varying vignettes resultant of the spatial composition, is the most fundamental facet of space-making in Hindu Temple architecture. This tool of Kinesthetics heightens the progression from the corporeal to the spiritual as one progresses from the entrance gateway (Gopuram) to the inner sanctum (Garbha-griha) catalyzing the co-evolution of the microcosm and the macrocosm, a growth of two realms- being and experience in traditional Hindu temple.

**63. Are Video Games Gateway for the Conscious in Dreamland?**

Nirakh Parmar, Dayalbagh Educational Institute

[with Mehar Parmar, Renu Singh Parmar, Dayalbagh Educational Institute]

Our understanding of the importance of night-time dreams has come a long way since the days of Freud's 1900 "Interpretation of Dreams" where he claimed that dreams were the royal road to the unconscious. Although Freud did a lot for introducing the serious study of dreams into a culture that rejected them as unimportant, he also labelled dreams as the area where the individual's unconscious instinctual impulses are stored. Since the development of sensitive electrophysiological recording techniques and the subsequent discovery of rapid eye movements during sleep, this pathologizing of dreams, has ended. In the last half century, a body of work, while not absent of controversy, has generally shown that night-time dreams are functional to the life of the brain. An evolutionary theory is that of Revonsuo (2006) who postulates that themes concerned with ancestral and current survival threats should be prevalent in dreams. Barrett (2007) argues that "dreams are thinking or problem solving in a different biochemical state from that of waking" (p. 140). Finally, dreams as play, in the sense of practice for later events beyond threat simulation, is a view which has also received empirical and theoretical attention (Bulkeley, 2004).

Revonsuo (2006) suggests that both dreams and virtual reality (VR) simulations are world simulations that result in models of self in the world. In other words, we can conclude from our experience of dreams and VR, where self is in artificially generated worlds (biologically driven in dreams and technologically driven in VR), that normal waking reality is also a "world simulation". This is one of various bodies of work that have taken the position that self in the world is a construction (Blackmore, 2004). In any case, these models of self in the world (dreams, VR, waking reality) impact each other, sometimes in profound ways as in the nightmares of trauma victims which wake them from sleep, making it difficult to get back to sleep no less cope with the trauma. Sometimes the impact is less profound, such as in playing a video game for so long that standing up from the sofa results in dizziness as one acclimates to the new "world" of waking reality from that of VR.

Previous research on video gaming and dreams has found an impact of gaming on dreams. While these studies suggest that video game content is incorporated into dreams, it is important to consider the implications of such incorporation. So, for instance, Schredle, Anders, Hellriegel and Rehm (2006) concluded that contrary perhaps to popular lore, playing computer games in children does not cause nightmares. This also supports the Gackenbach et al's examination of dreams of video game players – which showed the evidence of lucid and control dreaming in gamer's sleep.

Hence, these studies gave rise to the idea of video games as the gateway for the conscious in our dreams – giving rise to lucid dreaming; which also suggests the alteration of an evolutionary function of dreams - threat simulation.

**64. The Importance of High Spatial Frequencies for Exogenous Consciousness. Evidence from the Attentional Blink Paradigm**

Martial Mermillod, Univ. Grenoble Alpes

[with Mickaël J. R. Perrier, Institute for Transport Studies, University of Leeds, Univ. Grenoble Alpes, Louise Kauffmann, Univ. Grenoble Alpes, Carole Peyrin, Univ. Grenoble Alpes, Nicolas Vermeulen, Université catholique de Louvain (UCLouvain), Psychological Sciences Research Institute, Louvain-la-Neuve, Fund for Scientific Research (FNRS-FRS), Brussels, Frédéric Dutheil, Université Clermont Auvergne, CNRS, LAPSCO, Clermont-Ferrand]

In the present study, we attempted to highlight the respective importance of low spatial frequencies (LSFs) and high spatial frequencies (HSFs) in the emergence of visual consciousness by using an attentional blink paradigm in order to manipulate the conscious report of visual stimuli. Participants were asked to identify and report two targets (happy faces) embedded in a rapid stream of distractors (angry faces). Conscious perception of the second target (T2) usually improved as the lag between the targets increased. The distractors between T1 and T2 were either non-filtered (broad spatial frequencies, BSF), low-pass filtered (LSF), or high-pass filtered (HSF). This The spatial frequency content of the distractors resulted in a greater disturbance of T2 reporting in the HSF than in the LSF condition. We argue that this could support the idea of HSF information playing a crucial role in the emergence of exogenous consciousness in the visual system. Other interpretations are also discussed.

**65. Irreducible Subjectivity**

Allen Hough, Institute of Philosophy of Mind and Cognition, National Yang-Ming University, Taiwan

[with Yi-Hsin Su, Institute of Philosophy of Mind and Cognition, National Yang-Ming University, Taiwan]

In our daily life, our experience makes it seem that there must be a self to have the experience. We rarely deny there is a phenomenal self. But, must the self actually exist as a substance? There are many different theories about what is the nature of the self. They fall into two broad categories. One is the so-called ego theory of the self, the self as an agent that is a subject of a person's experience. Bundle theory of the self is another one. Thomas Metzinger, a bundle theorist, proposes that the phenomenal self as an illusion is a fascinating representational phenomena that arises from the self model. The bundle theory faces the challenge in accounting for the subjective point of view from which we perceive the world. What I will argue in this essay is that the irreducible first-person or subjectivity poses a serious challenge to the bundle theory.



### 66. Beyond The Subjectivity Trap – Neuronal Inputs and Outputs: the Conjured Simulacrum

Martin O'Dea, Dublin Business School

The evolution of brain function in a biological, physical context and the functional understanding of much of the brain's activities sees comprehension of mind in easy alignment with the other perhaps 1 trillion living organisms on earth.

The issue of the subjective human experience seems to be the one aspect that humans struggle to explain with neuronal functionality only.

While the brain's vast inputs and outputs contribute to all brain states, much of what is discussed as the subjective experience and the 'hard problem of consciousness' resides in language and the internal monologue's narrator's 'I'.

It is proposed that by understanding the role of human language and the evolution of gesture signals through many generations of refinement of this motor skill set to social language has led to a conjured simulacrum that holds its own superior nature as that very subjective experience.

The fact that it is with this simulacrum that we share opinions about the nature of the simulacrum leads to the concept of the 'Subjectivity Trap'. From beyond the subjectivity trap, in fact narrated thought can be seen as practiced language, a motor skill that has its understanding in neuronal inputs and outputs as with all else.

This provides a functional explanation of consciousness and so a further degradation of the 'special' role for humans that humans have long held sacred

### 67. Breathing and the Brain – Decelerated Breathing Synchronizes Brain and Body Rhythms

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Regensburg

[with Nike Walter, Christopher Doliwa, Thomas Loew, Research Section of Applied  
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Numerous methods for enhancing consciousness and well-being emphasize the role of breathing. We have investigated the link between body rhythms and brain dynamics during paced breathing. About 40 participants conducted paced breathing sessions with respiration rates (RR) from 6 to 14 s/cycle for 7 min each task. Measures of respiration, heart rate variability (HRV), skin conductance and 64 channels EEG as well as subjective ratings were recorded and compared with each other.

Both, the respiratory sinus arrhythmia of the HRV and the slow cortical potentials (SCPs) of the EEG correlated with the respiration cycle, however the highest correlations were observed at a RR of 10s/cycle especially for the SCPs. A strong positive voltage deflection during inhalation is followed by a negative variation during exha-

lation. This decelerated breathing rhythm matches the frequency of the baroreceptor sensitivity, leading to synchronization between breath, HRV, baroreceptors and the brain. Subjectively, participants rated this RR as the most relaxing one. Brain oscillations from Delta to Gamma correlated only weak with respiration. This study demonstrates the importance of the speed of breathing on the brain dynamics. A more detailed analysis might help us understanding the role of the breath for altering states of consciousness.

### 68. Psychological and Kinematic Effects of an Invisible Self-Body on Voluntary Gait

Yuta Nishiyama, Nagaoka University of Technology

[with Hajime Kobayashi, Shusaku Nomura, Claudio Feliciani, Hisashi Murakami,  
Tatsuji Takahashi, Tokyo Denki University, Nagaoka University of Technology,  
The University of Tokyo]

This study reports that participants decreased a sense of reality and held a sense of agency when they were walking at a first-person point of view in a certain virtual environment. A sense of reality is a feeling that I am now and here, and a sense of agency is a feeling that I am an initiator of my own action. Both of them have been related to bodily self-consciousness in so far as there is a visible body. Our experimental setup provides one's own invisible body. Participants wore a head mounted display (HMD) in which a real room live images captured by 360° camera were projected. They took six steps forward in three separate conditions: normal view (Ctl), invisible body view (T1), and discrete optic flow view (T2). The results of questionnaire showed that a feeling of being in the room they saw and a feeling of seeing the present images were weakened in T1 and T2 in comparison with Ctl but a feeling of moving the viewpoint by themselves was decreased only in T2. Moreover, the T1 condition shortened subjective time awareness about walking period. Furthermore, we introduce a characteristic of walking performance in each condition.

### 69. Naturalism and the Meta-Problem of Consciousness

Uziel Awret, Inspire Institute

Chalmers' (2018) "The The Meta-Problem of Consciousness" can be viewed as a 'naturalization procedure' 'placing' abstract and normative phenomena within our scientific world view and commensurate with a meta-philosophical naturalism that seeks to replace immutable philosophical questions existing 'nowhere' with the same questions asked by beings like us in a world like ours. I will argue that while naturalism is notoriously hard to define, the meta-strategy provides us with the closest thing to a well-defined naturalization procedure by conjoining the solution space of a philosophical problem with the topic neutral solution space of its associated meta-problem to improve both.

I will apply Chalmers' 'naturalization procedure' to expose inconsistencies in both Papineau's scientific naturalism ( combining biological functionalism with the 'phe-



nomenal concept strategy') and De Caro's liberal naturalism and show that in all these cases application of Chalmers' meta-theoretic procedure first forces a choice between eliminativism and realism on the relevant ontologically problematic entity and then forces the realists to establish coherence conditions and avoid Gettier cases of unjustified true belief.

I will end by asking whether a topic-neutral solution to problem and conscious reports should be enough (similarly to Dewey's Ur-Dualism) to force eliminativism on all ontologically problematic entities except consciousness.

#### 70. The Phenomenon of Embodiment and Disembodiment, Near Birth and Near Death Clinical Observations

Anjoo Bhatnagar, DEI Saran Ashram Hospital Dayalbagh Agra

[with Phoolchand Bhatnagar, DEI Saran Ashram Hospital Dayalbagh Agra]

The process of embodiment at birth and disembodiment at death is accompanied by strikingly similar clinical findings on medical grounds. We have, in this study compared these signs, symptoms, reflexes and EEG findings at the time of beginning and end of life.

1. Cephalocaudal vs. caudocephalic progression of life's vital force or energy (1) Life begins with loud cry and respiration is established, the baby starts movements of arms followed by those of the legs. With development, the infant starts opening eyes at 2-3 months, holding neck at around 4 months, sitting up around 6-7 months, standing and walking by 1-1.5 years. On the other hand, at the time of death there is withdrawal of life signs, from below upwards e.g. Pedal edema, loss of bowel and bladder control and terminally, disappearance of dorsalis pedis pulse from feet followed by disappearance of radial pulse from arms. Neck holding is lost, followed by up-rolling of eyes. Sleep, deep sleep, coma and then the end of life is marked by cardio respiratory arrest and finally pupillary dilatation. 2. Abdomino thoracic respiration - In the normal newborn breathing is abdominothoracic type for initial 2-3 months of age. This pattern of respiration is also observed in deep coma and near death, otherwise respiration is thoracoabdominal type in normal condition. 3. Gamma synchrony in electroencephalogram The newborn spends most of its time in active or REM sleep (paradoxical sleep). Electrical discharges in the frequency of >60 HTZ (Gamma waves) in EEG of newborn is a finding of unexplained significance. During deep meditation and near death also, gamma synchrony (an indicator of conscious awareness) has been observed. (Chawla LS 2009, Chopra D. 2006)

4. Neonatal primitive reflexes these inherent reflexes are present at birth and disappear during first 3-12 months of postnatal life. They reappear in conditions of coma and near death e.g. Stretch reflexes, flexion-extension reflex, abdominal reflex, oral, ocular and neck reflexes (4) (Rossor MN, 2001). 5. Universal awareness near death and during fetal life The sense organs like eyes, ears, touch etc do not seem to function as in normal awake and alert state but awareness of surroundings is present and the person can describe this later after coming out of the condition as is evidenced by studies on fetal memory (prenatal learning Chamberlain, David) and out of body and near death

experiences (Long, Perry, 2011) How can we explain these clinical similarities at time of birth and death? What is the cycle of embodiment and disembodiment?

This phenomenon can only be explained by correlating Western science with eastern philosophy of birth, death and rebirth and existence of spirit or soul and its ascent and descent in human frame i.e. and attaining highest form of conscious awareness at the time of death according to Religion of Saints (Radhasoami Faith).

#### 71. The Pseudo-Time Arrow: Explaining Phenomenal Time with Implicit Causal Structures in Networks of Local Binding

Andres Gomez Emilsson, Qualia Research Institute

[with Michael E. Johnson, Romeo Stevens, Qualia Research Institute]

Can phenomenal time be explained causally? We posit that the age-old mystery of how time perception arises can be solved with implicit causality in networks of local binding. We start by distinguishing physical and phenomenal time: physical time is what a clock measures, and it can be explained in terms of a macroscopic arrow of time (often attributed to entropy gradients). Phenomenal time is the feeling of time as it is experienced. Strikingly, meditation, psychedelics, and intense experiences give rise to "exotic" phenomenal time, such as: time reversal, looping, moments of eternity, temporal branching, timelessness, etc.. A satisfactory theory of phenomenal time ought to explain both "normal" experiences of time and exotic variants. To achieve this we assume: indirect realism about perception, discrete "moments of experience", and Qualia Formalism (every experience has a mathematical model whose features explain its phenomenology). Combined, these assumptions can be used to model experience as a networks of locally-bound qualia. We then show that phenomenal time can be found in the implicit arrow of causality of such networks, which is uncovered with conditional statistical independence. Unlike existing models, this account generates testable predictions concerning exotic phenomenal time that can be verified in the near future.

#### 72. A Study of Gunas and Emotional Intelligence in the Holistic Development of Students in Northern India

Richa Chauhan, Banasthali Vidyapith, Niwai, Tonk, Rajasthan

[with Neelni Giri Goswami, Shalini Nigam, Banasthali Vidyapith, Niwai, Tonk, Rajasthan, Dayalbagh Educational Institute, Agra]

A student's overall performance may be attributed to his cognitive ability, parents, society, school and the environment he has grown. Researchers are getting more and more interested in investigating the factors responsible for student's mental health and their complete development. Gunas (Behavioural Qualities, Verma & Tiwari, 2016) are considered as an important personality factors in the Indian philosophy. This word has different meaning in different literature. Referring to Samkhyas these constituents of Prakrti (Someone's nature is their character, which they show by their behavior, Collins Dictionary) are called Sattvaguna, Rajoguna and Tamoguna. In Bhagwat Geeta Lord Krishna explained that when we perform any act without expectations of result

it is called Sattva personality (Aswamedha parva of Mahabharata describes Sattva personality as happy, enlightened, forgiving, and truthful), secondly, when we do any action with the expectation of some result that is Rajas personality (Rajas personality is described as jealousy, desire, pride, dissatisfaction, endurance), and when any deed is performed to harm or damage someone is called Tamas personality (Tamas personality has grief, ignorance, fear, violation of rules, absence of faith and blindness) (Janghel & Shrivastav, 2016). Sastry (1981) believed those individuals who are Sattvik in nature will grow in their career rather than persons who possess Rajasik and Tamasik characteristics.

Emotional intelligence on the other hand is the ability to monitor one's own and others' feelings, to discriminate among them, and to use the information to guide one's thinking and actions and be a better decision maker (Mayer & Salovey, 1997). Society has depended on the intellectuals for helping develop the young generations and equip them with the tools—values, personality, behaviour traits and cognitive skills to become net value contributors in the development of society. The present study aims to understand the correlation between Gunas and Emotional Intelligence and their impact in carving the student's personality. For this purpose, it is proposed to conduct a study on students of Universities in Northern India. A self-structured questionnaire will be administered for the Gunas and Emotional Intelligence on the basis of Guna-Traya Inventory by Das and Chanda, 2017, and Guna Questionnaire by Pathak, Bhatt and Sharma. For Emotional Intelligence-Inventory, EII-MM by Mangal and Mangal would be referred.

### **73. Conscious Leadership: Apply the Global Neuronal Workspace Model of Consciousness to Help Leaders Thrive in Uncertain, Complex and Exponential Futures**

Tyler Mongan, Haku.global

Old leadership models are no longer working. Leaders need new paradigms, mindsets, and heart-states to thrive in uncertain, complex, and exponential futures. Scientific research shows that at higher levels of consciousness the brain has more connectivity, complexity, information flow, and uncertainty. These higher levels of consciousness help us to understand the challenges and solutions of the current decision-making environment. By first establishing a context of brain and heart coherence, leaders can inspire and influence high level of self-awareness, emotional intelligence, collaboration and trust within their own physiology. Within a coherent context, leaders can apply the Global Neuronal Workspace (GNW) model of consciousness to limit the reliance on PAST information, upload clearly stated VALUES to enhance decision making, engage in AWARENESS practices to FOCUS in on what is important, optimize their PRESENT PERCEPTION, and envision more coherent and rich FUTURE ACTIONS. Further, the GNW model provides leaders with new frameworks and tools for increasing team collaboration, discovering actionable innovations, and building a future intelligent organization.

### **74. Future Possibilities in Animal Consciousness: Evolution, Devolution or a State of Constancy**

Pranay Bhatnagar, Dayalbagh Educational Institute, Agra

[with Deeksha Yadav, Dayalbagh Educational Institute, Agra]

The concept of consciousness is multifaceted and has been a recurrent theme of discussion for researchers and philosophers worldwide. Consciousness is the essence of every organism but is present in varying degrees and that is what accounts for the superiority of one species or even an individual over another. The paper evaluates the different levels of consciousness with a view to establish the following argument:

Does consciousness, like every other attribute of an organism, evolve or decline or remain stable?

The prime argument of the paper is that consciousness substantially relates to perception and memory which are controlled by certain parts of brain which are amygdala, hippocampus and prefrontal cortex. Thus consciousness can be considered as an attribute of brain and so with the evolution of these parts there are chances of evolution of consciousness. The next argument in the paper is that the present advanced consciousness of humans can evolve into cosmic consciousness through spiritual exercises.

The paper also asserts that as long as the organism thrives in its present niche and has reached its threshold, its level of consciousness will remain stable.

The study further uses Dollo's law of irreversibility to prove that there are no possibilities of devolution of animal consciousness.

The concluding segment of the study establishes that transcendence of consciousness is a slow and gradual process and depends on various factors including the individual's personal memories and experiences. The study is open to further research where we intend to explore the deeper aspects responsible for the evolution of consciousness.

Keywords: Animal consciousness, evolution, devolution, state of constancy, cosmic consciousness

### **75. Are Action Potentials "Integrated" Into Conscious Awareness Via "Ionic Soup"-Movement-Generated Biophotons?**

Barry R Komisaruk, Department of Psychology, Rutgers University, Newark

[with Hiba Rahman, Department of Psychology, Rutgers University, Newark]

The relation between action potentials and conscious awareness (CA) presents a conceptual difficulty: When, during the generation and transmission of the action potential and its resultant effects, all of which are distributed in time, does a neuron generate its "bit" of awareness? Is it possible that this process generates an analog "emergent property" ... perturbation of the ionic milieu surrounding the neurons... "integrating", thereby "simplifying", the activity of the billions of brain neurons, which generates CA? The positional change of the ions moving through the neuronal membranes, in their capacity as charged particles, would thereby generate "biophotons". (Same process: static discharge generating a visible spark). Could CA be the response to the pattern of biophoton output of this process, as if "illuminating" our relevant sensory system activity, coherently structured by the integrative and memory processes of our

cortical neuronal synaptic circuitry (absent in our spinal cord)? Could the “observer” of the biophoton pattern be the brain systems that are NOT active at the moment of the biophoton pattern, but which will respond to it at the next moment, in a continuing sequence? Could the “observer” exist in another dimension, integrating both the biophoton pattern and the inactive brain pattern concurrently?

#### 76. Concept of Superior Man According to Confucianism and its Relevance in Modern Business Environment

Sumiran Satsangi, Soami Nagar Model School, Royal Bank of Scotland  
[with Shipra Satsangi, Dhur Satsangi, Soami Nagar Model School, Royal Bank of Scotland]

Confucius, a moral philosopher and a social reformer, aimed at teaching the practical way of life. He enforced the concept of an Ideal Man ‘Chun Tzu’, which is achievable even by the ordinary man. A Chun Tzu is virtuous and always adheres to the moral law. Six important virtues have been given by Confucius enforcing the concept of Chun-Tzu, these are Jen, Yi, Li, Hsiao, Hsin and Chih. These six virtues form the basis of the character of an Ideal Man; ‘Chun-Tzu’. This research paper introduces the idea of Superior Man and then elaborates the six virtues of Chun-Tzu and its attributes in detail. The research has two aspects:-

- a) A study of correlation has been performed between the leadership competencies required for business success and the virtues of Superior Man; ‘Chun-Tzu’. The purpose of this statistical analysis is to achieve cohesion between the virtues of Chun-Tzu and Leadership Competencies, which are a pre-requisite for business success.
- b) A list of 15 attributes of Superior Man have been derived exclusively for this study, from the Six Virtues as discussed by Confucius. This study has henceforth assessed the relevance and suitability of those attributes of Chun-Tzu in modern business environment.

#### 77. What It Is Like to Be Me – There Is a Hole in Reality

Dorothea Franck, University of Amsterdam (formerly)

I want to investigate an intriguing aspect of our consciousness: the blindness of consciousness for itself. I argue that this is comparable to the blind spot in our visual field. It is difficult to detect because the brain insists to fill in the gap. But consciousness is not inaccessible to itself. Introspection does not lead to vicious circularity, if proper methods are observed.

The „Two-States solution“ of *res extensa* and *res cogitans* is a sloppy philosophical compromise with untenable presuppositions. Even though this view is widely criticized it is still the dominant common sense world view. Not only advanced science but particularly the humanities and the arts are challenged to interfere. Consciousness investigating itself operates with different logics and requires radically different methods than observations in the external space of the object world.

Experiences and reports of introspective research do exist – in fields that are not usually consulted by science. I will present some examples and some methodological consequences for the communication between objective and subjective research. I understand this as preliminaries of a Topology of Inner Space and a philosophy of Radical Subjectivity.

#### 78. Consciousness as a Physical Process Caused by the Organization of Energy in the Brain

Robert Pepperell, Fovolab, Cardiff Metropolitan University

To explain consciousness as a physical process we must acknowledge the role of energy in the brain. Energetic activity is fundamental to all physical processes and causally drives biological behaviour (Heisenberg, 1958; Morowitz, 1979). Recent studies that measured levels of consciousness using indexes of complexity following perturbation of the brain with TMS (Casali et al., 2013; Casarotto et al., 2016) can be interpreted in a way that suggests consciousness is a product of the organization of energetic activity in the brain. The nature of energy itself, though, remains largely mysterious (Feynman, 1963), and we do not fully understand how it contributes to brain function or consciousness (Shulman, 2013). According to the principle I will outline, energy, along with forces and work, can be described as actualized differences of motion and tension (Sherrington, 1940; Deacon, 2013). By observing physical systems, we can infer there is something it is like to undergo actualized difference from the intrinsic perspective of the system (Nagel, 1974). Consciousness occurs, I suggest, because there is something it is like, intrinsically, to undergo a certain organization of actualized differences in the brain.

#### 79. The Complementarity Model of Brain-Consciousness and Its Epistemological Consequences

Harald Walach, Medical University Poznan, Poznan, University Witten-Herdecke, Dept. Psychology, Witten, Change Health Science Institute, Berlin

The complementarity model is a special kind of dual aspect-model of the brain-consciousness relationship. It proposes that consciousness/mind and brain/matter are complementary, and hence irreducible and phenomenologically distinct aspects of reality, and hence that consciousness/mind is as fundamental to reality as matter. Thus an internal, first person perspective of a complex cognitive system is not only a result of neuronal complexity, but also a precondition. This model, first proposed by Spinoza, developed by Leibniz and in modern days again espoused by Pauli and Jung, also has important epistemological consequences. Standard empiricist epistemology operates on the ontological assumption that consciousness is somewhat secondary to material organization and hence only has a secondary function: in measuring from a 3rd person perspective, and in 1st person introspection, registering states of consciousness either as specific states of internal representation of an external world, or of private internal states. The complementarity model, however, leads to an enhanced epistemology: If

consciousness is co-fundamental with matter, then it also allows direct introspective realization of reality. This would be extending introspection to reality as such and perhaps a potential additional access route to knowledge as reported in spiritual traditions or in scientific theoretical insights. It might be the key to understanding the deep structure of reality.

#### **80. A Psychological Approach to the Study of levels of Consciousness in Pre-School Children: An Application of Children's Apperception Test (CAT)**

Sant Pyari Kumar, DEI, Nursery School and Play Centre, Dayalbagh

It has now been well established that the sources of artistic expression lie in the specific regions of the brain and a study of these can help us analyse and understand the process of creativity in an individual. The interaction of specific brain functions creates complex cognitive domains which are reflected in an artist's imagination. Not influenced by the limiting notions of traditions, language, culture or religion, art is a universal means of communication through which an artist lays bare his emotions and thoughts in the non-vocal medium of colour and forms.

Research in psychology has revealed that age is no barrier in studying the evolution of cognitive skills. This study is an attempt to measure and analyse the levels of consciousness in pre-school children, through the Children's Apperception Test (L. Bellak and S.S. Bellak). The CAT is an individually administered projective personality test appropriate for children aged between three to ten years. The application of the CAT is intended to measure the personality traits, attitudes and psychodynamic processes evident even in pre-school children.

The statistical analysis of the results strengthens our belief in the powerful impact of artwork on the human mind and its ability to be a medium to understand the inner states of mind and consciousness.

#### **81. A Study of Higher Consciousness Evolved Through Drama as per the Concepts of 'Catharsis' and 'Karuna Rasa'**

Sonal Singh, Suman Mathur, Dayalbagh Educational Institute

Amongst all art forms, Drama has proven to be one of the most potent sources of awakening higher consciousness in humans. Abstract philosophy of other art forms has often failed to generate any phenomenal impact on human soul in comparison to a serious dramatic performance. We often perceive human values in a more clear light when we observe the ordeals of the protagonists rather than learning from our own personal sufferings. A great dramatic piece clearly projects the law of cause and effect behind human pains and gives hints to a greater divine motive at play. The present paper endeavors to attempt a study of the converging and diverging components of the two concepts.

#### **82. Ejecting No-Win Situation in Game Theory Computational Models: A Many-Worlds Simulation**

Adhar Sharma, Dayalbagh Educational Institute

The formulator of the "Shapely-Shubik Power Index" - Martin Shubik was also known to design the best No-Win Situations. The Many-Worlds Interpretation of the quantum theory leads to the possibility of introducing universes parallel to the quantum states into the game. By bringing quantum mechanics into game theory, research shows that players using quantum resources would far supersede any classical player and thus revolutionizing the current game theory applications.

#### **83. Consciousness as the Cosmic Ordering Principle and the Interplay of Order and Disorder in the Physical and Biological Systems**

Asima Tripathy, Rajat Kumar Pradhan, Dayalbagh Educational Institute

We investigate and discuss the role of the opposing principles of Order and Disorder in Physical and Biological systems in ensuring stability, growth and evolution and to bring forth the potential role of the cosmic mind as a universal ordering agency. We analyze its role in decreasing entropy by coarse-graining and hence in determining the initial low entropy state of the big bang universe.

#### **84. From Superintelligence To Superconsciousness [Paths, Dangers & Strategies]**

Sapna Agarwal, Tamanna Agarwal, Dayalbagh Educational Institute

We propose a novel methodology to understand the mechanism behind how machine consciousness has evolved from human consciousness, and further the path involved in the development of super-intelligence, which as per the closed loop system is under control of strategic Super-consciousness.

#### **85. Low Cost Live Streaming Virtual Reality 360 Degree Stereoscopic 3D Real-Time Surveillance System**

Utsav Kapoor, Muskaan Kapoor, Dayalbagh Educational Institute

This paper deals with the indigenous surveillance system using two raspberry pi, arduino and servo motors which work on the principle of virtual reality (VR). Moreover, VR incorporates features like 360 degree motion of the camera and real time access to the video. This paper explores the abilities of low cost single on board computer raspberry pi. This new technology is less expensive and in this project it is used as a standalone platform for image processing. It also increases the usage of mobile technology to provide essential security to our homes and for other control applications.



#### 86. Low Cost Healthcare Model by Integrated System of Medicine akin to Integration of East and West

Siddharth Agarwal, Sapna Agarwal, Dayalbagh Educational Institute

This study is an observational trial, where Integrated System of Medicine and an expert experiential system have been used, in various health related states. The ultimate goal is to achieve cure or palliation as the condition is. The Integrated model of healthcare provided in this trial is akin to the Integration of science and wisdom of East and West. The outcome data consistently shows reduced morbidity although the mortality remains unchanged. Interestingly some confounding factors have been encountered, which have changed the path like social service, community participation, mass prayers and recitation of holy name.

#### 87. Workplace Spirituality – Socially Responsible Employees: A Road Towards Sustainability of Existence

Guru Mehar Tatavarty, Guru Aarat Tatavarty, Dayalbagh Educational Institute

This paper gives an insight into the evolution of the concept of spirituality and its application at the workplace and attempts to discuss the future journey of optimistic transformation with spirituality at the workplace through various theories, seminal papers and use cases. The paper discusses and evaluates various researches which have proved association of persons and corporates with more spiritual inclination having achieved more in the field of corporate social responsibility and employee satisfaction.

#### 88. Consciousness and Experiences of Struggle and Suffering of Human Form due to Its Past Thoughts, Words, Deeds and Desires

Kanta Arora, Dayalbagh Educational Institute

According to Eastern thought Consciousness is that potency, from which all things are born, and after being born they live, and into which they merge when they cease to be. Human Form is chained with magic power of cosmic energy for its every action and reaction. The paper explores co-relation between the birth, existence and death of individual with his actions and reactions which arise from past thoughts, words, deeds and desires.

#### 89. Rajaborari: “The Forest of the Merciful”– A True Example of a Modern Eco Village

Utsav Kapoor, Muskaan Kapoor, Dayalbagh Educational Institute

Rajaborari is a true example of modern eco village which is living the Sigma Six Q way of life. It is not only preserving natural resources but also uplifting local community and serving humanity. Globally, there are divergent views, opinions and strategies for Development of Tribal and Forest areas. Should the Tribals be left undisturbed or should they be assimilated in the national mainstream? What should be the nature, direction, scope and speed of development, etc.? According to Most Revered Prof. Prem Saran Satsangi, tribals should get opportunities to attain peaks of progress where a peak of progress would imply highest spiritual progress.

#### 90. East Meets West: The “God Concept” Provides a Bridge

Nancy Woolf, Dayalbagh Educational Institute

The human experience of God is arguably the highest level of consciousness, the ultimate abstraction. Major differences exist between Eastern and Western philosophy regarding consciousness. We greatly benefit by considering both perspectives to fully explain our ability to imagine God. In Western thought, human consciousness is a product of brain activity. Whether viewed as an exotic emergent phenomenon or a quantum computation arising out of classical computing, conscious awareness is a derivative of brain activity: a bottom-up process. In Eastern philosophy, consciousness exists not only outside the human brain, it is a fundamental property transcending all living and non-living things. It is a top-down force in the brain that likely reflects a similar force present throughout the universe.

#### 91. Absolute Values, Quality and STEM Education Through Robotics

Utsav Kapoor, Muskaan Kapoor, Dayalbagh Educational Institute

This STEM (Science, Technology, Engineering and Mathematics) education is the new era of teaching. Robotics provides teachers with an opportunity to reimagine what learning could look like. It provides a context for inquiry and discovery, leading students to become active problem solvers and to engage in their own learning. A robotics curriculum introduces students to knowledge, concepts, and skills that are needed for understanding the intelligent information-based technology of the future.

#### 92. Achieving Higher Levels of Quality Teaching Through Integrating Virtual Reality Systems in the Classroom

Utsav Kapoor, Muskaan Kapoor, Dayalbagh Educational Institute

We have constructed a cheap Virtual Reality kit which can be implemented in classrooms. This includes an android or iOS application which supports virtual reality



and a HMD (head mounted display) and a remote which would be used to interact with the virtual environment, and would give almost the same experience as if the student is inside the virtual environment. Therefore, virtual reality learning is an ideal way of engaging these students with a particular subject in a manner they are comfortable with.

### **93. IOT Based Smart Remote Surveillance and Automation of Real-Time Connected Devices over the Cloud (An Embedded System Approach)**

Utsav Kapoor, Muskaan Kapoor, Dayalbagh Educational Institute

This poster presents the potential of 'IOT based Smart Automation Systems', which is the aim of the Smart Systems in the near future. The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

### **94. Consciousness and Experience of Loneliness, Solitude & Tendency to Suicide in Individual Human Form**

Kanta Arora, Dayalbagh Educational Institute

Human experience of Loneliness implies the pain of being alone and solitude glorifies the bliss of being alone. Tendency to suicide is the act of intentionally causing one's own death. The paper explores and brings out a reconciliatory state of mind and levels of consciousness in these conditions experienced by human form reflected in works of spiritual leaders, poets and philosophers of East and West and Law of Focus.

### **95. Enhancing Three Dimensional Social Consciousness – A Case of Neem Schools**

Anjali Nigam, Dayalbagh Educational Institute

The paper is based on the effort of last eight years towards enhancing social consciousness by injecting value gene in 3-15 year old children living in slums, through value education to keep them away from juvenile crime. This has resulted in enhancing three dimensional social consciousness, fulfilling the ethos of 'Fatherhood of God and Brotherhood of Man.

### **96. Beyond the Field of Vision of Our Two Eyes. The intuitive Consciousness of the Third Eye**

Anjoo Bhatnagar, Phool Chand Bhatnagar, Saran Parshad Srivastava, Dayalbagh Educational Institute

This study is about comparison of first person joyful experience of getting the sight back after operation vs. blissful experience of opening of third eye with intuitive vision. We have also compared expanse of cosmos as seen with physical eyes and evidenced by western scientists i.e microcosm vs. the intuitive vision of third eye i.e Brahmand and Pure Spiritual Region i.e Macrocosm, as revealed by Eastern Saints and how it matches with the unfolding knowledge of present times. The paper concludes that the cosmology of Radhasoami Faith on one hand is consistent with all extant religions in the world, and on the other hand is also consistent with modern science.

### **97. Our Quest for Soteriology**

Chhavi Gupta and Gopi Chand Gupta, Dayalbagh Educational Institute

Salvation is the concept that God, as part of Divine Providence, saves humanity from spiritual death or eternal damnation by providing for it an eternal life. All religions seem to agree that the spirit-entity is endowed with bliss, intelligence and energy. Saints, as well, have clearly stated that it is possible to conceive conditions of enrapturing imagery, of penetrating and refulgent intelligence, of intensely charming music, of glorious beauty, and of the exquisite joys of other senses, which may produce an extreme state of ecstasy in individual cases.

### **98. A Study into the Intuition, Meta Cognition and Competencies & Skills Development in Learners from a Systems Perspective**

Shalini Nigam, Neha Sinha Mehta, Dayalbagh Educational Institute

This study attempts to unravel the process of competencies development in learners through meta cognition and intuition from a systems perspective. It also tries to establish a relationship between intuition and meta cognition. An experimental study on the students of Dayalbagh Educational Institute is being conducted to better understand the process of metacognitive intuition that help the quick and optimal development of competencies in learners and eventually aid skill development. This study also explores a direct relationship between intuitive faculties and competencies development.

**99. A Study of the Increase in Innovation through Meditation, Intuitive Consciousness and Meta Cognition from the Management Perspective.**

Neha Sinha Mehta, Shalini Nigam, Nandita Satsangee, Dayalbagh Educational Institute

A study of entrepreneurs and higher management personnel in industry is being conducted to gauge changes in their innovation and decision making capacities when meditation, intuitive consciousness and meta cognition were present. A comparison is also being attempted to measure their innovative capabilities with and without intuitive consciousness.

**100. From Mindlessness to Mindfulness – A Journey from Meaningless, Mechanized Existence to One of Complete Bliss**

Satya Srivastava, Ankur Ashok, Shubham Ashok, Ashima Srivastava, Dayalbagh Educational Institute

The journey from mindlessness to mindfulness consists of six milestones. Starting from worldly mindlessness, witnessed in today's always-busy, hyper-connected world where we often go into autopilot mode, it ends at spiritual mindfulness – stage of supreme bliss while experiencing the Ultimate Reality. Achieving the Summum Bonum of life requires performance of Surat Shabd Yog of the Saints while passing intermediary milestones. The spirit thereafter, continues its journey alone into the region of pure spirit - achieves salvation, with blessings of the adept.

**101. Western Scientific Techniques Applied to Study Eastern Meditation Practices in Dayalbagh Community**

Mukti Sahni, Dayalbagh Educational Institute

The tools and concepts used in Dayalbagh community combine neuroscience and theological practices for scientific study, and are among the most modern ones available in the Western world, such as 15-channel SQUID (Superconducting Quantum Interference Devices)-based Magneto-encephalogram (MEG) installed in Magnetically Shielded Room, as well as measures for social issues like Corporate Social Responsibility (CSR), a term coined by Harvard management gurus. We can observe the effect on the environment which can be measured without even being privy to these ultra-transcendental meditational practices and this is the direction in which we are trying to measure Corporate Social Responsibility for group of people who practise this and others as control group who do not practise this. Luckily at Dayalbagh, we have a confluence of people with the latest scientific techniques as well as people who are armed with this inner force of reality.

**102. Being Consciously Economical to Attain Contentment**

Shabad Preet, Prem Bhalla, Pooja Satsangi, Dayalbagh Educational Institute

Educating the next generation about nature's sustainable strategies of reusing and recycling resources would certainly sensitize them about their role as global citizens towards optimum use of resources. The present study deals with the survey conducted on individuals based on the core value of "Waste Nothing" which concluded that practising economy in day to day life not only culminates in contentment but leads to prosperity.

**103. Consumer's Conscious Preferences towards Unethically Marketed Products**

Sneha Bhalla, Sumeera Bhalla, Dayalbagh Educational Institute

Food choice and food consumer behaviour is affected by a large number of factors. Consumer way of life and health are relevant factors to understand consumption preferences. Last few decades have witnessed a dramatic increase in the number of so-called civilization diseases like cardiovascular diseases, high blood pressure and diabetes. Researches link this with the change in way of life including rising stress in a fast paced world and lack of attention to physical activity and good nutrition. A survey was conducted to explore food preferences towards unethically marketed products on consumers aged between 15-25 years in wake of changing food and eating habits, thus enhancing their consciousness in making healthy choices.

**104. A Journey into the Heart of the Soul**

Hans Raj Kandikonda, Maharaj Kumari Kandikonda, Dayalbagh Educational Institute

An integrated approach is essential for understanding the field of consciousness. On one side efforts should continue to understand the Brain-Mind-Consciousness interactions using Quantum Models, experimental investigation of Brain using EEG, MRI, MEG, fMRI etc., and on the other side efforts should be made to practically realize consciousness through meditation (Surat Shabd Yoga). Only then the complete picture will emerge. In this paper initially a brief review of effect of various types of meditation on human body, human mind and human perception of reality are attempted, and subsequently an experimental investigation is conducted to understand effect of a simple meditation technique using a mystical name on physique, mind and perception using modern scientific tools including MEG and first person experiences.

**105. Nurturing Consciousness from Foundation: The First Three Years from Birth**  
Sona Ahuja, Dayalbagh Educational Institute

In the Supermen evolutionary scheme at Dayalbagh, Agra, toddlers from age range of three months to three years get exposure to environment conducive to overall development including development of physical, mental, emotional, self, social and spiritual consciousness. The present study aims to examine the effect of Superman scheme on the different dimensions of consciousness. The results also underline the development patterns of the children enrolled in this scheme.

**106. Plant Consciousness: Integration of Eastern and Western Perspectives**  
Swami Sharan, Dayalbagh Educational Institute

Scientist community is at last willing to look into the fascinating evidence showing plant really are highly conscious, intelligent and yes, they do have a brain. Since ages, the eastern philosophy propounds that consciousness manifests in many forms. Everything around including plants and animals has been regarded as pervaded by a subtle divine presence as Prana/Shakti energy, power, in every electron, particle, atom, cell and in every manifestation of matter.

**107. Worldly Possessions and Spiritual Consciousness**  
Mahima Mathur, Sanjeev Swami, Saurabh Mathur, Dayalbagh Educational Institute

The discipline and the rigor of training your mind and body is well understood and appreciated in consciousness studies. In a way there is also a realisation that most worldly possessions lead to some sort of abuse on the body as they seem to be inorganic and hence do not find resonance with the human body. Can it then be inferred that human beings with less worldly possessions have high level of spiritual consciousness? Is a minimum level of possessions essential to gain satisfaction and attain higher spiritual consciousness? This paper attempts to understand the relatedness of worldly possessions and spiritual consciousness. We propose to conduct empirical research to fulfil the objective of this exploratory study.

**108. Modeling Risk Consciousness of Entrepreneurs during Business Failures: A System Dynamics Approach**  
Santi Swarup Kandikonda, Mukti Sri-Narain, Karan Narain, Dayalbagh Educational Institute

We have studied the entrepreneurial consciousness towards possible business failures. We have identified variables which affect their decision of business continuation, despite the threat of their survival. The initial set of variables were identified using focused group discussion with the experts and primary data was collected using semi-structured interviews of 30 entrepreneurs. Using system dynamics model the cause and effect relationships were identified and the same were triangulated using both primary and secondary data. The study highlights the importance of enhancing risk consciousness for loss mitigation in business failures.

**109. Information, Perception and Quantum Objectivation: The Potential of Human Consciousness**  
Asima Tripathy, Rajat Kumar Pradhan, Dayalbagh Educational Institute

The universe is a system of physical information that is perceived by conscious observers as a plurality of mutually interacting things and beings. Perception itself involves such interaction of the observer with the observed. The perception is in terms of qualia which cannot be categorized as physical information and hence must be regarded as a separate class of information that is indispensable for perception. Source-Field duality of physics provides the clue for ascribing the mind a creative role in perception. Objectivation is the process of creation of objective reality by the conscious subject with the help of its perceptual apparatus of the mind.

**110. Decoding Mandala Architecture – A Universal Constant yet an Integral Part of a Personal Vision Quest**  
Nirakh Parmar, Mehar Parmar, Renu Singh Parmar, Dayalbagh Educational Institute

This study presents the significance of the mandalas based on the aspects like symbolism, fractals, numerology and sacred geometry that are used as codes to reveal the mystery of the universe and the eternal laws that govern the order of the universe. It starts from a point – as the cosmic centre that expands infinitely to merge into the cosmos. The point or bindu encircled by concentric circles suggests the concept of expansion, enrichment and unfolding of radiance of positive energies, to ultimately merge in the enveloping cosmic force.

**111. Super-Intelligent Machines : Super-Sentients Or Digital Zombies?****[A Comparison With Human Qualia And Consciousness]**

Mehar Parmar, Nirakh Parmar, Renu Singh Parmar, Dayalbagh Educational Institute

Machine Intelligence Research Institute (MIRI) envisages a combination of Moore's law and the advent of recursively self-improving software-based minds culminating in an ultra-rapid Intelligence Explosion. The upshot of the Intelligence Explosion will be an era of non-biological super-intelligence. Whereas raw processing power in humans evolves only slowly via natural selection over many thousands or millions of years, hypothetical software-based minds will be able rapidly to copy, edit and debug themselves ever more effectively and speedily in a positive feedback loop of intelligence self-amplification

**112. Formant Analysis of the Fundamental Word of Creation as per the Religion of Saints**

Prakash Sahni, Shabd Sahni, Dayalbagh Educational Institute

The Discourses on Radhasoami Faith analyzes the fundamental word of creation "Radhasoami" in articles 67 and 70. This is done in a qualitative manner, with Ra being the tremor, Dha being the strike, Soa being the ellipsoid and Mi being the inward closing and convergent action. In this research, we mathematically analyse 'the Word' and relate it to the process of creation. Formants have been used to do a mathematical analysis of speech. There are peaks in the amplitude of the frequency spectrum.

**113. Despite of Space: Digital Immortality and the Necessary Limitations of Embodiment**

Stephen Burwood, University of Hull

One of the promises of many trans-humanist narratives is that post-singularity we will be able to free ourselves from the restrictions of bodily existence as a biological organism. This may take many forms but perhaps one of the most radical is the suggestion that we can exist as purely digital beings. Whole brain emulation presents us with the prospect of mind uploading our consciousness, replacing our biological embodiment with an in silico incarnation and substrate for our conscious minds, thus offering a digital life of unbounded possibilities, freeing us from aging and bodily incapacities and liberating us from the constraints of our biological embodiment. Shorn of such constraints, our uploaded, digital selves would be free to explore a virtual environment, itself not internally bound by the familiar laws of physics. Despite this promise, the imagined experience our digital selves have of our new, virtual world are often surprisingly conservative: largely or exactly like ours. However, this ignores how our experiences are shaped by our bodily engagement with our world. Either the digital afterlife will be radically unlike ours, in ways unforeseeable, or our digital selves will require digital avatars, themselves requiring limitations equivalent to those provided by our biological embodiment.

**114. When Does a Subliminal Masking Procedure Really Mask?**

Nicolas Vermeulen, Université catholique de Louvain, Université Grenoble-Alpes [with Anne Kever, Martial Mermillod, Gordy Pleyers, Université catholique de Louvain, Université Grenoble-Alpes]

Since the work by Marcel (1983), it is well accepted that target words hidden between two letters (XXXXXX) or symbols (#####) masks with a short stimulus onset asynchrony (SOA) will typically not access awareness. .

So it is widely accepted that when SOA are shorter than 30ms, this procedure will result in a masked, so-called subliminal, word presentation. Importantly, although this masking procedure is taken for granted in cognitive, social and emotion psychology, a few studies examined precisely the efficiency of the mask. In a series of experiments, we tried to replicate a widely quoted experiment in which participants had to decide whether a word (50%) or no word (50%) was present. Firstly using the same method as the original one (XXXXXX sandwich masking), we found that identification rates were very high (accuracy > 80%) for masked targets presented during 16ms (60Hz). Secondly, after modifying one (X#XXXXX), three (X#X#X#X) or all (#@&%\$\*=) parts of the post-mask (compared to the XXXXXXXX pre-mask), we found that accuracy rates drop linearly up to chance level. Since most of the published papers used a similar pre-post mask, we discuss the results by questioning the genuine "subliminality" of word exposure with these methods.

### 115. Manipulating Consciousness: False Memory Susceptibility after Mindfulness Exposure

Larry D. Fort, Towson University

This poster will review two studies. In the first study, participants were randomly assigned to control (lecture) and experimental (breathing based mindfulness) groups. Both received 15-minute audio of their condition before and after recall/recognition procedures operating out of the DRM paradigm. Data supports the notion of mindfulness leading to less reliance on verbatim traces of memory via a significant decrease in correct information recognition after the experimental condition. The second study utilized the same design with a new control condition in mind wandering mindfulness, while analyzing cognitive error proneness and trait mind wandering in participants. Implications will be discussed.

### 116. Giving Illusionism a Run for Its Money

Emmett Holman, George Mason University (emeritus)

Lately, many physicalists about consciousness have been touting a view known as ‘illusionism’. Illusionism gives up on the attempt to show that phenomenal properties are physical. Instead, it proposes that conscious experiences of phenomenal properties are illusory; so phenomenal properties are not instantiated. I argue that in order for this to work, conscious experiences must be construed as purely introspective intentional states that are sui generis; hence not reducible to belief or any other commonly acknowledged intentional state. Furthermore, the intentional states in question should be construed as outputs of modular mechanisms which are unaffected by background beliefs or other higher cognitive functions. Finally, these intentional states must carry epistemic weight; and so confer evidence on the (false) belief that conscious experience involves instantiated phenomenal properties. If this can be worked out, it can lessen the impact of some of the criticisms that have been leveled against illusionism. I think these moves show some promise, but they are no sure thing; and even if they do succeed there are still some loose ends left. So I see it as an open question whether or not illusionism can succeed.

### 117. The Inner Voice

Lokesh Khurana, Dayalbagh Educational Institute, Agra

Daniel Kahneman, in his 2011 bestseller, *Thinking Fast and Slow* introduced two distinct modes of cognition: System 1 - all about gut instinct and System 2 - characterised by analysis and reflection. Gut feeling or an inner voice or a sixth sense or intuition plays a real part in individual's decision making process.

Recent studies reveal that intuition does exist and can be measured. It's an ability to understand something instinctively, without the need for conscious reasoning. The paper studies the information involved in intuition. The nonconscious emotional information

that holds some value or extra evidence beyond what is already there in the conscious mind.

### 118. The Ghost is Alive: How Physics and Neuroscience Support the Idea of Interacting Souls

Alin Christoph Cucu, International Academy of Philosophy (IAP) in the Principality of Liechtenstein

My starting point in this paper is the objection from energy conservation against the existence of immaterial souls (i.e. dualism) (e.g. Dennett 1991, 34-35; McGinn 2000, 92; Searle 2004, 42; Westphal 2016, 41-44). I first show that the principle of energy conservation (PEC) cannot be used as an a priori argument against souls, because according to modern physics, energy conservation holds only conditionally (Noether 1918; Goldstein 1980; Pitts 2018). Thus, a neuroscientifically informed investigation of whether or not energy is in fact conserved in brains (or not) is in order. I argue that, on consideration of the neuroscientific data, it is more likely than not that energy conservation fails in brains at the initiation of volitional movements. While dualism can handle that very well – in fact, it is what at least one version of dualism predicts (Plantinga 2007) – purely physical(ist) explanations to salvage energy conservation seem implausible. I finally argue that even in energy-conserving brains, dualism would be a viable option, because the soul-brain-interaction could be of a quantum-mechanical and thus energy-conserving nature (Beck and Eccles 1992; Collins 2008; Halvorson 2011; Schwartz, Stapp, and Beauregard 2005; Stapp 2007, 2011, 2017).

### 119. The Scientific Explanation of Consciousness

Thomas Görnitz, Fachbereich Physik, Goethe-Universität Frankfurt/Main

The exploration of consciousness and its neural basis includes matter, energy and information. These entities are usually understood as being completely different from each other. However, in analogy to how the theory of relativity established the equivalence of matter and energy, the basic structure of quantum theory allows the surprising conclusion that matter and energy are equivalent to absolute quantum information. Accordingly, quantum structures of material and energetic particles can be constructed mathematically from quantum bits.

It is only in the evolution of life that information can acquire meaning. Meaning arises when information becomes significant for living beings through stabilizing interactions. Finally, the “uniware” of matter, energy and information enables the development of consciousness being a form of quantum information, which is carried by real and virtual photons in a living brain and which can experience and know itself.

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### 120. A Pansychic Universe? Plant, Animal, and Human Consciousness in Julio Llamazares' Novel "Wolf Moon"

Olga Colbert, Southern Methodist University

"Wolf Moon," the 1985 novel by Spanish author Julio Llamazares, presents a pansychic universe in which humans, plants, and non-human animals live in a highly integrated ecosystem. The novel delineates two seemingly opposite processes: the "humanization of nature," resulting in highly conscious plants and animals and the inverse dehumanization of the novel's human characters. The story follows the survival of four Republican soldiers during and after the Spanish Civil War (1936-1939) in the cold mountains of Northern Spain. I draw from the emerging field of plant cognition, particularly Monica Gagliano's and Peter Wohlleben's work, as well as Giulio Tononi's Integrated Information Theory to analyze the role of plants in the novel. The work of Franz de Waal, Brian Hare, Diana Reiss, or Temple Grandin provide the scientific framework to analyze animal cognition. The guerrilla fighters are trapped in a present without a future in which the memories of an experience-rich past are a threat to their struggle to survive another day. Despite being a first-person narrative, there is precious little qualia. Overall, one could argue that "Wolf Moon" presents a pansychic universe, a world in which consciousness may be a fundamental property of reality, as articulated in David Chalmers' work.

### 121. Consciousness and the Self: Where is the Illusion, if Any?

Anand Jayprakash Vaidya, San Jose State University

Panpsychism, the view that consciousness is everywhere, offers an alternative to Promissory Physicalism, the view that physicalism will eventually provide a complete picture of consciousness. However, two of the most promising versions of panpsychism face substantial challenges. Strawson's Micropsychism faces the combination problem, since it assumes that macro-conscious states are built up out of micro-conscious states. Goff's Cosmopsychism faces the decombination problem, since it assumes macro-conscious states are grounded in universal consciousness. Using debates from the Vedantic tradition of Indian philosophy, I juxtapose the question of the reality of subjects as a counterpoint to analytic explorations of panpsychism. I argue that a new debate between Keith Frankish's Illusionism, three traditions of Vedanta, and Analytic Panpsychism is profitable because the debate takes us to a combinatorial question about human subjectivity in the exploration of consciousness. The core question is: what is the illusion, if any, in conscious human experience? Is the illusion phenomenal consciousness, subjectivity (the ownership and aboutness of experience), or both? I explore three positions deriving from classical and contemporary Vedanta. The first is from Adi Sankara's Advaita Vedanta. Another is from Ramanuja, an 11th century Vedantic philosopher who generated a view known as qualified non-dualism in contrast to Sankara. The third position is from Sri Ramakrishna, the 19th century Bengali mystic. I show how these positions can come into contact with contemporary analytic panpsychism.

### 122. Qualia are Physical Qualities

Brent Allsop, Canonizer.com

We know what our redness quale is like. We predict that qualia are physical things. Objective observation is different from these qualia, and by nature, abstract. The word red isn't red, and needs to be interpreted back to a set of physics to know what red represents. The name of the neurotransmitter glutamate, along with descriptions of how it behaves in a synapse, is also abstract. Abstract descriptions of something like how glutamate behaves in a synapse may be descriptions of, and possibly be interpreted as a physical redness quality or quale. In other words, until we know how to link our abstract information to the right set of physical qualities, physical qualities we can know, directly, we will remain qualia blind. Only after Mary first experiences redness could she link all her abstract descriptions of red back to what redness feels like, or back to its physical properties. If experimentalists could verify this, as predicted, avoiding qualia blindness, and discovering which set of physics is redness that we are directly aware of, this will enable us to bridge Joseph Levine's explanatory gap. We could then objectively eff the ineffable with statements like "My redness is like your greenness".

### 123. Do Fish Have Explicit Memory?

Tadeu Mello e Souza, Universidade Federal do Rio Grande do Sul

Explicit memory (EM) is the conscious recollection of any information or experience. The very nature of consciousness, whether it is a fundamental or emergent property of cognitive systems, is still under debate. Therefore, EM is still a private experience that can not be confirmed objectively. Here we list pros and cons of the hypothesis that there is fish EM accepting the view that a recurrent, hierarchical arrangement of cognitive systems is necessary for consciousness emergence, allowing information to be maintained and then processed using a memory trace. The minimal structure may reside in the cortex or brain stem alone or both. Fish have small telencephalon, but primary consciousness might not need cortical function. Goldfish learns trace conditioning, which in humans correlates with content awareness but may occur under the vegetative state, indicating that a memory trace may not imply the existence of consciousness. Fish may also have spatial allocentric and relational memory, where multiple stimuli must be related in space or time to allow proper behavior. Can all this be nonconscious? Certainly, EM is richer in conscious content in humans than in fish, but what kind of experience can a fish have in relation to feelings and object recognition?

#### 124. Self-Consciousness, Environmental Consciousness, and the Philosophy of Primary Education

Sunita Kumari, Dayalbagh Educational Institute, Agra

(with Shruti Dutt, Dayalbagh Educational Institute, Agra, Prem Malhotra, Anand Engineering College, SGI Group, Agra)

Human interaction with the environment exists since the existence of humanity and it is increasing rapidly with the rise in human population. Both direct and indirect human interference with the environment affect all the creatures which exist in the environment. Moreover, rapid industrialization, technological advancement and human induced climate change has caused depletion of natural resources, global warming thereby resulting in environmental crisis. This environmental crisis has made the concept of environmental consciousness increasingly important. Environmental consciousness is a form of behavior, thought and attitude of an individual and community to maintain a balanced way of interaction with the environment. The basic purpose of this consciousness of the people is to get benefit from environment without any damage to the environment. Several studies related to environmental awareness education has been carried out in recent years. Much of this work has been carried out on determining the awareness of youngsters regarding environmental consciousness (Oğuz et al) but not much work is done in mapping self consciousness with environmental consciousness. The present study aimed to determine the environmental awareness and level of self consciousness of 100 primary level students. This paper draws comparison between the students in an education system where curriculum objectives emphasized on value education and vice-versa. The study sample was drawn randomly from four primary level schools, two which provide value based education and two that do not emphasize on value based education. Respondents were asked to fill the questionnaire, a total of 35 questions were asked to the students regarding their self-consciousness and the conscious use of natural resources, energy saving, and recycling, reuse and waste management. A sample was given a further set of questions on lifestyle patterns with an environmental bearing. Research findings revealed that the students, having a high level of self-consciousness also have high level of environmental consciousness including awareness for sustainable environment, use of natural resources, energy saving, recycling and reuse were part of education system emphasizing on value based curriculum. The students from other type of schools showed low level of consciousness and awareness towards the environment. Keywords: Environmental consciousness, curriculum, interaction, education, self consciousness

#### 125. A Galileo Moment

David Lorimer, Scientific and Medical Network

The Scientific and Medical Network published the Galileo Commission Report by Prof Dr Harald Walach in autumn of 2018. The Report builds on earlier work relating to the

metaphysical foundations of modern science and seeks to open up issues arising from the commitment of many academics to the presuppositions of scientism or scientific materialism with its postulate that the brain gives rise to consciousness. The Report highlights the scientific evidence supporting a wider approach first highlighted by FCS Schiller, William James and Henri Bergson 120 years ago - that aspects of the mind may be nonlocal and that a more constructive metaphor for the brain may be that of a transducer. In response to this evidence, some thinkers advocate idealism while others propose a dual aspect theory of mind and matter arising from a deeper 'implicate' level. The poster will present the schematic outline and argument of the Report, and copies of the summary booklet will be available to delegates.

#### 126. Insights from a First-Person Perspective of Bistable Perception

Peter Model, University of Fribourg (formerly)

My initial submission for this TSC conference, "Prerequisites for Consciousness", was accorded 6 points. This second submission offers a different theme. The groundwork for it is summarized in a short video titled: "What Can Matter Be?", created for my presentation at the 2017 Electric Universe conference: [https://www.youtube.com/watch?time\\_continue=21&v=mYtXSVOV60w](https://www.youtube.com/watch?time_continue=21&v=mYtXSVOV60w)

#### 127. Consciousness as a Concrete Physical Phenomenon

Jussi Jylkkä, Abo Akademi University

(with Henry Railo, University of Turku)

Why any type of neural activation is associated with consciousness is a fundamental unsolved question in neuroscience. To bridge the gap between neural activity and consciousness, one seemingly must tie together two very different entities. In this paper we present a metatheory of consciousness that we call Naturalistic Monism (NM), which lays foundations for empirical theories of consciousness. NM consists of the ontological component that consciousness is a concrete physical phenomenon in the world, and the epistemological component that scientific representations are always distinct from the concrete phenomena they model, whereas an experiencer is not distinct from her experiences. According to NM, consciousness is the concrete physical phenomenon in the world that we scientifically model as "the constitutive mechanism of consciousness" (CMC), and that the happening of the CMC in a subject S constitutes its what-it-is-likeness for S. Thus, science can empirically model the phenomenology of consciousness, how it is based on lower-level mechanisms, and how it causally interacts with other phenomena. Our framework clarifies what it is that empirical scientific theories of consciousness should aim to explain, and collapses the "hard problem" into a standard problem of science.

**128. Evidence of Quantum Consciousness in Evoked Zero-Spin Echoes**

Christian Kerskens, Trinity College Institute Neuroscience, Trinity College Dublin  
[with David Lopez, Trinity College Institute Neuroscience, Trinity College Dublin,  
Faculty of Psychology, University of Warsaw, Warsaw]

That consciousness could have its basis in quantum computing has been speculated for many years. Unfortunately, unitary quantum gates, the main ingredient of quantum computing, are not compatible with irreversible biological systems which are effectively non-unitary. This is in line with experiments which so far haven't connected consciousness to quantum computing. Here, we used magnetic resonance imaging (MRI) to study long-range quantum coherence in the human brain. We were surprised to find that the cardiac pressure pulse evoked zerospin echoes (ZSEs) in brain parenchyma. The ZSE signals, which are thought to be generated by long-range intermolecular zero-quantum coherence (iZQC), were much higher than expected. In contrast, single quantum coherence (SQC) imaging, which is also indirectly related to iZQC, was not affected. These findings suggest that we observed a nonclassical effect originated from a small subdomain of the parenchyma. This evoked quantum effect was directly connected to consciousness as only sporadic ZSE signals were detected during sleep while a loss of the evoked quantum effect would probably always result in unconsciousness because the cardiac pressure pulse is necessary for consciousness. Our findings are unexpected but in line with recent biological research.

**129. How Consciousness is Related to Energy: a Perspective of Taoism and Confucianism**

Zhenbao Jin, Beijing Sanhe Meditation Center

When people talk about consciousness, they rarely talk about energy, as if consciousness exists independently from the state of energy of a human being, and perhaps also from his physical state. People often talk about mind-body, and very rarely they talk about mind-energy-body. However, according to the old Chinese tradition of Taoism and Confucianism, consciousness does not exist and evolve as an independent element. Rather, it's deeply imbedded in its dynamic relationship with the physical and energy (Qi) dimensions of life, and evolves together with them. Accordingly, Taoism and Confucianism by their essence are not religion, but a philosophy of consciousness and life with strong practical application. While Taoism focus more on the energy dimension, Confucianism focus more on the consciousness dimension.

This author was a law academic and a lawyer in China. Due to his health problems he started to practice meditation more inspired by Taoism in 2012 and since then he shifted his research from law and philosophy of law to meditation, Taoism, Confucianism and other aspects of traditional Chinese culture, and their relevance in today's world. This research will try to shed some light on the significance of Taoism and Confucianism for the science of consciousness as well as for physical and mental health, education and other important challenges of today's world.

**130. Consciousness, Pivot Between Intuition – Emotions, and Automatic Action – Flow, a Process View**

Knud Thomsen, Paul Scherrer Institut Villigen

Consciousness has many facets and it touches upon other phenomena and states of mind at diverse fronts. Somehow, consciousness mediates action in the center. Here, it will be argued that a recently proposed biologically inspired cognitive architecture, the Ouroboros Model, can offer a comprehensive view of both, the emergence of consciousness, and also of states, which are characterized by limited conscious engagement. Intuition, emotions, automatic (re)action, and flow-states of mind are selected for discussion. Starting with any sensory input, this might trigger some automatic response long before its full conscious perception. Lacking well defined categories for classification or a clear-cut best response, intuition is the guide for action, and thus intuitively provoked acts might enter consciousness only at their execution. Emotions generally signal the progress being made, or, when there is none, activity is interrupted and full consciousness is triggered. In cases where everything unfolds smoothly and almost effortlessly, in particular, without interruptions, consciousness of details fades in the continuous flow of activity. According to the Ouroboros Model, above corresponds to schemata comprising action-components as they are (partly) activated, and conscious engagement is evoked by the output of a self-reflective monitor function when special, novel or unanticipated situations arise.

**131. Conscious Subjective Experience and the Hilbert Space**

Vitor Manuel Dinis Pereira, LanCog Research Group, Centro de Filosofia, Faculdade de Letras, Universidade de Lisboa

Cao et al. (2017) discuss how space can emerge from an abstract quantum state in Hilbert space, and how something like Einstein's equation (in the form of a relationship between curvature and energy) is a natural consequence of this bulk emergent gravity program. Here I would like to show how conscious subjective experience correlated with evoked electrophysiological potentials (as opposed to being aware of available information distinctly correlated with evoked electrophysiological potentials) can be expressed in the Hilbert space. Given the hard problem of consciousness (Chalmers, 1995) there are no brain electrophysiological correlates of the subjective experience (the felt quality of redness or the redness of red, the experience of dark and light, the quality of depth in a visual field, the sound of a clarinet, the smell of mothball, bodily sensations from pains to orgasms, mental images that are conjured up internally, the felt quality of emotion, the experience of a stream of conscious thought or the phenomenology of thought).

However, there are brain occipital and left temporal electrophysiological correlates of the subjective experience (Pereira, 2015). Notwithstanding, as evoked signal, the change in event-related brain potentials phase (frequency is the change in phase over time) is instantaneous, that is, the frequency will transiently be infinite: a transient peak in frequency (positive or negative), if any, is instantaneous in electroencephalogram averaging or filtering that the event-related brain potentials required and the underlying

structure of the event-related brain potentials in the frequency domain cannot be accounted, for example, by the Wavelet Transform or the Fast Fourier Transform analysis, because they require that frequency is derived by convolution rather than by differentiation. However, as I show in the current original research report, one suitable method for analyse the instantaneous change in event-related brain potentials phase and accounted for a transient peak in frequency (positive or negative), if any, in the underlying structure of the event-related brain potentials is the Empirical Mode Decomposition with post processing (Xie et al., 2014) Ensemble Empirical Mode Decomposition.

### 132. Time and Distance

Dwight Holbrook, Adam Mickiewicz University, Department of English, Poznan

We distance time, separate it into units, minutes, days, years. And yet, when I wake up in the morning, where is that unit of separation? Invariably I go to my watch. And what exactly does that tell me? Measured time -- a number in a number system that applies numbers to what I see. Yet how long is any unit of time? We can answer with smaller units -- minutes, seconds. Or we can take subdivisions in such a way that we never get to our destination in time and distance -- Zeno's paradox.

- Where does that leave us?

Taking extent of time altogether out of events and the distance between them would seem to leave nature in the condition of being unextended in time, i.e. in a state of instantaneity -- something that not even Stephen Hawking's big bang notion of vertical time would give a hint of sanctioning.

- Is there a way out?

One approach to an explanation is to take, as an analogy to the meaning and significance of the instant, the perception of color for the first time, specifically the color that colorblind Mary sees for the first time. One might translate that non-comparable first-time difficulty of hers with the way Aristotle speaks of the now: "Again, the 'now' which seems to bound the past and future -- does it always remain one and the same or is it always other and other? It is hard to say."

The proposal here is that the immediacy of the now exhibits an aspect similar to that of seeing color for the first time, namely that of a time without properties based on comparison and hence without a timeline of before and after.

### 133. Consciousness Business Organisations and Corporate Social Responsibility: A System's Approach

Madhuri Malhotra, Loyola Institute of Business Administration Chennai

A systems thinking emphasises on "the interrelationships rather than linear cause-effect chains and seeing processes of change rather than snapshots (Senge, 1990)." The whole has one or more defining properties or functions. Each part in the set can affect the behaviour or properties of the whole. There is a subset of parts that is sufficient in one or more environments for carrying out the defining function of the whole. The

way that each essential part of a system affects its behaviour or properties depends on the behaviour of one other essential part of the system. It depends on the interrelationship of various components in a model (system). System thinking approach can be applied to business models as well. One of the areas where system approach tends to maximise the benefits is "Corporate Social Responsibility". Although the concept of corporate social responsibility (CSR) has been analysed for decades, agreement on how CSR should be defined and implemented remains a question amongst academia, businesses and society. This gap is problematic for corporations because they are increasingly being required to align with societal norms while generating financial returns. In order to reach a consensus on the issue of CSR, the following definitions is presented as: corporate social responsibility is a business system that enables the production and distribution of wealth for the betterment of its stakeholders through the implementation and integration of ethical systems and sustainable management practices. Conscious business practices with the application of a systems approach makes the definition of CSR conclusive. This paper presents a system thinking approach to study the relationship between conscious business practices and corporate social responsibility.

### 134. Research Lineages for a New Science of Consciousness

Michael Edward Johnson, Qualia Research Institute

New sciences are born out of existing research threads whose combination is often obvious in retrospect. Which present-day lineages could form the basis for a formal science of phenomenology? We first list crucial challenges such a science must address:

- \*Container for knowledge\*: what is it a theory of consciousness should even do?
- \*Empirical paradigm\*: how do we connect our theories of phenomenology to the brain?
- \*Starting point\*: what are the natural kinds of phenomenology, and what is the simplest quale to reverse-engineer?
- \*Elegance aesthetic\*: what kinds of arguments and explanations should we be drawn to?

- \*Context tracking\*: what levels of analysis can we deploy to understand consciousness, and how can we keep track of which statement belongs to which level?

For each challenge, we then offer an existing research lineage with a clear and crisp solution. Finally, we briefly describe how the Qualia Research Institute (QRI) has synthesized these five lineages into a unified whole, and the empirical fruit of this research, focusing on novel falsifiable predictions and potential applications for neurotech.



**135. Music Moves Brain To Pay Attention**

Aakash Baranwal, Dayalbagh Educational Institute (Deemed University), Agra  
[with Anil Kumar Baranwal, Niranjana Baranwal, Dayalbagh Educational Institute (Deemed University), Agra]

The real world presents our sensory systems with a continuous stream of undifferentiated information. Segmentation of this stream at event boundaries is necessary for object identification and features extraction. Here, we investigate the neural dynamics of segmentation in entire musical symphonies under natural listening conditions. Using brain images of people listening to short symphonies, a research team from the Stanford University School of Medicine found out how the brain sorts out the chaotic world around it. They showed that music engages the areas of the brain involved with paying attention, making predictions and updating the event in memory.

The 20 second clip of a subject's fMRI illustrates increase in cognitive activity during a short period of silence between musical movements.

The team used music to study the brain's attempt to make sense of the continual flow of information the real world generates, called Event Segmentation. The brain partitions the information into meaningful chunks.

They found "striking" difference between activity levels in the right and left sides of the brain with the right side significantly more active. Our study provides direct experimental evidence for dissociable and casually linked Ventral and Dorsal networks during event segmentation of ecologically valid auditory stimuli.

**136. Cognitive Control in Action Observation, Motor Imagery, and Combined AO+MI**

Stefan R. Vogt, Dept. of Psychology, Lancaster University, Lancaster

This talk aims to contribute to the integration of research on action observation (AO), motor imagery (MI), and conscious (cognitive) control (CC). In the mainstream neuroimaging literature, AO is often construed as a bottom-up, passive state of information uptake. I will discuss several lines of evidence that challenge this view: First, in neuroimaging studies on imitation learning, we have repeatedly shown that during observation of novel actions, two key brain structures of CC become activated: dorsolateral prefrontal cortex and medial frontal cortex (Buccino et al. 2004; Vogt, et al. 2007; Sakreida et al. 2018). These findings point to the relevance of conscious control operations during AO. Second, there is now robust evidence that participants can concurrently engage in AO and MI ('AO+MI', Vogt et al., 2013), where the imagined action can either coincide or complement the observed action (e.g., observed attack and self defense action). Here, coordinating and attenuating the AO- and MI-related motor simulation processes is a further potential role for CC (Eaves et al., 2016). Based on the available evidence from neuroimaging research, I will present a coherent framework for the possible functions of CC in AO, MI, and AO+MI processes and highlight opportunities for future research.

**137. EEG and Functional MRI-Guided Simultaneous Transcranial Direct Current Stimulation and Repetitive Transcranial Magnetic Stimulation Improve a Patient with Minimally Conscious State**

Yuping Wang, Department of Neurology, Xuanwu Hospital, Capital University, Beijing

[with Yicong Lin, Qian Huang, Yingying Su, Weibi Chen, Daiquan Gao, Tiaotiao Liu, Xin Tian, Taicheng Huang, Zonglei Zhen, Tao Han, Hong Ye, Department of Neurology, Xuanwu Hospital, Capital University, Beijing / School of Biomedical Engineering, Tianjin Medical University, Tianjin / State Key Laboratory of Cognitive Neuroscience and Learning & IDG/McGovern Institute for Brain Research, Beijing Normal University, Beijing]

A minimally conscious state (MCS) is highly challenging to treat. In one MCS patient, we delivered simultaneous transcranial direct current stimulation (tDCS) and repetitive transcranial magnetic stimulation (rTMS) based on brain network analysis and evaluated their therapeutic effect.

The directional transfer function (DTF) and global brain connectivity were calculated based on electroencephalograph (EEG) analysis and functional magnetic resonance imaging (fMRI) analysis respectively. By referring to the results, we identified bilateral parietal regions as targets. In the two-week treatment period, fourteen sessions were applied to the identified bilateral parietal regions. Simultaneous anodal tDCS and 5 Hz rTMS were delivered for 20 minutes per hemisphere in each session. Clinical evaluation scores were recorded weekly throughout the treatment.

The clinical scores improved, and the effect lasted for up to 1 month. After treatment, EEG analysis showed an increase in DTF in bilateral posterior regions, and fMRI showed a trend toward normalized activity in the default mode network.

EEG and fMRI are applied to characterize the functional connectivity features of the network in an MCS patient. A simultaneous combination of tDCS and rTMS was explored. The patient showed a long-lasting moderate clinical improvement and a trend toward normalized functional connectivity.

**138. Collective Orchestration – Nature's Pathway to Complexity**

Werner Kriegelstein, College of DuPage, Illinois Institute of Technology

[with Daniel Kriegelstein, College of DuPage, Illinois Institute of Technology]

Collective orchestration is an organizational tool introducing order and stability in an otherwise chaotic universe. Individuals join together, temporarily, and act as one. Together they can perform tasks they were not capable of doing alone. They effectively cooperate and become a super-organism. As a cooperating super-organism they conserve energy and avoid being overpowered by merciless free riders. Darwin used the term super-organism to describe social phenomena he observed among insects. I will show that the same process is ubiquitous, producing super-organisms at all levels. These qualities lead to an increase in complexity, which is responsible for the hierarchical order in nature. Far from being a mere accidental result of random mutations, a fluke or coincidence, this process of cooperation synchronization, and of creating super-or-



ganisms is a strategy of nature to prevent extinction, effectively counteracting, but not negating, the Second Law of Thermodynamics.

In collective orchestration nature found an alternative to individual mutation and competition. Through cooperative action groups of individuals are able to achieve goals they could not reach on their own. After successfully merging the formerly separated individuals act as one. Collectively they advance to a higher level.

### 139. The Self-Referential Aspect of Consciousness

Cosmin Visan, Independent, <http://alicematters.web.cern.ch/?q=CosminVisan>

Following the phenomenology that is revealed by the emergent structure of consciousness, the path will lead to the acknowledgement of consciousness having a self-referential aspect. By following phenomenological clues, properties of self-reference will be revealed. The two most prominent properties of self-reference will be shown to be inclusion and transcendence that will be shown to be found everywhere in the phenomenology of consciousness. Also, self-reference will turn out to be unformalizable, this imposing limits on what a theory of consciousness can ever achieve. The unformalizability of self-reference would be shown to be because self-reference: is itself, includes itself, and transcends itself, all at the same time. Nevertheless, unformalizability will be shown to be an essential feature needed to bring essences into existence. Paper can be found here: <https://philpeople.org/profiles/cosmin-visan> Presentation about The Emergent Structure of Consciousness at SAND 2018: <https://www.youtube.com/watch?v=6jMAy6ft-ZQ>

### 140. Enhancing the Management of the Inner Space – Psychedelic Medicine, Witness Consciousness and the Guide

Philip E Wolfson, Center for Transformational Psychotherapy, The Ketamine Research Foundation, San Anselmo

Civilization is a product of the development of inner rules and participation in the outer cultural rules of others. The constant reciprocal interaction between the two determines the quality of personal and social life. Within the construct of personal consciousness, there are multiple levels of awareness that are in constant activity and are variously discriminated by the individual. The ability to observe mind and note its process and contents is the product of cultural evolution. It generates the Guide as the reference source for evaluation of sanity, impulse, potential and actual behavior, relationship, affect, needs and desires. It establishes a sense of balance as a reference point that is dynamic and fluent, yet sufficiently stable to conduct the business of living. Disruptions to the Guide occur from multiple sources such as anxiety, depression, trauma, mental illness, loss and grief, avarice, avoidance, ignorance, confusion, the impact of others, shifts in culture and more. Evaluation of the balance established by the Guide, conformity to its measurement, reevaluation and relocation of its center is ongoing. The expansion of mind through the thoughtful use of psychedelic medicines enhances our self-monitoring and the Guide.

With this framework as operational, it is possible to generate a theory of mind and its aberrations that is both personal and systemic.

### 141. Attachment and Exceptional Experiences Among Twins – About Twin Telepathy

Göran Brusewitz, University of Greenwich, London  
[with D. Luke, University of Greenwich, London]

Is there any relationship between the attachment twins report having and the many exceptional experiences (including telepathy) they report having with each other? This question was in focus in this thesis, carried out with UK twins, including three experimental studies on twin telepathy, and a web survey on attachment and the relationship with reporting having had exceptional experiences (with their twin and with other than their cotwin), experiences that include shared physiological responses to illness, injury or accident, i.e. remote sensing the other twin's pain, accident or state of mind and other telepathy-like experiences.

Electrodermal activity, EDA was used as an indication of potential (telepathic) connectedness in three studies, where one twin was exposed to a surprise at a random time epoch, the other twin in a distant shielded room, wired to the equipment measuring the EDA. If there was a peak on the graph corresponding in time with the surprise being exposed to the sending twin, it was an indication of physiological connectedness, also possible to regard as a synchronous reaction. The overall result was significant. Attachment data from two questionnaires were collected in the survey from more than 2000 twins. Identical twins were compared with non-identical twins, and female twins with male twins. Different periods of age were compared.

### 142. Contemporaneity of Animal Consciousness with Yugas [eras]: A Review Study

Yanamandra Sumant, Alumnus of Dayalbagh Educational Institute, Agra and CSIR – National Institute of Oceanography, Goa  
[with Y. N. Rao, Law officer, Radhasoami Satsang Sabha, Dayalbagh, Agra, A. K. Sinha, Professor (Emeritus), Dayalbagh Educational Institute, Agra]

The order of nature being the co-existence among living forms whether mutualistic, altruistic or parasitic, is evident from innumerable incidences depicted from various types of interactions among inter-generic organisms. We had instances of communications developed among all living beings through the broader timeline depending on different astronomical calculations. Satya Yuga reflected the highest levels of consciousness, where each living form could read the mind of the other. During Treta Yuga (the period of Rāmāyana) also, the levels were high, but relatively lower. Dwapara Yuga (the period of Mahābhārata) followed the sequence. Both the epics depicted the conversations between humans and animals, Jatāyu (raptor) with Rāvana in Rāmāyana, Nāgāstra (arrow with the head of king cobra) with Karna in Mahābhārata and many more. The levels got further reduced in Kali Yuga (the present era) and the relationships are expressed

in different ways like mutualism between Pitcher plant and Crab spider etc. Inherently animals perceive the things of the nature. Snakes sense vibrations of the earth. Animals indicate omens. Many animals were reportedly escaped from the cataclysmic tsunami effecting coastal areas of South East Asia in 2004 predicting something direful. There are so many to be elaborated in the presentation.

#### 143. Consciousness, Emotion and the Social World

Ava Ma de Sousa, University of Toronto

Emotion and consciousness are highly intertwined. I propose that emotions are what allow for sentience, as seen in animals, to zero-in on salient aspects of the world. Thus, emotions serve to guide this first-order consciousness. However, I propose that second-order consciousness and awareness then arose in humans out of a need for emotions to be reined in in the new ecology of the social world. In such a context, intense, uncontrolled emotional responses are not well adapted. Thus, mechanisms to control these processes were needed. Among these is the ability to simulate possible emotion states in various situations, projecting the self into different time and space. Being adapted to the social world also requires complex modelling of the environment, namely other people. Such complex processes, I argue, require self-awareness and meta-self awareness, to a level that can be achieved only through the development of language. Thus, the pressures of the social world demand a reversal of the order of explanation, from emotion as guide to consciousness, to consciousness as guide to emotion, with language as an intermediate step. This proposal of an 'origin story' of human consciousness does not however rule out the possibility of mechanization of strong AI.

#### 144. Impact of Religiosity on Religious Consciousness: A Comparative Study of Jains and Radhasoamis of Agra

Poornima Jain, DEI [Deemed University], Dayalbagh, Agra  
[with Rajesh Sharma, DFCL, Agra, Gaurav Sharma, HCL Technologies, Noida]

In the modern era, there is a decline in religiosity among most religious communities. Proportion of Jains is declining from last two decades (4% 1991 and 0.37% Census, 2011). Although, Radhasoamis are not enumerated as a distinct religious community in the Census, but the official figures as maintained by the Headquarter of the Radhasoami Satsang Sabha, reveal that their number is continuously rising. Why this difference between the two communities? One of the causes assigned is the difference in degree of religious consciousness present among a religious community.

Objectives:

1. To study the impact of religiosity on religious consciousness of an individual.
2. To compare the degree of religiosity among Jains and Radhasoamis of Agra city.
3. To compare the degree of religious consciousness among Jains and Radhasoamis of Agra city.

4. To study the differential effects of age, gender, and education on the degree of religiosity and religious consciousness.

Sampling: Two stage sampling method was used.

Tools of data Collection: Interview schedule has been constructed for collecting primary data. A scale on religiosity and religious consciousness have also been constructed.

#### 145. Axiomatizing Consciousness, with Applications

Henk Barendregt, Faculty of Science, Radboud University, Nijmegen  
[with Antonino Raffone, Sapienza University, Rome]

Human consciousness and its functions will be axiomatically approximated by describing a hierarchy of increasingly complex 'agents'. A\_0 General agents, interacting computationally with their 'world', have a discrete stream of states. A\_1 'Autistic' agents, like Turing Machines, have input, state, and action and corresponding three-fold streams. The state of their world is the (unknown) full memory-content and position of the R/W-device. A\_2 Simple robots have sensors, actuators and location in the outside world. A\_3 Agents with attention, receive complex data with focus, enabling priorities. Neural-net computations provide acquired interactions, introducing the notion of 'error'. Small units of associative memory are present with limited capacity and reliability. A\_4 Agents with cognition have 'symbols' in their memory with recursively constructed 'meaning'. With robust associative memory this enables mental programs. A\_5 Agents with mindfulness – information obtained from the previous state – may relinquish dysfunctional components, by considering these as data and moving attention elsewhere.

Applications. 1. 'Suffering' (worldly/existential) defined as streams in strange attractors. 'Meditation' as systematic stilling of input and action, varying only states, enables mindful observation of the resulting loop. Then 'reset' becomes possible, escaping the attractor. 2. Robust associative memory can be constructed from many small units. 3. Qualia as iterated mindfulness.

#### 146. Perception Theory and Time : Key Items of Consciousness Theory Leading to Symbiotic Intelligence [SI]

Ashley Willis, Perception Theory Pty Ltd

Perceptual mechanisms are bifurcated loops within the body that entrain vibration patterns that mimic and syncopate with external stimuli, giving the body and brain an internal replica with which to contrast and compare. They are the interface between sensory, perceptual, memory and analytical systems, and as such, are pivotal to the development of consciousness.

1. Reverberations in the eyes are correlated with auditory beat. Sound waves reverberating within the spheroidal vitreous humour interact & stimulate the in-vivo blood vessels, coalescing as standing waves signals transmitted up the optic nerve, which symbiotically grow and develop the brain to recognise these consistent replicable signals.

2. Entities flying over the cortex syncopate with auditory beat and rhythm, possibly being an external outcome of ‘connectome’ dynamics, and in any case, are felt as ‘flux through the field’ and stand to quantify physical properties of the mind.

The internal replica of perceptual mechanisms can be contrasted and compared with external stimuli and consequentially allow for learning and growth of the CNS/brain. Perception Theory is the interface of physicality and psychology.

I will introduce these two Perception Mechanisms and axioms of Perception Theory, and discuss Time as being a quality of consciousness, not the external universe.

#### 147. Making Computer Conscious as Brain: A Paradigm

Siddharth Agarwal, DEI Faculty of Integrated Medicine (AYUSH) Medical College, Dayalbagh, Agra

[with Ansh Agarwal, DEI Faculty of Integrated Medicine (AYUSH) Medical College, Dayalbagh, Agra]

The computer whose processor is provided the ample amount of Integrated real time information with the real cause-effect power actualized at the conceptual level will be conscious. A conscious event exists (like a given Universe) as the different entities in it interact with each other (fundamental fields/particles) that make up our Universe. Information can reach from one particle to another. Consciousness is irreducible as it is the truth. The sum of the individual frames is more, it is synergistic.

So, with the above philosophy, we apply the real mathematical science in its abstraction to build a conscious computer programme. We tried to build logic gates in the Patient management programme software of the Integrated Systems Faculty, wherein the information provided at different levels, (n) was integrated, irreducibly, unknowingly rather, and the masterchart which evolved was amazing. It predicted accurately the events which had occurred, and blind observers had no clue of them. We retrospectively studied different information exchanges of data between the subsets. We tried to calculate the least Phi. To our surprise, it was not that complex as propounded by Max Tegmark and Dr. Giulio Tononi.

We are interpreting the information in parallel. This information integrates into our previous information understanding. We took some logical structures that must be in place for this to work. When we summated them, they form more complex structures. The complex structure’s functionality is linked to the computer programmer’s consciousness. Some of these complex structures work outside of aware consciousness, in the subconscious. These complex(es) are mutually exclusive, and must be “maximally irreducible” to give rise to consciousness.”

#### 148. Can Artificial Intelligence [AI] Ever Be Conscious?

Lydia Papageorgiou-George, Deree – The American College of Greece

[with Paraskevi Papadopoulou, Deree – The American College of Greece]

The study of consciousness has perplexed both scientists and philosophers alike for centuries yet, there appears to be some consensus over what is conscious and what is not. Given the fact that AI systems use a process called deep learning to solve computational problems which aim to replicate human cognitive abilities, it is interesting to consider whether or not consciousness could be replicated through AI. AI uses networks of layered algorithms to solve complex problems designed by a human programmer making it hard for machines to operate autonomously and consciously. While certain aspects of human consciousness, such as reacting to environmental stimuli, are fairly straightforward to replicate through algorithms, self-awareness, and experience form part of what is known as the ‘hard problem’ of consciousness.

Taking into account the multiple theories that exist concerning the nature of consciousness, this study examines the question in light of two hypotheses. The first hypothesis is that consciousness arises from increasing neural complexity, and the second hypothesis is that consciousness is a fundamental aspect of the universe. If the first hypothesis is supported, it ought to be possible to construct AI that replicates human consciousness. The opposite would support the second hypothesis.

#### 149. The Nature of Consciousness – Quantum Mind

Si-Chen Lee, Department of Electrical Engineering, National Taiwan University

It was proposed in 2018 The Science of Consciousness conference that the universe consists of 8-dim (8D) complex spacetime, in addition to our well known 4D real space-time, there exists another 4D imaginary space-time (information field or spiritual world) full of consciousness and information websites. Since the imaginary spacetime is filled with consciousness and information websites, it is natural to assign the mathematical symbol  $i$  in physics to represent the consciousness, this assignment immediately resolve the mysteries of quantum mechanics that Schrodinger wave equation resulted in a complex wavefunction  $\Psi(r, t)$  that can not be measured in a physical instrument. Copenhagen interpretation used this complex wavefunction to multiply its complex conjugate wavefunction  $\Psi^*(r, t)$  to represent the probability of finding the particle in the position  $r$  and time  $t$ . But it could not explain why a deterministic Schrodinger equation ended up with a probability interpretation. Actually, the imaginary  $i$  of the complex wavefunction or quantum field had already brought consciousness into the physical law by Schrodinger, but unfortunately, it was not explained in this way. The probability interpretation came from the fact that the quantum wave can tunnel into the imaginary spacetime and be scattered by all the imaginary image of other real objects just like gas molecules are scattered by all the other molecules in the gas that led to Boltzmann statistics. This also explain the paradox of quantum entanglement that the exchange of information between two entangled quanta exceeds the speed of light. because two quanta are entangled in imaginary space-time which has no speed limit.

**150. Wave Particle Duality and the Uncertainty Principle in Neurons**

Alexandra Pinto, ETH Zurich

The main interest of this thesis, is to answer the wave to pulse generation problem in the chemical synapses of our nervous system. The current state of the art in this respect is pretty scarce and unclear, regarding conservation of information and frequency at the interior of the synaptic cleft. The curiosity to solve this problem was mainly raised by the fact that the trains of action potentials certainly encode and transmit information along the nervous system but most of the time neurons are not transmitting action potentials, 99 percent of their time are in the sub threshold domain were only small signals without the energy to emanate an action potential are the ones that carry the majority of information, the one that let us perceive the world in one way, the same synchronised way that let us have a language, memory and in general, activities that don't require the fast response inter neuron communication as in electric synapses.

The model that is proposed in this thesis for a synapse, is an oscillatory constructive and destructive interference pattern of wave activity, that smooths the train of action potential and keeps its frequency. Synapses are presented here as a system composed of an input wave that is transformed through interferometry as slits in analogy to Young's experiment but with the real synaptic distribution or ionic structural distribution depending on the level of analysis that wants to be achieved.

The creation of the synapse network in order to have the real biological distribution of the "slits", required the acquisition of the position and volume of a real neuron topology and the detection of each synapse was done using an algorithm that is able to fill in the empty space inside the neuron to quantify it and extract the contact points with surrounding neurons. Each synapse in the real neuron image, is replaced by an oscillation that depends on the wavelength of the input signal. The collective synaptic interference pattern of waves will reflect the points of maximum amplitude for the density wave synaptic function were the location of the "particle" in our case action potential, has its highest probability.

**151. Mind without Magic: How the Blind Mindmaker Explains Consciousness**

Colin S. Morrison, University of St Andrews

The really mysterious thing about mind is not its existence, or even its information-content. Both of these could be explained (albeit provisionally) by identifying mind with brain structures where that information is represented. The really mysterious thing is the fact that the data in question is sorted according to its sensory origin and represented in a three-dimensional subjective space in a way that makes the subjective spatial relationships between the qualia representing particular sensory stimuli perfectly representative of all the real spatial relationships between those sensory stimuli – and not only those stimuli but in some cases even their external sources. Of course, we know that this information is PRESENT in the brain. The brain could

CALCULATE each one of these spatial relationships. But as far as we can currently tell there is nowhere in the brain where they are all DIRECTLY ENCODED by material structures. This observation has led to strange hypotheses like functionalism or radical externalism. The theory revealed in my book THE BLIND MINDMAKER renders such unscientific appeals unnecessary. It shows how the relevant information could have EVOLVED to be spatially represented in exactly the right way, and it shows us precisely what physical structures our qualia are.

**152. Consciousness and Effect of Meditation: An Experimental Study**Gur Charan Singh, Dayalbagh Educational Institute, Dayalbagh, Agra  
(with D.K.Chaturvedi, Dayalbagh Educational Institute, Dayalbagh, Agra)

Chaturvedi et.al (2010, 2012, 2013, 2014) demonstrated in the past that the consciousness of an individual is perfectly correlated with the Chakra Energy. It is also studied that the human performance is dependent on their consciousness (level of Chakra Energy). The study has been conducted on industrial workers, UG and PG students and health care workers to determine their performance by measuring their Chakra Energies.

In this paper, an experimental study has been conducted to find the variation in consciousness (Chakra Energy) due to concentrative meditation. The results show that the consciousness increases initially during meditation during meditation. But sometimes the energy falls. The reason of this fall is disturbances of physical material plane and the negative mind forces.

**153. Multi-Value Perspectives of Processing Existential Consciousness in Terms of Cybernetics and System Science**

Daniel Dick, Akademie der bildenden Künste Wien; Institut für existentielle Bewusstseinsforschung

From an existential point of view, a two-valued logic of does not reflect the immediate human experience, which ranges from an undefined and imaginary future to a constructed and defined past and also includes notions of sense-making and humour. System theory and cybernetics operate beyond a two-valued logic which introduces self-referential and autopoietic aspects of living systems. A third value was further introduced by cybernetic and semiotic approaches through considering also the processing feedback loops of the observer of distinctions and the interpreter of signs. Gotthard Günther declared reflexion as the third value to justify the intersections and exclusive conjunctions between the subject, denoted as the double-reflexive, and the object, denoted as the irreflexive. Several steps of feedback loops, designated by Gregory Bateson as steps of learning, by Johannes Heinrichs as logical steps of reflexions and by Niklas Luhmann as self-referential levels, allow a differentiated view on levels of self-consciousness based on the triad of distinctions, reflexions and reaction of actions and its recursions. This presentation deals with the integration of the former models into a structured epistemological process of conscious becoming of the world.



#### 154. Biological Evolution of Consciousness: Climbing Above the Forest of Proposals to See the Big Picture

James Beran, Independent

How did biological evolution lead from simpler organisms to species with conscious experience? About 30 years ago, Sir John Eccles proposed that neocortical neural assemblages (“dendrons”) evolved to give mammals conscious experience (see, e.g., Eccles, 1992). Others have since advanced a forest of proposed explanations, obscuring the big picture—which explanation is best? This work develops a two-stage comparison technique: First, we compare proposals at similar scales; second, we consider combining proposals from different scales into multi-scale hypotheses. As a preliminary test of the two-stage technique, we compare several proposals in three scale ranges: At scales of organism features, we compare proposals involving brain complexity (Feinberg et al., 2013; Godfrey-Smith, 2017), brain size (Godfrey-Smith, 2011), and electromagnetic features (McFadden, 2000; Beran, 2017); at neuron scales, we compare proposals based on dendrites (Eccles, 1992; Beran, 2013) and the axon initial segment (AIS) (Beran, 2018); at genome variation scales, we compare quantum proposals (McFadden, 2000; Hameroff, 2017) with ankyrin germ line variation (Beran 2018). We then use results from the first stage to obtain multi-scale hypotheses. Based on our preliminary test, two-stage comparison appears very promising.

#### 155. Meditation Training and Spiritual Exercises at Workplace

Amit Kumar, Dayalbagh Educational Institute, Agra

The motive of this paper is to highlight the spiritual values and work life by means of meditation training and spiritual exercise at workplace. The paper also addresses values and spirituality which are considered conventionally to be the prerogatives of religion and they are observed as being embodied in the household unit. Meditation helps us to detach from damaging practices of feeling, thought and reaction. This outcome is a conscious, optimistic release of energy which progresses the quality of our attitude, movements, and interactions.

#### 156. Workplace Spirituality and its Impact on Organizational Commitment and Employees' Job Satisfaction Amongst Higher Educational Institution Teachers

Dayal Sandhu, Dayalbagh Educational Institute, Agra, GLA University

This research was planned to ascertain the impact of workplace spirituality towards organizational commitment and employees' job satisfaction amongst Higher Educational Institution Teachers. The organizational commitment and job satisfaction has been treated as dependent variables and workplace spirituality constituted the independent variable for the research. The research employed normative survey method and mix

sampling technique for the purpose of investigation. The investigator used self-constructed workplace spirituality questionnaire, organizational commitment scale and Job Satisfaction Scale to collect personal information and to measure workplace spirituality, organizational commitment and job satisfaction amongst Higher Educational Institution Teachers. This research employed Analysis of Variance (ANOVA), Pearson Product Moment Correlation Coefficient and linear regression analysis to obtain the results. The research revealed that there was statistical significant and positive relationship of workplace spirituality with organizational commitment and job satisfaction and further revealed that there was positive and significant impact of workplace spirituality towards organizational commitment and job satisfaction amongst Higher Educational Institution Teachers.

#### 157. Closed but Opened Bodily Self-Consciousness: PPS Boundary Disappearance With the Squeeze Machine

Mai Minoura, Department of Intermedia Art and Science, Waseda University, Tokyo [with Iori Tani, Takahiro Ishii, Yukio-Pegio Gunji, Department of Intermedia Art and Science, Waseda University, Tokyo, Japan, Research Center for Kansei Value Creation, School of Science and Technology, Kwansei Gakuin University, Hyogo

“Squeeze machine” is a V-shaped device to press the user's whole body to obtain a relaxing effect. The inventor Dr. Temple Grandin, a distinguished zoologist with autism, says, the machine does not only bring relax but also teaches her, “to feel empathy for other”. This report of Grandin is considerable from the following two points; first, the problem of empathy in autism is an important issue and Squeeze machine directly solves it for her. Second, the physical action of Squeeze machine approaches the essential aspect of mind, that can provide an insight of mind-body problem to us. Here, we hypothesize that Squeeze machine evokes our conscious intention to the bodily self and transforms self-consciousness itself. Therefore, acquiring such conscious intention would generate empathy to others.

In this study, as the first step in verifying this hypothesis, we tested whether bodily self-consciousness would be transformed by Squeeze machine. As its objective and online evaluation, we adopted pre-established method of peri-personal space (PPS) measurement. Our results showed that the boundary of PPS appearing in the control condition disappears in Squeeze machine. That suggests the experience between squeezing and being squeezed leads the one to abandon the PPS boundary.

#### 158. A Mathematical Model of Qualia

Pedro Resende, Instituto Superior Técnico, Univ. Lisboa

I shall present a mathematical definition of qualia from which a toy model of consciousness is derived. Concretely, a space of qualia is defined to be a suitable topological space  $Q$  which is equipped with algebraic structure that provides a primitive notion of time and makes  $Q$  a so-called stably Gelfand quantale. For some mathematical background (not mentioning qualia) see [1]. In this talk the appearance of such mathe-



mathematical structures stems from the identification of a few basic principles which convey abstract aspects of the behavior of physical devices that “detect” qualia, such as brains of animals seem to do. This leads to interesting conceptual consequences. For instance, “stable observers” emerge naturally and relate closely to the perception of space, which here, contrary to time, is not a primitive notion. Moreover, a mathematical relation exists to operator algebras (cf. [2]), hence also to quantum theory, and quantum phenomena like complementarity and entanglement acquire a natural logical interpretation.

[1] P. Resende, The many groupoids of a stably Gelfand quantale, *J. Algebra* 498 (2018) 197–210.

[2] P. Resende, Quantales and Fell bundles, *Adv. Math.* 325 (2018) 312–374.

### 159. Resonant States of Consciousness and the Golden Ratio Numbering System

Scott Olsen, College of Central Florida

Evidence in the sciences suggests there is a golden ratio numbering system underlying nature. Certain ratios, root 2, root 3, root 5 and particularly the golden ratio, are central to this system. Throughout nature adjacent Fibonacci numbers approximate the golden ratio. The chaos border, fine structure constant, and quark masses are functions of the golden ratio. In 2010 the golden ratio was found at the core of quantum mechanics. The Trappist 1 solar system and our solar system’s Venus, Mercury and Earth together harmoniously exhibit golden ratio relationships. DNA’s decagonal structure and Fibonacci driven nucleotide organization exhibit golden ratio resonance. Penrose and Hameroff provocatively suggest that consciousness emerges through the quantum mechanics of microtubules. Microtubules are composed of 13 protofilaments exhibiting an 8:5 phyllotaxis. Clathrins, located at the tips of microtubules, are truncated icosahedra abuzz with golden ratios.

These ratios and proportions governing all of nature may be accessed through a variety of methods. These include geometric constructions, contemplation of nature’s forms, listening to or creating harmonic sounds, and even visualization of harmonic ratios. The discussion concerning consciousness will include Theurgy, Gematria, Name-worshipping, or “imiaslavie,” of the Moscow School of Mathematics, and the profound insights of the mystical mathematician Ramanujan.

### 160. Mindfulness Meditation Training for Attention-Deficit/Hyperactivity Disorder

Aakancha Vashistha, Agra University, Agra

Attention-deficit/hyperactivity disorder (ADHD) is a developmental condition that continues into adulthood for the majority of cases (Barkley, Murphy, & Fischer, 2008). This often lifelong condition is characterized by pervasive impairment in multiple domains, including but not limited to academic, occupational, relational, mental health, and self-concept (Matheson et al., 2013; Stein, 2008). The present study aimed at finding out the effect of mindfulness meditation on ADHD adolescents. The participants were 200 in number (age range 12-14). They practiced mindfulness meditation for 3

months. The pre-test and post- test assessments were taken. The findings of the study are discussed in light of impact of mindfulness meditation on ADHD.

### 161. Effect of Meditation on Consciousness

Radha Agrawal, Dayalbagh Educational Institute, Agra

A growing body of empirical, systematic research points to the efficacy of meditation as an aid to relieve stress and promote psychological wellbeing in both clinical and non-clinical populations. Mantra meditation however (the repetition of a word or phrase, silently or aloud), has yet to be evaluated with such rigour. Given this, a systematic review will be conducted to explore and synthesise existing research investigating the impact of mantra meditation on the health and wellbeing of those who engage in the practice.

Attention is one of the components to enhance academic excellence. Traditional techniques were included in Indian schools to develop mental faculties with a view to add value to the latter.

Subjects consisted of 60 school students included (boys = 30 and girls = 30) in the age range of 12-14 years, who were trained for chanting GM for 5 days. They were assessed on DLST immediately before and after two sessions (i) GM chanting (10 min) and (ii) Poem line (PL) chanting with an equal duration (10 min). Fifty percent of participants performed GM chanting and remaining on the PL recitation on day 6. The orders of the sessions were reversed on day 7.

### 162. Mind Wandering, Conscious Experience and Different Forms of Mantra Meditation

Shivani Vashishtha, Dayalbagh Educational Institute, Agra

[with Sona Ahuja, Diksha Yadav, Dayalbagh Educational Institute, Agra]

Aimless and inadvertent drifting of mind is a common experience that most of the individuals undergo. Mind wandering is the state of engaging in thoughts that may or may not be relevant to task at hand. A considerable amount of research has reported that mind wandering disrupts performance on various tasks that require attention. The mechanisms involved in the process of meditation can improve attention. Among various forms of meditation practiced in East, mantra meditation is a practice where the meditator repeats a syllable, word or a phrase silently or aloud. It may reduce the distracting thoughts and enable improved focus and attention on task at hand. The present study is aimed at examining the impact of practicing different forms of mantra on mind wandering and conscious experience. The study was conducted on 200 participants (age range: 14-16 years). The responses pertaining to state of wandering mind and the cognitive, physical, social, self, emotional and spiritual aspects of conscious experience were sought from the participants who practice mantra meditation regularly. The four different groups were compared on mind wandering and conscious experience i.e. participants practicing (i) Gayatri mantra from Rigveda (repetition of three padas of eight syllable each) (ii) Radhasoami mantra from Oriental Philosophy of Saints (practice

of sound ‘Ra- dha- soa- mi’ at 4 chakras) (iii) OM mantra (chanting of single syllable sound ‘OM’) and (iv) active control group (silent reading). The results of the study are discussed in the light of impact of practicing different mantras on mind wandering and conscious experience.

### 163. Non-Equilibrium Quantum Field Theory of the Brain: Coherence in Open Systems

Akihiro Nishiyama, University of Alberta

Quantum Field Theory (QFT) of the Brain is one of the hypotheses expected to explain the mechanism of memory in the brain. It originated with the work by Ricciardi and Umezawa in 1967. The QFT of the Brain is nothing but Quantum Electrodynamics (QED) of water electric dipole fields. Coherent states in which electric dipoles are aligned in the same direction (breakdown of rotational symmetry, or order) can describe several properties of memory (diversity, long-termed but imperfect stability and non-locality).

The aim of this talk is to show non-equilibrium memory formation processes in QED with charged bosons in open systems as a practical model of memory.

We adopt the Klein-Gordon equations for coherent fields (order parameters) and the Kadanoff-Baym equations for incoherent particles. We show how coherent fields are amplified or damped in open systems due to the environment in numerical simulations. We also show the robustness of coherent states against the field-particle conversion (decoherence) in this model. Finally we discuss the roles of microtubules.

### 164. Expansion of the Scientific Method to Study Consciousness

Patrice Solomon, Private Practice

The mandate of science is to try to understand and describe reality. Prior to the age of Enlightenment, what was considered “true” or “real” was arbitrated according to rules of logic, philosophical perspectives, or simply dictated subject to prevailing religious dogma. The church embraced all that was metaphysical and demanded science constrain itself to the domain of the physical, with that demarcation having a continuing influence on science today.

A precise method was developed, the “Scientific Method.” Using specific rules, and greater deference to objectivity, coefficients denoting levels of reliability and validity could for the first time quantify “truth” according to levels of confidence in its certainty. Today scientists stand by that Method at all costs. A retreat from the Scientific Method risks a descent into “dark realms.” However, the Method itself makes philosophical assumptions that are unproven and not often acknowledged. Modern physics and current research suggest that new directions in science may require expanding methodology beyond materialistic perspectives. Especially as the issue of Consciousness is explored, wider philosophical paradigms in scientific methodology may need to be considered. This presentation explores that topic.

### 165. Fundamental Time in an Eight Dimensional Reality

James J. Hurtak, Academy For Future Science Tecnic Research Laboratory  
[with Elizabeth Rauscher, Stiftung Akademie für die Wissenschaft der Zukunft in Europa]

Why does time only seem to run forward at least from our perspective? In quantum physics, time enters when the observer is present to determine it. John Wheeler proposed the delayed-choice experiment in 1978 as a thought experiment (gedanken experiment) to determine the role of the observer. Since that time, extensive experiments have demonstrated that when photons impinged onto an apparatus, their apparent states can be retroactively changed to something which already happened. As no signal traveled at greater than the velocity of light to connect the events, there is a temporal inversion of the normal order of time. That is, the delayed choice experiment is such that it may appear that the present can affect what happens in the past or that it already happened before it happens. If we consider the Rauscher’s Eight Space, we can find a solution to it in a remote connectedness which creates an omnipresent observer who can choose his observational perspective. Here we have macro and micro nonlocality specifically from the frame of observation, where the luminal velocities are preserved on the n-dimensional Lorentzian manifold.

### 166. Through a Glass, Darkly: Mediated Consciousness and Mirror Neurons

Arianne Conty, American University of Sharjah

The Cartesian understanding of self-consciousness as a fundamentally autonomous and individual affair has played an essential role in Western philosophy, and is held to be responsible for the individualism that constitutes Western Modernity. But such a view was long ago contested by Hegel, as well as many 20th century interpretations of Hegel by postmodern scholars such as psychoanalyst Jacques Lacan. In their efforts to undermine the solipsism intrinsic to such a Cartesian view, these philosophers have sought to replace such an isolated understanding of subjectivity with a relational one, founded in the constitutive dialectic between self and other. After detailing Hegel’s philosophy of dialectical self-consciousness and comparing it with philosopher and psychoanalyst Jacques Lacan’s interpretation of the mirror phase, this article will compare these relational philosophies with the embodied relationality posited by cognitive science in its study of mirror neurons. The role of these neurons in the structure of the brain demonstrates that empathic solidarity is a natural evolutionary development. Advances in cognitive science may therefore make an embodied social ontology necessary, and call for a fundamental reworking of both Cartesian dualism and the Hegelian dialectic in order to take into account solidarity and community formation as essential human attributes.

#### 167. Towards the Development of an Integrated Ethical Decision Making Model with Focus on Business Leadership Decisions in a VUCA World

Shruti Satsangi, Dayalbagh Educational Institute, Agra

Decisions and choices are the basis of man's life. In making any decision of some weight or consequence, we rely on the social conventions of our society, our education and knowledge, and our inner moral compass. In order to make effective and morally correct decisions, it becomes important for us to consider ethics or moral philosophy on which we can rely. While there exist many rationalist models for ethical decision making, there is an increasing focus on understanding the non-rational processes that inform any decision, namely emotions, intuition and other sense-making factors that individuals use.

This paper makes the use of a rationalistic/intuitive integrated model to map individual ethical positions and develop a system to make sense of the rank importance of various guiding principles influencing decision making. There are detailed flows for how this model should be tested and verified, with special emphasis on business leadership in a VUCA world, along with suggestions for further research.

#### 168. Physical and Physiological Mechanisms of Consciousness and General Anesthesia

Stanislav Grizuk, Moskau ZNIIS

General anesthesia — anesthesia) - artificially induced reversible inhibition of the Central nervous system systems (CNS) with suppression of pain sensitivity, consciousness, motor and reflex VEGA -tative activity during surgical operations. Existing pharmacological theories do not give an exhaustive explanation of the mechanism of suppression of consciousness, although the mechanisms of other effects anesthesia is well studied. The reason lies in the fundamental difference between the vertical scheme of conducting ways CNS for the organization of most of its perceptual and Executive functions of the organization structures of the brain, it is necessary associated with the processes of consciousness in the information analysis and synthesis of control commands as a key synergetic factor of the self-organizing system. This allows not only to explain the essence of the phenomena of anesthesia by changing the functional dynamic orderliness in the neural networks of the cerebral cortex, but also to control the depth anesthesia and the state of the patient as a whole methods of analysis of self-organization of information saturation of signals of their regulation, monitoring the trend of fractal dimension generated at the same time entropy of the attractor.

#### 169. De-Simulating Natural Intelligence

Craig Weinberg, Multisenserealism.com

In recent years, scientific and popular imagination has been captured by the idea that what we experience directly is a neuro-computational simulation. At the same time, there is a contradictory idea that some things that we experience, such as the existence of brains and computers, are real enough to allow us to create fully conscious and intelligent devices. This presentation will try to explain where this logic breaks down, why true intelligence may never be generated artificially, and why that is good news. Recent studies have suggested that human perception is not as limited as previously thought, and that while machines can do many things better than we can, becoming conscious may not be one of them. The approach taken here can be described as a Variable Aspect Monism or Multisense Realism, and it seeks to clarify the relationship between physical form, logical function, and aesthetic participation.

#### 170. The Function of Consciousness in the Development of Brain Diseases

Ilana Rogel, Independent

The human thinking & feeling processes are not yet fully understood to science. Based on what we do know and my own research and practice, I will discuss how we can connect the dots between quantum entanglement effects, that serve a key role in the human thinking and feeling processes, and degenerative brain diseases.

By asserting the role of quantum entanglement effects in the human thinking process we will be able to show how specific patterns of wave interference and monotony can form the basis of degenerative brain disease.

The human thinking-feeling has radical implications on the physical body, as is already widely accepted for mental states such as stress, depression, etc. My research aims to expand the scope of this understanding and show how biochemical processes that we're familiar with originate from repetitive "destructive" thought processes. We will show how this ultimately leads to distortions in amino acids; distortions which we're yet not empirically familiar with but can already hypothesize - and experimentally observe in the future. This includes holding vs releasing, remembering vs forgetting and releasing, hope and will vs despair, authenticity vs servitude/pleasing, surrendering vs giving up, and more.

[PS: I'm attaching a few diagrams that describe the multi-layered mind/brain, emphasizing the emotional-chemical-biological-physical processes that can provide a coherent explanation to the genesis of diseases in the human body - primarily brain diseases.

#### 171. The Crucial Role of the Penrose-Hameroff and Stapp Paradigms in the Present Shift of Scientific and Philosophical Thinking

Gerard Blommesteijn, Quantum Reduction Connects

From the Enlightenment Age (the late 17th and 18th centuries) religious thinking diminished and rational explanation gradually took over. This left us with a world of

only matter, behaving strictly causal, with no explanation for the ‘I of the mind’. The advent of Quantum Mechanics (early 20th century) brought a new perspective for the understanding of consciousness. Von Neumann introduced the term abstract “ego” for the ultimately observing entity. He defines this by shifting the boundary between the observed portions of the world and the observing portion, step by step from (a) between the system actually observed and the measuring instrument, via (b) just in front of the retina of the observer, to (c) behind the totality of his retina, nerves and brain, only leaving the abstract “ego” as the ultimate perceiving faculty, whereby the results of process 1 (also called collapse or reduction of the wave vector) are perceived. In my presentation I would like to show that the approaches of Penrose-Hameroff and Stapp are crucial steps in the direction of uniting modern science and philosophy with the abstract “ego” principle, which is nothing of nerves and brain, it is beyond. So the lost consciousness is back.

### 172. Quasars of Introjection, or as Consciousness Swings

Elena Menshikova, New Institute For Cultural Research

The language of science discourages intuitionists and creative creatures who work out for a “Socratic dialogue” with themselves or Being another language - those invisible mental passes that the Muses braided their pigtails hairstyles, and therefore a different “communicator” of interjections of perception and phonemes of meaning is needed, and I think, language of poetry could become such a regulator in the homing of a cognitive bridge. Poetry is not only “riding into the unknown”, it is a kind of Koine Greek, or pidgin, which makes many go from prostration to thinking and, on the contrary, offers a good shake-up – a different register of deliverance of the frustrations that make the world percept dull, artificial, false, dooming the brain to doze with a routine sleep. Synoptic connections in the course of poetic excitation are enormous, if not flammable, everything works with breakneck speed, with Bengali sparks of words from one cup of allegory, when in poetic “throwing” Consciousness searches for and finds the synapse that gives rhythm, meaning, and an image, and, extremely quickly - in a flash, improvising with the intuition and the stubbornness of the mind that it simply exercises in the paths of the tropes - as if hanging on the rafters of imagination, swaying on perceptions and jumping over all the tackles of the mysterious caravel that floats in your depths his brain is his route, according to his fairway, without a navigator knowing how not to change his own course. In part, Consciousness is the gene of resistance that drives evolution by the evolutionary method - empathic Qualia - the subjective perturbation of “natural selection”, the choice of which is not limited but stress-resistant to mistakes. In a word, correlation is possible by pressing your own key - the will, and the will of the Mind, who himself knows what is right and what is not. Metaphor is the shortest path to meaning. So, contrary to tradition, but paving the way for the new, I give my definition of Consciousness closer to the finale: “Consciousness is self-organizing Chaos, which acts as a resonant system in the structure of dissipative Being, creating eidoses of perception and hiding quantum of meaning in art, producing enzyme of resistance to being-in-the-world, and therefore, it is also the art of resistance”.

### 173. The Science of Consciousness [CIT]: An Upanishadic Perspective

V. Sujata Raju, Department of Philosophy Daulat Ram College, University of Delhi

The Mandukya Upanishad/ Mandukya Karika, one of the principal philosophical treatises brings out the nature of Consciousness through a comprehensive and rigorous investigation of the three states, namely, wakeful, dream and deep sleep. This methodology reveals that Consciousness is non-dual, unborn, continuous and pervasive in and through these three states of experience. The experiences of these three states radically differ from one another, yet the one who goes through them remains the same.

Consciousness can only be expressed through negation. Negation of all attributes does not mean that it is a mere void, as all illusory appearances have a real substratum. Consciousness is the substratum for all appearances including the body and the phenomenal world. Consciousness is not a characteristic of mind but self-manifesting principle of awareness. It is the Subject, not in the sense of ‘knower’/‘cognizer’, but in the sense that it is the ultimate revealing principle, the transcendental a-priori, which itself is not revealed by anything else.

The revelation of the Consciousness and the falsification of the three states are simultaneous and not successive in time. Consciousness is the essence of the knowledge of one’s Self, which is to be realized.

### 174. Two Arguments for Consciousness

Zhihua Yao, Department of Philosophy, The Chinese University of Hong Kong

In recent decades, a great variety of theories of consciousness are developed to account for what a mental state’s being conscious consists in. Among these theories, the most important contributions to the study of consciousness are the research on higher-order mental states and the controversies between higher-order and first-order theories and between different versions of higher-order theories.

In the history of Buddhist philosophy, there were also a great variety of theories addressing the issue how mental states become conscious or aware of themselves. By relying heavily on the metaphor of lamp, the early Buddhist school of Mahāsāṃghika and later Yogācāra-Mādhyamikas proposed a reflexive model of consciousness. This reflexive first-order theory was fiercely criticized by the Sarvāstivādins, who hold that mental states become conscious only when retrospection or reflection takes place in the second moment. This move toward a higher-order reflective model of consciousness makes memory or temporal consciousness a central theme in their discussions. By resorting to the very memory argument, Dignāga, a representative of the Yogācāra-Sautrāntikas, developed his concept of self-consciousness (svasamvedana). In the current paper, I will introduce the main Buddhist theories of consciousness by focusing on two major arguments: the lamp argument and the memory argument.



### 175. Modelling Neuro-Psycho-Physical Parameters of Inner Experiences: An Integrative Mixed Methodological Experimental Study

Pooja Sahni, Indian Institute of Technology Delhi

[with Prakash Sahni, Jyoti Kumar, Indian Institute of Technology Delhi]

EEG studies have provided evidence of enhanced structural plasticity, brain synchrony, and neural oscillations. On the other hand, novel experience monitoring tools can yield an in-depth understanding of the human mind. This study employs, a mixed methodology approach to comprehensively study the neuro-psycho-physical pathways that are functional during experiences in the natural environment. The study investigates the impact of nature experience on affect, cognition and brain oscillations through qualitative first-person subjective reports of inner experience (Price & Barrell, 2012), cognitive tasks and EEG to measure brain activity respectively. We randomly assigned 25 right-handed subjects (mean age = 26.6 yrs, SD=3.4; 16 males) to a 15 mins exposure to either audio-visual of the natural environment (n=14) or resting with eyes open (n=11). Results of pre-post data analysis show nature experience elicit i) increased positive affect ii) improved attention and enhanced memory corroborated by, iii) presence of higher alpha and beta in ‘fronto-parietal network’ altogether suggesting a state of ‘relaxed alertness’ after nature experience. There was no significant change in the engagement index during post-test cognitive task indicating an instorative effect of nature experience. Nature experience also induced a stronger correlated activity across different brain regions with a right lateralization known for creative thinking and consciously practicing mindfulness. It was interesting to note that subjects engaged in meditation independent from meditation technique and degree of experience, also report similar neural activity. Therefore, nature experience may be considered to promote the first basic change in the course of meditative development.

### 176. The Choice-Making Theory of Consciousness

Mark Friedman, Center for the Study of Social Policy

Evolutionary theory teaches that all modern biological functions have precursor forms. A growing scientific consensus holds that consciousness is a biological function and therefore a product of evolution. To understand human consciousness, we must first understand its precursor forms. What biological function, present throughout evolutionary history, could have become consciousness? One answer is “choice-making.” The first function of all life is acquisition of nutrients necessary for survival and reproduction. The earliest choices were about selective ingestion of contacted substances. Following the line of animal evolution, choices about movement enabled greater contact with nutrients. The animal capacity for directed movement, required a centralized function to mediate choice of direction. The modern self is descended from this function. Animal food acquisition strategies became increasingly complex. Predation increased choice-making complexity for both predators and prey. Animals began to cohere in

social groups as early as 150 ma, requiring choices about social competition for food and mating. Sexual selection and choices associated with tool use and language may be largely responsible for the level of choice-making complexity in humans. All functions of the human mind-brain can be viewed as choice-making functions. Choice-making is the evolutionary “purpose” of the mind-brain. Human consciousness is hyper-complex choice-making.

### 177. The Mind as a Swiss Army Knife: Assessing Arguments in Favor of the Massive Modularity Hypothesis

David Villena Saldaña, Department of Philosophy, Lingnan University

Evolutionary psychologists have strong claims about the origin, architecture, and functioning of the mind. After getting rid of the Lockean metaphor of the mind as a tabula rasa or blank slate, they introduce a new one: the mind as a Swiss Army knife. They argue that human mind is “not a general-purpose computer but a collection of instincts adapted for solving evolutionarily significant problems - the mind as a Swiss Army knife” (Pinker, 1994, p. 420). This means that our behavior is produced by hundreds of innate domain-specific psychological mechanisms or “mental organs” (massive modularity hypothesis) that evolved during a period of time that is coextensive with the Pleistocene epoch. Furthermore, we are invited to think of the consequent mental architecture as the “universal human nature”. I would like to assess the main arguments advanced in favor of the Massive Modularity Hypothesis as well as the method (reverse engineering, functional analysis) used for identifying the hypothesized modules in the context of evolutionary psychology. This implies an evaluation of the feasibility of evolutionary psychology since the Massive Modularity Thesis is one of its mains theoretical tenets.

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### 178. Electroencephalography Reveals Neural Correlates of Death Awareness

Shihui Han, Peking University

[with Yue Pu, Peking University]

The recognition and realization of our own mortality, or death awareness, characterizes human thoughts and influence our behaviors substantially. Although people usually avoid thinking about death due to existential anxiety, death awareness can be easily triggered by external stimuli. However, the neural correlate of death awareness induce by perceived stimuli is unknown. We recorded electroencephalography from healthy adults while viewing black and white cartoons of skulls and neutral/fearful faces presented upright or upside down at the center of a screen in a random order. Participants pressed a button to respond repetitions of the same cartoon in two consecutive trials. Participants also completed an implicit association test (IAT) by responding skulls/neutral faces and death-related/unrelated words. Reaction time results of IAT demonstrated reliable associations between skulls and death-related words. Upright skulls elicited



a negative neural responses peaking at 130 ms after stimulus onset over the parietal electrodes. The amplitude of this death-awareness related negativity (DRN) predicted stronger self-report of death anxiety across participants. The inverted skulls decreased the amplitude of an occipitotemporal negativity (N170), unlike inverted neutral/fearful faces that enlarged N170, relative to upright stimuli. Our results highlight an early neural response that is correlated with death awareness in human adults.

### 179. Electronic Music Production: From Individual Consciousness to Mass Resonance

Daniel Montoya, Fayetteville State University

Electronic Music (EM) is produced using virtual and analog electronic instruments. This creates the misconception that EM is cold and robotic. However, as all music, EM aims to create emotional effects in the listener using three main elements: drum, bass and melody. Paradoxically, EM is usually created in isolation, most of the time produced by lone individuals, with the aim to create an emotional experience in a group setting. A modern producer needs only a computer and headphones but he can manipulate the physiological activity of a crowd, producing euphoria or trance states. EM stands in the intersection between the individual and the group. We use the resonance theory proposed by Hartmut Rosa to understand this phenomenon. Rosa indicates that resonance happens in the intersection between the subjective and the objective world. Resonance can be established only if four criteria are satisfied: affection, emotion/autonomy/efficacy, transformation and elusiveness. I propose that EM satisfy all these criteria when the right group context is present. This phenomenon is essential to human beings and has the power to shape our conscious experience. I will discuss how the characteristics of resonance can be used as a key to bridge subjective and objective processes.

### 180. The q-Deformable Isoqualitative Gauge as a Bridge Across the Explanatory Gap

Donald Mender, Yale University

This presentation adapts a q-deformable gauge construct to generalize the verb-like operator syntax of quantum observables into a bridge across the explanatory gap. Pre-quantum dualistic roots in nominative reifications of subject and object have already been partially circumvented by quantization common to disembodied quantum-cognitive models and postulated quantum neurophysics. However, these domains, though both quantized, retain two residual gaps. First, Heisenberg uncertainty applies to canonically conjugate observables but not to mutually “compatible” sets of psychological observables, including quantifiable “qualia.” Second, wet and warm biological milieus may thermally decohere quantum-neural wavefunctions.

An “isoqualitative” gauge is proposed to address the above issues. A q-deformable type of gauge is chosen because it can adjust commutator values for second-quantized habituated/dishabituated differences among qualia-operators in relation to physical

observables, which via quantum photosynthetic energy transfer without decoherence over time engage the brain’s metabolic fountainhead.

Scaling of pertinent quantum coherences is provided by a string-like configuration of the gauge. Antishielding thus appropriately masks psychological effects at scales requiring the apparent causal completeness of physics. Knotted “string” topologies offer a possible meta-taxonomic scaffold for other philosophical approaches to consciousness.

Future empirical testability of the entire model may relate to predicted and observed vacuum energy values.

### 181. Homo Spiritus and Radical Compassion: A New Paradigm for Heart-Based Journalism

Dayle Ohlau, California Institute of Integral Studies

Historical analysis charts the intersection of democracy and journalism affected by politics and culture. Transformation in the field of media and journalism enacted by hypercapitalism and the U.S. government, specifically, the Federal Communications Commission (FCC), has facilitated a culture of fear for profit. Could a new journalistic paradigm alter the trajectory of false news and information amplified by voices born of fear (Maher, 2016) motivated to manipulate the body politic?

US Founding Fathers believed a free press vital to democratic debate, but if journalistic gatekeepers are motivated by ratings and readership for profit, is the press free? How did the evolution of culture evolve into a climate of false news and information? Is this a contemporaneous phenomenon, or one exacerbated by current technologies often used to distort and polarize public opinion? Did culture determine this path of twisted journalism, or did journalism create tones of outrage (Maher, 2016)?

I propose a theoretical historical inquiry hermeneutically examining journalism through the theoretical lens of cultural evolution charting societal changes and group behaviors beginning with journalism pre World War I, before the advent of broadcast journalism. I will analyze how journalism responded during times of traumatic cultural events and change.

The heuristic epistemological study of the past focuses on the political and economic aspects of journalism specifically, media generally, with particular attention on the axiology of culture.

This inquiry will serve postdoctoral praxis for heart-based journalism founded on the basis of radical compassion and necessary community. A commitment void of fear and manipulation for profit to actively serve local communities, contributing to other and living cooperatively (Roosevelt).

Keywords: compassion, false news, ethics, culture, necessary community, heart-based spiritual dominance, homo spiritus, journalist activists

**182. A Process GRW Universe Composed Solely of Agents Possessing Free Will**  
Peter Ells, Independent

The Ghirardi, Rimini, Weber (GRW) interpretation of quantum mechanics naturalises measurement, unifies the macroscopic and microscopic, and explains why macroscopic objects have well-defined trajectories. A fault of GRW is that it proposes random (causeless) localisation events; because absolutely causeless events are metaphysically dubious. This presentation instead proposes that the universe consists of nothing other than agents possessing free-will in the (alternate-possibilities) sense of Conway and Kochen's Free Will Theorem. Localisations depend on the choices of agents, whose propensities to act are given by the GRW statistical rules. The model: (1) specifies the agents in explicit physical terms (by maximally factorising the total wave function at that moment in history into factors that are mutually unentangled); explains (2) how inconsistencies among agents' choices are resolved; (3) how the universe's fixed past develops over time by adding single layers of space-like separated localisation events; (4) how agents come into being, combine and die: when another layer of localisations is added, the total wave function is changed slightly. Despite philosophical differences this model is empirically identical to the original GRW model. But, in contrast to the original, it is easy to demonstrate that this model satisfies the Free Will Theorem.

**183. Consciousness as a "System of Intentional Functions" – Functions of Habituality**

Marek MM Maciejczak, Warsaw University of Technology, Warsaw

Husserl, in his later writings, described consciousness as a "system of intentional operations". Its correlate is a coherent and characterized by regularities world. The approach makes possible a better understanding of this complex whole, which is consciousness, the basis of its extraordinary effectiveness and fragile autonomy - relative independence from the systems in which it is placed. S. Strasser expressed Husserl's goal aptly: "If consciousness reaches full clarity with regard to its immanent causality (Leistungen) and its intrinsic rights, its transcendence cannot be contrasted as essentially mysterious". In the system of intentional functions, the important aspects is habituality - models, patterns, mental representations that arise in a series of homogeneous experiences. I would like to present the processes of "typification" which pre-determine the type of object, its features and properties, as well as the ways of its cognition. How combined into wider structures – networks, they define the scope of practical possibilities, purposes and interests of the subject. Their contribution to the shaping of concepts and the range of purely cognitive capabilities of the subject is also important.

**184. Social Adaptation of Immigrant Students Through Language and Literacy Acquisition**

Galina Richardson, Stonewall Middle School

With the increase of immigration, the number of bilingual students in Prince William County Schools (PWCS), Virginia, USA has grown significantly. During school year 2006-2007 there were 11,719 bilingual students in PWCS, and in 2018-2019 this number increased to 23, 432.

Being a teacher of English for Speakers of Other Languages, I am helping my students to improve their skills in four language domains: reading, writing, listening, and speaking. Schools in Virginia are implementing the World-Class Instructional Design and Assessment (WIDA) Standards. WIDA standards are derived from the 4 recognized language domains, address the different proficiency levels of English learners, and are aligned with Virginia Standards of Learning.

Another important part of my job is to help immigrant students find their identity in a new home country, get adjusted to the new culture, and find the best way to keep their own culture and language alive.

My presentation describes how social adaption of immigrant students is achieved through language and literacy acquisition. It focuses on bilinguals' language perception, comprehension and production in four domains as determined by WIDA Can Do Descriptors, and cross-linguistic influence in acquiring literacy and meeting minimum expectations established by Virginia Standards of Learning.

**185. Early Christianity About the Notions of Time and the Redemption of the Soul in the Works of Early Patristic Authors**

Elena Ene D-Vasilescu, University of Oxford

Early Christians fathomed that the human soul, despite being created, transcends historical time; from a limited existence (peculiar to it as a created entity) it is apt to progress to the time of God, and thus to be redeemed. The argument of this paper is that they held such a conviction because of a genuine belief in the manifestation of the Holy Spirit within, and not because of a need to console themselves for disappointments in connection with eschatological promises, as some researchers suggested.

When comparing the writings of the Patristic authors who lived before the eighth century from the perspective of how they treat the nexus time-salvation, one might at first be misled into believing that they propose two clearly distinct ways of approaching it: one metaphysical and one more explicitly concerned with it from the perspective of human history. But such a distinction does not do justice to the complexity of Patristic positions.

**186. The Thermodynamics of Perception**

Eva Deli, Institute for Consciousness Research, Nyiregyháza

The brain maintains a resting state via subtle regulation of electric flows associated with small potential differences. We analyzed the resting state in light of two fundamental physical principles, the reversed Carnot cycle and Landauer's principle [1]. Landauer's principle in the brain means that higher frequency evoked activities correspond to enhanced 'temperature,' whereas recovery of the resting state correlates with cooling down [2]. Activation and recovery, which form and the two sides of the brain energy-information cycle, can be analyzed within the Carnot cycle. The organizational stability and high entropy of the resting state form the recurring ground state of this loop. Such self-regulation is an essential quality of neural systems. Because the information value of the stimulus depends on the personal history of the organism, the resulting synaptic changes have a holographic nature. Improving responses to stimulus form a mental abstraction of the environment and lead to learning, which maximizes the system's potential to respond intelligently to future changes [3]. The above principles might apply for deep learning systems as well [4].

1, Deli, et al., (2018) J.Neurosci.Clin.Res 3:1

2, Fingelkurts and Fingelkurts, (2014). Front.Psychol.5:395.

3, Wissner-Gross and Freer, (2013). Phys.Rev.Lett. 110:168702.

4, Shwartz-Ziv and Tishby, (2017) <https://arxiv.org/pdf/1703.00810.pdf>**187. A Universal Model for Hallucinations and Its Implications**

Wenge Huang, Independent

From a unique perspective, this paper attempts to propose a universal model for hallucinations to reveal the essential rules concealed beneath various states of hallucinations. Our starting point is that there are two pathways through which to affect perception: When false internal stimulations and external objective stimulations affect perception together, the changes in their relative strength will result in the consistence, breakdown and re-consistence of the five senses, leading to three basic states of hallucinations (one can distinguish reality from fantasy, one cannot distinguish reality from fantasy, and reality and fantasy are totally reversed). Moreover, the inconsistency of the five senses can also explain the generation mechanism of out-of-body experiences, synesthesia and various marvelous psychedelic phenomena in altered states of consciousness (ASC). Furthermore, the third state of hallucinations suggests a novel hypothesis to interpret extrasensory perception (ESP): the essence of ESP is that false internal stimulations are mistaken as external objective stimulations which enter through sensory organs, while real external objective stimulations are mistaken as perceptions which do not result from sensory organs when one is in deep hallucinations.

**188. Is Our Consciousness a Holographic Construct of Parallel Multiverses?**

C.M. Chantal Toporow, Altruistic Engineering Consultancy

The full panorama of an uncanny number of recorded anomalous, and subjective human experiences, over millennia, demands to be seriously considered for their inherent value in developing a whole, non-myopic science, where Newtonian-objective and Goethean-subjective parameters weigh equally. Baruss and Hein's independent treatises on the Multiverse concept and, Talbot's Holographic Universe (developed from the work of Aspect and expanded upon by Bohm), all elucidate a clearer understanding of this Consciousness phenomena.

Current objective science requires us to repeat experiments to drive forward the theories of our universe. To do this, the scientist must remain impartial, detached, and nonexistent in the "experiment". Millions have NDEs, past life memories, apparitions, etc., yet those once-in-a-lifetime, non-repeatable events cannot be used in furthering science, as we know it. J. Long recently gathered 9000+ NDEs; even in 1505 lies a data point, Hieronymus Bosch painted in exquisite detail the NDE being manifested today. NDEs also have similarities to UFO, abduction reports, etc. Do we just continue to ignore the vast amount of one-time, non-repeatable subjective experiences, or do we begin to go forward to build a valid science of the subjective taking into account those subjective experiences in their individualistic totality across time and space?

**189. Transcranial Photobiomodulation Effect on Brain Functions and Consciousness**

Lew Lim, Vielight Inc.

Transcranial Photobiomodulation (PBM) involving the delivery of light energy to the brain is emerging as an effective non-invasive brain stimulation method. For many years, research has shown that it has the potential to address a number of clinical conditions such as dementia, brain injuries and depression. Today, its potential for enhancing mental cognition is beginning to surface. Recent investigations on PBM are showing that it has the potential to acutely affect mental performance. We are also now observing its potential to induce altered states in very short time duration during meditation. The theory that the mitochondria respond to near infrared light provides strong clue that with PBM, modulation takes place at a biologically fundamental level. More recent literature reveals that there are multiple mechanisms that lead to higher level effect – in brain networks and consciousness. There is also increasing awareness that the photons being a quantum particle of pure energy could have exponential effect on mental states if we learn how to harness them.

It leads to the enticing question of how far PBM can take the brain functions and consciousness. This question, the evidence and ongoing research will be discussed in this presentation.

**190. The Archetype of the Number and its Reflections in Contemporary Cosmology**

Alain Negre, Independent researcher, Saint Martin d'Hères

According to Jung and Pauli, physics is intimately related to psyche at a deeper level of reality. Mental and material states are dual aspects of an underlying reality that itself is neither mental nor material, a psychophysically neutral reality. Archetypal images or symbols are visible manifestations in consciousness of the archetypes-as-such which are pre-existing principles of organization. The number, “archetype of order which has become conscious,” points to the idea of a numerical field in which individual numbers figure as rhythmical configurations. While these qualitative aspects of the number belong to a clear-cut level of reality distinct of that of physics, they may reflect onto other planes of reality like the interpretations of modern theories of wholeness such as the contemporary prevailing model of the universe. We will explore the possibility of reflections of archetypes of Three and Four within the narratives that stem from this model, fitted with some speculative theories involving quantum gravity and physical models of consciousness. Standing out of the surrounding flow of cosmological events, a 4×3 fourfold structure attracts attention. It could bring about a new way of thinking in cosmology that would help to reconceptualize the world and make sense of life and consciousness.

**191. First-Person Research on Perceptual Reversals – Implications for the Mind-Brain-Problem**

Johannes Wagemann, Alanus University, Institute for Waldorf Education, Inclusion and Interculturalism, Mannheim

In view of the hard and, as yet, unresolved problem of mind and brain, new research strategies seem to be needed. Apart from obtaining increasingly accurate neurophysiological data or opening up new meta levels of philosophical debate, the constitutive phenomena of consciousness – as one side of the problem – should be explored with an adequate methodological rigour. This requires in particular the advance of experimental research in the field of pre-reflective mental states and actions, which are potentially supposed to play a central role in the constitution of everyday consciousness. In this talk, a structure-phenomenologically inspired first-person approach to mental micro gestures in perceptual reversals is demonstrated in respect of its method and results from empirical studies. From here, indications of a generalisable diachronic basic structure of mental action in perceptual processes emerge, the implications of which for a trans-categorical conception of the mind-brain relation will be outlined.

**192. Who is Kim Smith, Anyway?**

Tim Roberts, Independent

The problem of subjective experience remains a major topic of debate amongst researchers in both the philosophy of mind and the foundations of artificial intelligence. David Chalmers has referred to this as The Hard Problem of Consciousness, since subjective experience appears to resist most attempts at a functional description. Theories involving 60Hz oscillations in the cerebral cortex, Bose condensates, and quantum collapse in microtubules have all been proffered as offering potential solutions to the Hard problem, while some other researchers seem eager to retain an essentially dualistic world-view. This paper proposes an even more fundamental problem, potentially disturbing to both sides of the materialist / dualist divide: given that conscious organisms exist in the world, how can it be that one of those organisms happens to be you?

**193. The Brain Field Dynamics of Meaning and Knowledge Creation**

Joshua Davis, The Embassy of Peace, Whitianga

Human consciousness has been the subject of many debates from the tenets of ancient wisdom where unitary consciousness, enlightenment or God Consciousness have been proposed to be subjective states or levels attainable in human life with their associated benefits of inner peace and wisdom for example, provided that the right spiritual, biophysical and environmental conditions are met, as explained in “The Brain and Paradigm of Melchizedek”, a novel cognitive neuroscience approach to spirituality. This poster presents two theories-paradigms, one based on classical field brain dynamics and the other based on quantum theory and brain dynamics and it explores a potential synthesis between the two. It also elaborates on another potential synthesis between the spiritual and biological aspects of consciousness via a hypothesis about the creation of knowledge and meaning in the brain, which departs from the exclusive neuron doctrine to a systems neuroscience concerned with the pulse-wave-pulse conversion, hand in hand with the energetics of the brain involved in intentional action and values-based decision-making. It concludes with future integrative perspectives where the inquiry about the possibility of potential quantum mechanical causes behind action potentials are briefly discussed.

**194. Brain Functional Microstates as Neurobiological Substrates of Consciousness**

Thomas Koenig, Translational Research Center, University Hospital of Psychiatry Bern, University of Bern

Conscious experiences are unitary, intentional, and come in particular experiential qualities. Modern theories of consciousness aim to understand these properties conscious experiences as being realized through brain processes that somehow represent the mental content of these experiences. In the analysis of human multichannel EEG data, the observation that the brain spontaneously displays so called

“microstates” seems to be able to accommodate a series of these central qualities of conscious experience. Microstates are assumed to reflect sub-second, transiently stable brain states that are defined by potentially widespread neural networks with nearly synchronous dynamics. Conceptually, the observed simultaneity among widespread cortical networks may account for the unity of conscious experiences, whereas the particular type of network activation may account for the intentional direction and the qualitative mode of an experience. Empirically, microstates have been found to depend on the type of content that is momentary in the subject’s mind (e.g. visual, auditory, verbal experiencing) and to be altered in diseases that affect conscious cognition (e.g. schizophrenia or dementia). At the same time microstate-like brain activity may also be observed in unconscious subjects, suggesting that what constitutes a microstate may not be sufficient to materialize a conscious experience. On my poster, I will present the central observations and conclusions of the microstate model, give an overview of the existing empirical knowledge obtained in subjects in various normal and abnormal conscious modes, and present potentially interesting links between microstates and existing theories of consciousness.

#### **195. Spiritual Development for a Better World Order from the Perspective of Eastern Religion of Nirguna Saints**

Siddharth Kumar, P Sriramamurti, Dayalbagh Educational Institute

This paper, encapsulates the concept of Self, Ultimate Reality, Spiritual progression, as explained by the Eastern religion of Nirguna Saints – Sant Mat, specifically Kabir Sahab, Tulsi Sahab and Soami Ji Maharaj. The paper studies the correlation between spiritual development of human beings and social order. It has a supposition that spiritual awakening results into healthier social environment, which further establishes a better world order – based on peace, harmony and coexistence of all spiritual beings. The paper highlights the concepts of Superman, for better worldliness as expounded by the Eastern Religion of Saints.

#### **196. Effect of Meditation on Pregnancy**

Ajit Srivastava, Gur Devi Srivastava, Dayalbagh Educational Institute

100 pregnant women above 24 weeks of gestation were studied in O.P.D. of Saran Ashram Hospital Dayal Bagh Agra. Ultrasonography was performed during meditation (Recitation of holy mantra Radhasoami) for half an hour to see the foetal movement counts. There was significant increase in foetal movement counts during period of meditation indicating foetal liking for meditation. We recommend for all pregnant women above 24 weeks of gestation regular meditation practice for at least half an hour a day to increase the positive energy and level of consciousness of the foetus with the aim to get a new generation of physically fit, mentally alert and spiritually blissful - Supermen of tomorrow.

#### **197. An Investigation into the Pineal Gland and its Secretion to Understand the Chemistry of Consciousness**

Manju Srivastava, Aseem Srivastava, Siddharth Kumar, Khusboo Rawat, Dayalbagh Educational Institute

We all have a secret passage within us as part of the architecture of our brain, which has a capacity to consciously connect with higher intelligence. This passage is activated by the pineal gland when it secretes a hormone similar to melatonin, generally known as METAtonin, a similar but Higher Octave of melatonin. The chemically active ingredient in METAtonin is known as DMT.

#### **198. Numeracy Skills: The Role of Executive Functioning and Sleep**

Aditi Bapte, Kailash Vashistha, Dayalbagh Educational Institute

Numeracy skill is one of the key components to master academic success and one such factor that aids this success is Executive Functioning (EF). EF is the cognitive construct that controls an individual’s behavior to attain the desired goals and achieve academic success. The researches (Moreau, 2013; Tucker, 2010 & Lis, 2008) show a positive effect of undisturbed sleep on the skills of Executive functioning of children. When it comes to sleep, difficulties both in reference to quality and quantity can have a significant impact on children’s daytime functioning. This analysis was carried out by the standardized Children’s Sleep Habit questionnaire (Owen, 2010). In the present study the authors endeavor to study the role of executive functioning and sleep on the numeracy skills.

#### **199. Raso Vai Sah: From Aesthetic Experience to Supreme-Consciousness**

Namita Bhatia, Soami Das Bhatia, Dayalbagh Educational Institute

The glory of Paramātmā has been sung in Upanishads as blissful. ‘Raso vai saha’ – That Paramātmā is blissful. (Taittiriya Upanishad: 2/7) This blissful Paramātmā is the cause of the bliss of all. Bliss is only experienced by attaining Him. He is the one who makes everyone blissful. The experience of one’s own consciousness leads to the experience of Supreme-Consciousness.

#### **200. A Sterling Pathway for the Amalgamation of Values Education and Intuitive Ability**

Ami Chopra, Sandeep Paul, Dayalbagh Educational Institute

Humans are surrounded by an environment. Human gets input from the environment and performs an action which is projected as output. The action goes into the environment which again goes as input to human. Now the question is, what are the various factors action is based on by given input. Human is considered as a system which is defined by a state which functions on the set of values. The output is also



governed by the objective of life of a human being which defines the actions. We present a conceptual model to understand the Dayalbagh Way of life in an intuitive manner.

#### **201. Divine Inspiration: A Conscious Act of Creativity in the Literature of East and West**

Gurpyari Bhatnagar, Dayalbagh Educational Institute

Scholars from the East and the West alike have asserted the involvement of a higher force or divine inspiration in the act of creation of works of literature. Surprisingly theories from the West too have argued that three core characteristics of inspiration - transcendence, evocation and motivation are indicative of association of a higher influence which make the poet/writer create beyond his capabilities. The study reviews research and theory within the domain of literature, from both the Eastern and the Western domain to establish that inspiration is complementary to the conscious act of creativity and thus, should not be treated as supernatural or madness.

#### **202. Effect of Rehabilitation Program on Social Consciousness and Self Consciousness, and Self Esteem of Juvenile Delinquents**

Namrata Singh, Astha Upadhyay, Archana Kapoor, Dayalbagh Educational Institute

The present study has been taken up with a view to study the effect of Government run Rehabilitation Programme on the Self Esteem, Social Consciousness and Self Consciousness of Juvenile Delinquents. The post intervention scores of the students reflect a rise in self-esteem of the children showing that the students are learning to become self-reliant and gaining confidence in the process of doing so. The results also show increase in the social consciousness and self-consciousness levels which indicates the positive effect of the Rehabilitation Programme on the Social Consciousness and the Self Consciousness of the Juvenile Delinquents.

#### **203. Ebullience In Consciousness for Children**

Priya Satsangi, Anhad Satsangi, Dayalbagh Educational Institute

In general children are more exuberant. The younger the child the more exuberant he is. It is known that the amount of learning that happens in the early age of childhood is of very high degree (speech, languages, motor skills etc.). This paper attempts to correlate the ebullience in children with their increased level of consciousness as they are able to learn and better grasp the information from their surroundings. The author will present various experiments and their results to substantiate the correlation between ebullience and improved consciousness.

#### **204. Humility: An Odyssey to Consciousness**

Shashi Srivastava, Madhu Srivastava, Shakuntala Jaiman, Dayalbagh Educational Institute

In order to lead a disciplined and virtuous life pursuing the ultimate goal of life, we need to be humble and surrender ourselves in the Divine Will. Daniel Defoe in his novel Robinson Crusoe shows how Crusoe survives on a deserted island only because he had realized that he has to surrender himself totally to what God decided had for him. Whether it is the eastern or western perspective this is a universally accepted and applicable fact that ‘Humility is an odyssey to the higher planes of consciousnesses.’

#### **205. Information Consciousness within the Realm of Creation and the Power Law of Collective Observation: A Mathematical Interpretation**

Sanjay Bhushan, Nidhi Bhushan, Dayalbagh Educational Institute

At the cosmic level, the physical analogy of Information consciousness idea is best corroborated by an excellent depiction of Penrose diagram (named after mathematical physicist Roger Penrose) which is conformably equivalent to the actual metric in space-time. This conformal factor is chosen such that the entire infinite space-time is transformed into a diagram of finite size. Consciousness does not speak the language of mathematics, but it is true that one can endeavour to model it comprehensively in the language of mathematics.

#### **206. Biasing in an Independent Core Observer Model Artificial General Intelligence Cognitive Architecture**

David Kelley, Mathew Twyman, Dayalbagh Educational Institute

This paper articulates the methodology and reasoning for how biasing in the Independent Core Observer Model (ICOM) Cognitive Architecture for Artificial General Intelligence (AGI) is done. This includes the use of a forced western emotional model, the system “needs” hierarchy, fundamental biasing and the application of SSIVA theory at the high level as a basis for emotionally bound ethical and moral experience in ICOM systems and how that is manifested in system behavior and the mathematics that supports that experience or qualia in ICOM based systems.

#### **207. Experience, Experiencer and Experienced**

P Sriramamurti, C Durga Prasad Rao, Dayalbagh Educational Institute

In the Eastern tradition, human experience is understood as consciousness that manifests by dispelling the darkness of ignorance (avidya) that conceals it (avarananivrittirupa abhivyaktimatchaitanyam avagatih) and chaitanya or consciousness which is Truth, Intelligence and Bliss and shines or comes into purview as Sat, Chit and Ananda, trikalabadhya (ever existing), prajnana (intelligence) and prema (love). The

experiencer is always the Spirit entity. The experienced objects are material, mental and spiritual as the case may be. They are also classified according to the states of consciousness namely, Jagrat (wakeful), Swapna (dream), Sushupti (deep sleep) and Turiya (the fourth and above), i.e., the consciousness of Trikuti, Sunn, Bhanwargupha, Sat Loka and Radhasoami Dham.

#### **208. The Effect of Music Listening on Concentration and Work Performance: A Case Study of an Automobile Industry**

Majer Singh, Meenu Singh, Charan Prasad, Dayalbagh Educational Institute

Psychologists and scientists have been looking at the link between music with mood, concentration and better production for years. Playing background music is taken into consideration by most of the organizations with the expectation that it will reduce the work-place stresses, control ill thoughts, develop self confidence, inner strength and ability to study and comprehend more quickly. It will also develop the creative visualization, psychic power and peace of mind. The study was aimed at examine the effect of background music on the concentration which will improve the production in an automobile industry manufacturing two wheelers.

#### **209. Paradigms of Consciousness**

Sinha Anand Prem Dayal, Dayalbagh Educational Institute

In this paper, the author observes that every person gets easily affected by the worldly pleasures and pains and all equilibrium is disturbed by trivial kinds of worldly prosperity or adversity. There is a need to build the relevant ability and capability to attain an exalted life. Also, there is a growing realization among few human beings about the urgency to adopt pure or higher Consciousness to get peace of mind and steer towards a better life.

#### **210. Attainment of Nirvāna [Nibbāna-Pali] Through the Practice of Dhyāna [Jhāna-Pali] in Early Buddhism**

Bhanusree BVS, Aparna Yanamandra, Dayalbagh Educational Institute

Ever since life evolved on the earth, dukha or suffering also co-exists and the struggles and the endeavors to overcome it are also going on persistently. This paper aims at elucidating the Buddhist concept of Nirvāna Sthiti or the state of absolute sufferinglessness. Dhyāna is the highest contemplation through which the state of Nirvāna is accomplished.

It is a four stage meditative process. In the first stage, one experiences Vitarka – Reflection, Vicāra – Investigation, Prīti – Delight, Sukha – Bliss and Ekāgrata – Tranquility. In the second stage, both reflection and investigation disappear and eventually delight also gets faded in the third stage. One experiences only tranquility and equanimity after the disappearance of bliss in the fourth stage.

#### **211. Synergy of Sound and Eternity, Levels of Consciousness, Insight with Religious Notions**

Deepshikha Nigam Sood, Prabhavit Kumar Sood, Dayalbagh Educational Institute

Sound is deeply connected with the roots of all religions / Faiths, whose followers can also reach the highest level of eternal Sound by uplifting their own consciousness through meditational Sound practices. The Material and External Sound Rendering in External Spheres of the followers of various faiths affects the mind, body and soul of their adherents. The Spiritual or eternal Sound rendering through Sound practices elevates the consciousness level of the soul, which leads the followers towards the ultimate goal of life, by achieving the oneness with Eternity or The Supreme consciousness.

#### **212. Marriages Made in the Garden of the Merciful Lead to Dynamic Evolution of a New Race of Awakened Beings**

Vineeta Mathur, Anjoo Bhatnagar, Dayalbagh Educational Institute

Scientists and the general masses do not know the supreme purpose of Creation. In the Religion of Saints it is believed that there is an interlinking in the physical, mental and spiritual evolution i.e. evolution enables the spirit entities to get evolved forms of brain and mind so that they become more spiritually aware and ready to perform new methods of devotion and polity and hence to attain the objective of creation. Marriages performed in the Garden of the Merciful would definitely result in the dynamic evolution of a new race of spiritually awakened beings.

#### **213. Consciousness Enigma: An Approach with Quantum Turing Machines**

Preeti Sinha, Dayalbagh Educational Institute

In this paper, the author has taken up a typical case of human life consciousness to explain the various conditions involved in emergence of higher levels of consciousness, whereby the different brain centers are energized in producing the various states of consciousness. There are several areas in the brain which have different duties assigned to them and which, on being energized, produce different experiences. This paper addresses the linkage of Consciousness with Quantum Turing Machine (QTM) through the usage of the qubit states.

#### **214. Meditation: Gateway to Infinite Joy**

Hans Mohan, Kanika Kayastha, P Sriramamurti, Dayalbagh Educational Institute

Meditation practice requires much patience and dedication, and it matures with perpetual training and experience. The ‘eyes of observer’ and ‘mind of the seeker’ help in attaining the mastery over the ‘art of meditation’ in the course of time under meticulous guidance. Mere knowledge of scriptures is inadequate to achieve the eternal

all-pervading omnipresent divine consciousness. Mankind continues to seek happiness in the outer things of life-in physical possessions, social positions, and personal powers. They are short-lived; they neither bring happiness nor contentment; they result in greater cravings and aversions. As a consequence, more and more people are suffering from neurosis, psychosis and psychosomatic ailments, because modern man is full of emotional stress, frustration and anxieties infected with confrontations and sorrows.

#### 215. Consciousness in Plant System

Mrinalini Prasad, Rajiv Ranjan, Dayalbagh Educational Institute

Consciousness is the quality or state of awareness, or, of being aware of an external object or something within oneself whereas plant consciousness is the process of bio-communication (Perception) in plant cells. Plants being sessile continually sense, feel and monitor their internal and external worlds for informational/functional shifts in the relevant fields. Plants possess a highly developed, conscious root brain that works much as a human does to analyze incoming data and generate sophisticated responses. Plants might be considered as smart and intelligent systems which perceive / react to any internal or external signals very efficiently.

#### 216. Aparavidya to Paravidya: Snakes and Ladders Board Game as an Edutainment Tool of the Hierarchy of Spiritual Consciousness

Seema Bhat, Prashant Talwar, Sridhar Kotti, Dayalbagh Educational Institute

We have designed and developed a new Snakes and Ladders (S & L) board game based on the rudimentary modeling framework for spiritual domains. The effectiveness of this S&L game in learning about the spiritual domains of the Radhasoami Faith was studied in children and adults in North America. We will present the design, features and instructions for playing this new S&L game. We will also present the data of the preliminary studies conducted for evaluating the usefulness of this game in learning the spiritual domains of the Radhasoami Faith in children and adults.

#### 217. Subjective Experience: The Basic Aspect of Consciousness

Tatavarty Neh Satsangi and Guru Sant Tatavarty, Dayalbagh Educational Institute

This paper investigates how subjective experience helps mosquitoes (*Culex quinquefasciatus*) developing resistance against permethrin (larvicide). The experimental study was conducted in two cycles and the experimental set up consists of bioefficacy study on the larvae of *Culex quinquefasciatus*, and later their acetylcholinesterase (AChE) activity was measured using Ellman's reagent. AChE is an enzyme that catalyzes the breakdown of acetylcholine and of some other choline esters that function as neurotransmitters. The results obtained by experiments are further analyzed for genesis of human consciousness.

#### 218. Management of Human Consciousness: An Empirical Approach

Guru Sant Tatavarty, Vikas Tripathi, Dayalbagh Educational Institute

We have provided a systemic approach on how the moral and spiritual reawakening can contribute immensely to the growth of societies and individuals. We have conceptualized a comprehensive process for assessment of level of consciousness and have developed an absolute scale of consciousness by identifying the major attributes based on the teachings of Saints. Further, based on the awareness of one's own level of consciousness, we have also developed optimal policy framework for attainment of higher levels of consciousness. An attempt has been made to show how the spark of spirit can make positive impact on millions of people, ultimately resulting in the "New World Order" and "Better Worldliness".

#### 219. Does Superintelligence Imply [Super]Consciousness?

Vasanth Lakshmi, Patvardhan Chellapilla, Jyothika Chellapilla, Dayalbagh Educational Institute

Recent years have witnessed phenomenal progress in the field of Artificial Intelligence (AI). AI can be loosely described as a field of human endeavor wherein attempts are made to make machines smarter and make them do things that need intelligence. The progress has been so rapid and, in some cases, so unexpected that some researchers have started visualizing a scenario wherein the machines would exceed human capability in all areas of human endeavor. This is being referred to as Superintelligence. This is in stark contrast to the current "narrow" AI whereby a machine can do one thing very well but is not very good at anything else.

#### 220. Consciousness and Academic Achievement

Arz Taneja, Pratishtha Bhatia, Dayalbagh Educational Institute

The purpose of this study is to understand the link, if any, between level of consciousness and academic achievement amongst students. Measuring consciousness levels and its relation to various aspects is a growing and key topic amongst the scientific community. However the literature on its linkage to academic achievement in schools is somewhat limited and provides a unique opportunity for research. The study will examine and select various factors which are useful for measurement of consciousness amongst students and then carry out surveys amongst students of Soami Nagar Model School, New Delhi.

#### 221. Nurturing Prerequisites for Higher Consciousness

Adeesh Diwan, Prem Pyara, Prem Sewak Sudhish, Dayalbagh Educational Institute

In this paper, we investigate whether elevation to higher levels of consciousness has some necessary prerequisites and if these prerequisites may be attained through training

starting at a young age. In this ongoing study, we seek to determine how thought and actions may be aligned with the necessary prerequisites through a continuous training during early years. We assess more than a hundred young subjects from a remote location in India through a survey consisting of a single session per subject, consisting of a recorded, semi-structured interview accompanied with a multiple-choice questionnaire. The results present the correlates between the absorption of this training and the lifestyle changes that such training brings towards the development of the prescribed pre-requisites among different age groups.

#### **222. Vegetarianism as a Prerequisite to Evolved Intuitiveness**

Gazal Mathur, Sohang Mathur, Bhakti Mathur, Mrityunjay Mathur, Abeer Taneja, Dayalbagh Educational Institute

In this study we venture into the locale of vegetarianism, which is gradually gaining recognition world over. Roughly 22% of the human race is now vegetarian. India (at 38%) and Israel (at 13%) lead the vegetarian bandwagon. These statistics are quite staggering considering that in the twentieth century, vegetarians were looked upon as weirdos, hippies or faddies. Yet, in just the past three years, there has been an increase of vegans by 600% in the US alone. These rising statistics warrant further research into the underlying effects of this kind of diet modification.

#### **223. A Framework towards Ultimate Moral Philosophy – Antahkarna & Higher Order Intuitive Consciousness**

Preetam Tadeparthy, Sriramamurti P, Patvardhan C, Dayalbagh Educational Institute

Today right and wrong is shrouded in the mystery of religion, culture and society. If desires of various kinds drive our existence, these desires are grown and substantiated by other aspects of mind. We show that, when we base our actions not on ourselves or the self within, which is otherwise kinetic in the wakeful state, but on something or someone with no influence from the mind consciousness, that action is sure to be a morally perfect action

#### **224. Epigenetics and Evolution of Supermen in Dayalbagh: Where West and East Meet**

Patvardhan Chellapilla, C Jyothika, Vasantha Lakshmi, Dayalbagh Educational Institute

Huzur Sahabji Maharaj, the Fifth Revered Leader of Radhasoami Faith, had stated that Satsang will produce a race of Supermen. The concept of Superman is that an alloy or an amalgam of the qualities of all the four varnas viz., Brahmin, Kshatriya, Vaish and Shudra should be formed, and a generation of men imbued with the qualities

of this alloy or amalgam should be produced. The Superman Scheme in Dayalbagh turns epigenetics on its head as it endeavors to utilize the positive impact of carefully nurtured lifestyle for the evolution of Supermen of tomorrow. This is Applied Epigenetics at its best that would eventually result in a race of Supermen with their qualities having been developed within the proven scientific basis.

#### **225. Does Consciousness Empower Horizontal Leaders? A Case-Based Approach in Technological Organisations**

Abhishek Nigam, Rupali Misra, Dayalbagh Educational Institute

The present study attempts to study the role of consciousness in empowering horizontal leaders in organisations. Using a combination of observation and case-based approach, we identify three projects which have been successfully completed in a large multi-national technological organisation. We use twenty-three item measure developed by Podsakoff et al. (1990) to measure six traits of transformational leadership, consciousness quotient (Brazdau, 2013) and self-developed questions to capture who's and why's of preferred future managers.

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