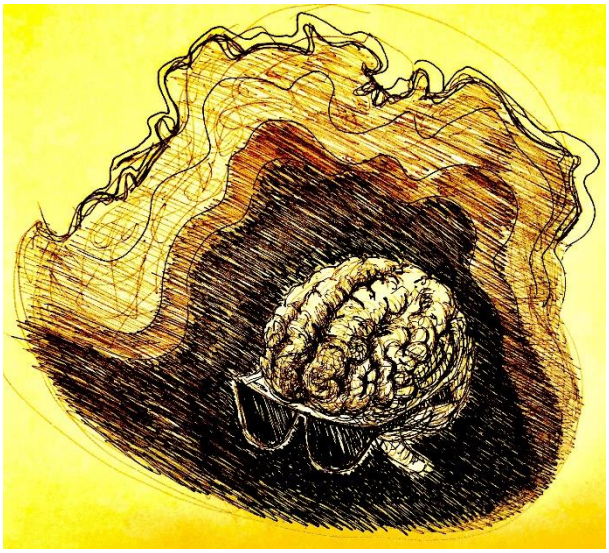

Philosophy and Neuroscience at the Gulf III
October 9-11, 2020
Third annual meeting of the Deep South Philosophy and Neuroscience Workgroup

Held on line due to the covid pandemic

Organized by John Bickle (Mississippi State University and University of Mississippi Medical Center) and Antonella Tramacere (Mississippi State University and Max Planck Institute for the Science of Human History, Germany)

Themes:
Epigenetics in the nervous system,
Mechanisms of memory from molecules to circuits,
Neurophilosophical varia

PROGRAM: PHILOSOPHY AND NEUROSCIENCE AT THE GULF III
THIRD ANNUAL MEETING OF THE DEEP SOUTH PHILOSOPHY AND NEUROSCIENCE WORKGROUP

Friday October 9

(All times US Central Daylight (Chicago) Time)

8:00am *Meeting Opens for participants to join*

8:30am Workshop Introduction and Welcome

1* Session "Molecular Tools and the Engram"

8:40am KEYNOTE **Josselyn,** Sheena, Hospital for Sick Children and University of Toronto, "Neuronal allocation to an engram underlying memory"

9:35am *Coffee Break (10 minutes)*

9:45am Robins, Sarah, University of Kansas, "The Mendel of memory? Richard Semon, ontogenetics, and the concept of the engram"

10:25am Najenson, Jonathan, Hebrew University of Jerusalem, "What have we learned about the engram?"

11:05am *Coffee Break (10 minutes)*

2* Session "Epigenetics and Evo-Devo in Behavior and Cognition"

11:15am KEYNOTE **Jablonka,** Eva, Cohn Institute for the History and Philosophy of Science and Ideas, and London School of Economics, "Genetic accommodation and the evolution of new cognitive capacities: The case of tool-making in humans"

12:10pm *Coffee Break (10 minutes)*

12:20pm Guerrero-Bosagna, Carlos, Linköping University, "Epigenetics: Bridging the gap between environmental exposures and behavior"

1:00pm (13:00) Di Salvo. Giuseppina, Università Vita-Salute San Raffaele, "Reproductive behaviour and evolution: A neuroepigenetic perspective"

1:40pm (13:40) *Lunch break (1 hour)*

3* Session "Molecule-Environment Interactions"

2:40pm (14:40) Barwich, Ann Sophie, Indiana University, 'How biology perceives chemistry: Smells as environmental kinds"

3:20pm (15:20) Bickle, John, Mississippi State University and University of Mississippi Medical Center, and **Kostko,** Aaron, University of Minnesota, Rochester, "The 'causal pathways' concept: On the emerging role of case studies from neural epigenetics"

4:00pm (16:00) *Social time and end of the first day of workshop*

Saturday, October 10

(All times US Central Daylight (Chicago) Time)

4* Session "Why Epigenetics in the Nervous System?"

8:00am *Social Time (30 minutes)*

8:30am KEYNOTE **Love,** Alan, University of Minnesota and Minnesota Center for Philosophy of Science, "Mechanical epigenetics in nervous system ontogeny: Challenges for integration and a puzzle for reductionism"

9:25am *Coffee Break (10 minutes)*

9:35am Tramacere, Antonella, Max Planck Institute for the Science of Human History and Mississippi State University, "Epigenetics in the nervous system: The ayahuasca of the mind"

10:15am Nathan, Marco J., University of Denver, "Fuhgeddaboudit! Neuroepigenetics and the future of the brain"

10:55am *Coffee Break (10 minutes)*

5* Session "Approaches in Multiscale Processes"

11:05am Jones, Mostyn, Washington & Jefferson College (retired), "How do protein-qualia correlations affect the reduction/multiple realization debate?"

11:45am Pitts, J. Brian, University of Lincoln, University of South Carolina, University of Cambridge, "How does science constrain mind-body interaction?"

12:25pm *Lunch Break (1 hour)*

6* Session "Epigenetics in Conscious Memory Processes"

1:25pm (13:25) Garavaglia, Fabrizia Giulia, Università Degli Studi di Cagliari, "Self-generated memory: When the boundaries between what happened and what is happening collapse"

2:05pm (14:05) Hopkins, Patrick, Millsaps College and University of Mississippi Medical Center, "Why is epigenetic memory research all about implicit memories and not explicit episodic memories?"

2:45pm (14:45) Kraemer, Eric, University of Wisconsin, La Crosse, "Epigenetics and rethinking the nature of mind, free will, and mental illness"

3:25pm (15:25) *Coffee break (10 minutes)*

7* Session "Epistemic and Ethical Values in Epigenetics and Neuroscience Research"

3:35pm (15:35) Purcell, Elyse, State University of New York, Oneonta, "Trauma, memory, and genetic enhancement"

4:15pm (16:15) May, Josh, University of Alabama, Birmingham, "Bias in science: Natural and social"

4:55pm (16:55) *Social time and end of second day of workshops*

Sunday, October 11

(All times US Central Daylight (Chicago) Time)

8:00am *Social Time (30 minutes)*

8* Session "Molecules, Variations and Brain States"

8:30am Viola, Marco, University of Turin, "Neuroscience beyond the Platonic brain: Addressing the challenges of individual differences"

9:10am Gessell, Bryce. Southern Virginia University, "Epigenetics and the notion of a 'brain state'"

9:50am *Coffee break (10 minutes)*

10:00am KEYNOTE **Anderson,** Michael, University of Western Ontario, "Reuse and functional flexibility in genes and neurons"

10:55am *Coffee Break (10 minutes)*

9* Session "Methodologies in Philosophy of Neuroscience and Mind"

11:05am Johnson, Gregory, Mississippi State University, "Active forgetting and the limitations of cognitive psychology"

11:45am Barack, D.L., Columbia University and **Gerraty,** R., Columbia University, "Represent represent"

12:25pm Abrams, Marshall, University of Alabama, Birmingham, "On the possibility of pseudorandom number-generating circuits in brains"

1:05pm (13:05) *Lunch and Social Time, end of workshop*

PRESENTERS, TITLES, EMAILS AND SHORT ABSTRACTS

Invited Keynote Addresses

Anderson, Michael, University of Western Ontario, "Reuse and functional flexibility in genes and neurons," 8th Session (Sunday), mljanderson@gmail.com

In this talk, rather than emphasize the apparent multifunctionality of brain regions (that is, the by now widely known and reasonably well-established phenomenon of neural reuse), I would like instead to speculate on the underlying microscale dynamics that lead to that macro-scale phenomenon. For instance, the gene npr-1, when expressed in the nervous system of C. Elegans,

can lead to specific (and different) changes in the function and behavioral effects of individual neurons. That the genetic and epigenetic mechanisms I will outline are real is not in question, but their relationship to macro-scale cognitive and behavioral phenomena is still poorly understood. Thus, this talk will not, in the end, be a recitation of established findings, nor a presentation of new ones, but will rather offer a manifesto for a future neuroscience of multi-scale dynamics. I've come to believe that the neurosciences writ large are plagued by a version of the fundamental attribution error, emphasizing the fixed function or responsivity patterns of biological elements from genes to neurons, and minimizing the importance of dynamics and contextual effects. This talk hopefully offers a small therapeutic intervention.

Jablonka, Eva, London School of Economics, Great Britain, and Tel Aviv University, Israel, "Genetic accommodation and the evolution of new cognitive capacities: the case of tool-making in humans," 2nd Session (Friday), jablonka@tauex.tau.ac.il

Taking the capacity for tool-making in the genus *Homo* as an example, I argue that the emergence of new motor capacities in our genus involved the evolution of both domain-general capacities, such as capacity for enhanced executive and emotional control, and domain-specific capacities related to manual dexterity. The evolution of these capacities was driven by cultural evolution and led, through genetic accommodation and cumulative cultural evolution, to positive evolutionary feedback loops that shaped the anatomy of the human hand, human social relations, and human culture.

Josselyn, Sheena, University of Toronto and Hospital for Sick Children, Toronto, Canada, "Neuronal allocation to an engram underlying memory," 1st Session (Friday), sheena.josselyn@sickkids.ca

Understanding how the brain uses information is a fundamental goal of neuroscience. Several human disorders (ranging from autism spectrum disorder to PTSD to Alzheimer's disease) may stem from disrupted information processing. Therefore, this basic knowledge is not only critical for understanding normal brain function, but also vital for the development of new treatment strategies for these disorders. Memory may be defined as the retention over time of internal representations gained through experience, and the capacity to reconstruct these representations at later times. Long-lasting physical brain changes ('engrams') are thought to encode these internal representations. The concept of a physical memory trace likely originated in ancient Greece, although it wasn't until 1904 that Richard Semon first coined the term 'engram'. Despite its long history, finding a specific engram has been challenging, likely because an engram is encoded at multiple levels (epigenetic, synaptic, cell assembly). My lab is interested in understanding how specific neurons are recruited or

allocated to an engram, and how neuronal membership in an engram may change over time or with new experience.

Love, Alan, University of Minnesota, "Mechanical epigenetics in nervous system ontogeny: Challenges for integration and a puzzle for reductionism," 4th Session (Saturday), aclove@umn.edu

The contemporary scientific definition of epigenetics refers to heritable changes in gene expression that result from biochemical marks, such as DNA methylation or histone modification, which are not alterations of DNA sequence. However, epigenetics has an older, broader conceptualization that refers to the complex and diverse causal interactions among different factors during development that map genotype to phenotype in organisms. Over the past two decades, mechanical epigenetics—causal interactions arising from mechanical properties of developing embryos—have increasingly been shown to play a crucial role in the development of biological traits, including many features of the nervous system: from the differentiation of neuronal cell types to the complex folding of cortical surfaces during brain morphogenesis. Most philosophical analyses of mechanist explanation in neuroscience overlook mechanical epigenetics, concentrating primarily on molecular and biochemical mechanisms within and between cells. I argue that models capable of integrating these mechanical cues and their associated dynamics with molecular processes are required to have empirically adequate mechanistic explanations of these phenomena. I sketch some of the challenges associated with this project of integration and describe a puzzle that emerges for reductionism: explanations of living phenomena that involve mechanical epigenetics—a form of physical interaction—appear to be non-reductionist in character.

Submitted Talks

Abrams, Marshall, University of Alabama, Birmingham, "On the possibility of pseudorandom number-generating circuits in brains," 9th Session (Sunday), mabrams@uab.edu

Certain animal behaviors are stochastic in ways that suggest a source of randomness in the brain. I challenge the idea that this source is quantum mechanical, and explain how brains could implement pseudorandom number generating algorithms (PRNGs). Simple PRNGs can be built using operations such as multiplication and addition that are easily implemented in neuronal networks. However, PRNGs depend essentially on quantities whose equality or difference is readily determined, while neurons operate with continuous quantities that seem to make such determination unreliable. I explain how a PRNG could be implemented in neurons using Cantor coding, which allows

properties to be coded in continuous quantities in a way that allows reliably determination of equality and difference. That neurons (or populations) implement Cantor coding has some plausibility, since researchers have argued that circuits connecting CA3 to CA1 in the hippocampus may produce Cantor coded representations of temporal sequences.

Barack, David, Columbia University and **Gerranty, R.** Columbia University, "Represent represent," 9th Session (Sunday), dbarack@gmail.com
The notion of representation is central to many philosophical and neuroscientific investigations. Here we argue that despite apparent similarities, the two disciplines use it to invoke distinct concepts. The looser notion of representation in neuroscience generalizes the philosophical concept and is committed to a *content pluralism* in which any variable in a computation is a representation. Using computational models of the hippocampus, a region known to be essential for memory in humans, we demonstrate that neuroscientists do not always use representation to carve out the truth-evaluable content promoted by philosophers. We argue, however, that the explanatory success of representation in neuroscience models is in part a function of their explananda: predictions of neural responses. It remains an open and largely empirical question whether future neuroscientific models will need to invoke the more philosophical dimensions of representation in order to explain cognition and link computation to successful behavior.

Barwich, Ann Sophie, Indiana University, "How biology perceives chemistry: Smells as environmental kinds," 3rd Session (Friday), abarwich@iu.edu
What creates that distinct fruity odor of peach instead of mango or strawberry? Orthodox explanations of odor perception in science and philosophy center on structure-odor relations (SORs) to determine which particular molecule's particular parameters may constitute its odor quality. This paper explains why an understanding of odor identification requires a systems' theoretical approach. It advances an explanation of odors as ecological kinds. What characterizes olfactory encounters "in the wild" is the unpredictability of the chemical stimulus in its environment and its interaction with the sensory system. Drawing on recent neuroscientific studies, the olfactory system is shown to be primarily tuned to track and identify the chemical environment, not classify individual chemicals in isolation. More precisely, the olfactory system measures the statistics of a changing odor environment.

Bickle, John, Mississippi State University and University of Mississippi Medical Center and **Kostko, Aaron** University of

Minnesota, Rochester, The ‘causal pathways’ concept: On the emerging role of case studies from neural epigenetics,” 3rd Session (Friday), jbickle@philrel.msstate.edu, atkostko@r.umn.edu
Lauren Ross has lately developed the ‘causal pathways’ concept in biology in extensive detail. But we derived an account from recent work on epigenetic mechanisms of fear and stress responses across generations. In this talk we compare and contrast these emerging concepts of causal pathway. Research into epigenetic mechanisms in the mammalian nervous system provide promising scientific case studies to flesh out this important concept. We find a number of distinct uses of ‘causal pathway’ at work in this science, some more unlike the more popular mechanism concept (as Ross has claimed), others more like it.

Di Salvo, Giuseppina, Università Vita-Salute San Raffaele, “Reproductive behaviour and evolution: A neuroepigenetic perspective,” 2nd Session (Friday), giusyds@gmail.com
Epigenetic researches offer a scientific perspective to address the role of environmental insults and stress exposure on the modulation of genetic expression. In this workshop, it will be investigated whether epimutations may influence evolutionary processes and, specifically, if that may happen through the alteration of the neuroendocrine system. Specifically, participants will review the role of the neuroendocrine system in controlling reproductive behaviour. Following this, the workshop will focus on the possibility of an epimutation of the neuroendocrine system and its consequences on the regulation of gonadocorticoids secretion. Such a possibility will be investigated on the hypothesis that an epigenetic alteration of the neuroendocrine system may reduce reproductive fitness – a central feature of evolutionary processes such as sexual selection. Concerning this, the hypothesis that some epigenetic modifications may have indirect evolutionary importance will be presented. Finally, participants will discuss the consequences of this indirect evolutionary effect on the basis of the Hardy-Weinberg principle.”

Garavaglia, Fabrizia, Università Degli Studi di Cagliari, “Self-generated memory: When the boundaries between what happened and what is happening collapse,” 6th Session (Saturday), giuliafabrizia@gmail.com
Could past and present coexist at the same level of reality? In patients affected by music generator epilepsy there is a clear phenomenological perception, which belongs to their past lives, that they feel as completely real. These perceptions overlap the perception of the subject’s environment, sometimes in an overly dramatic way. I propose here that a non-conventional interpretation of this kind of aberrant memories could help to shed new light on the process of normal perception and its relationship with time. I explore the aspect of synchronicity to

propose a re-reading of the waves phenomena that occur in the brain, the role that they can play in encoding information, and their possible correlation with conscious experience of memory.

Gessell, Bryce, Southern Virginia University, "Epigenetics and the notion of a 'brain state'," 8th Session (Sunday), bryce.gessell@svu.edu
The idea of a "brain state" is one concept among many which are integral to the foundations of neuroscience, but which are somewhat ill-defined. This talk examines the concept from the perspective of epigenetics. Epigenetic influences on the nervous system show that a brain state cannot just be about neuron activity, frequency bands, or local field potentials--it may also involve glial cells, the endocrine system, cell nuclei, the transcription environment, and chromatin structure. I propose that expanding brain states spatially and possibly even temporally makes them both more useful and more correct. Distinctions like "mental/non- mental" and "neural/non-neural" are to a great degree artificial, and can limit or distort our picture of nervous system function. Expanding our understanding of "brain states" to include things like the genome and epigenetic mechanisms brings our conceptual tools more in line with how the world really is.

Guerrero-Bosagna, Carlos, Linköping University, "Epigenetics: Bridging the gap between environmental exposures and behavior," 2nd Session (Friday), carlos.guerrero.bosagna@liu.se
Stressful conditions are common in the environment where production animals are reared. Stress in animals is usually determined by the levels of stress-related hormones. A big challenge, however, is in determining the history of exposure of an organism to stress, because the release of stress hormones can show an acute (and recent) but not a sustained exposure to stress. Epigenetic marks in peripheral cells, such as blood cells, can serve as epigenetic biomarkers of a history of stress, because it is expected that if animals are constantly subjected to stress and to stress-dependent plasmatic hormonal changes, this exposure will leave a mark in their epigenome. In chickens, different rearing conditions can be identified in the methylome of red-blood cells of adult chickens. Additionally, epigenetic tools can help to understand stress response, neurological mechanisms behind stereotypical behaviors, and behavioral variability among genetically homogeneous animals.

Hopkins, Patrick, Millsaps College and University of Mississippi Medical Center, "Why is epigenetics research into memory all about implicit memory rather than explicit episodic memory?" 6th Session (Saturday), hopkipd@millsaps.edu
Epigenetics research is replete with references to "memory". However, the concept of "memory" is tricky and variable—sometimes very technically narrow

and sometimes very unhelpfully broad. Researchers describe individual cells "remembering" events, species "remembering" skills, and individual organisms from fruit flies to mice inheriting "memories" of pain, cold, and toxins. Interestingly, though, almost all references are to long-term implicit memory. Explicit memory (individuals recalling themselves in events) is almost entirely absent. In fact, the first 1,000 hits from a database search on "epigenetic" and "memory" contains only a single relevant reference—and that for "episodic-*like* memories" in mice. But why would this be? Is it less credible to think remembering the *personal* experiences of another organism is possible? If long-term memories are reductionistically mechanical, why would episodic be less likely to be inherited than implicit memories? I examine this problem and potential answers.

Johnson, Gregory, Mississippi State University, "Active forgetting and the limitations of cognitive psychology," 9th Session (Sunday), gregory.johnson@msstate.edu

Methodological functionalism is a technique that is used to describe a system when the existence of the system is inferred from its outputs. To investigate such a system, the inputs that the system receives and the outputs that it produces are monitored, and intervening components are proposed as the parts of the system. I have argued that methodological functionalism is prone to error and, in historical cases, was eventually replaced by methods that identified the actual entities that compose the system (2016). There, I examined historical cases from biology and chemistry. Here, I examine explanations of forgetting in psychology and in neurobiology. It is too early to tell whether the neurobiological investigation corrects the explanation offered in psychology, but it is clear that an important part of the process cannot be investigated using methodological functionalism but can be determined by tracking the neurobiological process.

Jones, Mostyn, Washington & Jefferson College (retired), "How do protein-qualia correlations affect the reduction/multiple realization debate?" 5th Session (Saturday), mqj412@gmail.com

Neuroscience has never explained how our starkly different qualia can correlate with the quite uniform computations in perception's various labeled lines. Nor have recent theories such as IIT and GNWT specified testable computational correlates for qualia. By contrast, there's now growing evidence that our different qualia correlate with different ion channels and GPCRs in sensory-detector cells. I identify qualia with these proteins. Computations just help modulate activity in the proteins' circuits. I defend this qualia-protein type identity against Aizawa and Gillett's argument that qualia are multiply realized in proteins — and Ptito's argument that stimulating blind people's visual cortex creates somatosensory qualia. This qualia theory may help support mind-brain type identities such as Bickle's (2003) and Strawson's (2016).

Kraemer, Eric, University of Wisconsin-La Crosse, "Epigenetics and Rethinking the Nature `of Mind, Free Will, and Mental Illness," 6th Session (Saturday), ekraemer@eagle.uwlax.edu

This presentation examines how epigenetics discoveries variously impact philosophical debates in three areas: the mind-body problem, the problem of free will and the nature of mental illness. With respect to the mind-body problem I argue that epigenetics shows that functionalism must be modified, which in turn seems to create a serious problem for the view. With respect to the problem of free will I argue that compatibilist defenses of free action also need to be modified to accommodate known epigenetic changes and I suggest several alternatives. And, with respect to debate over the nature of mental illness I suggest that epigenetics seems to support of a permissive approach which allows for some cases of mental illness to be diagnosed as diseases with specific somatic origins and other cases of mental illness to be classified as disorders identifiable by symptoms alone.

May, Josh, University of Alabama, Birmingham, "Bias in science: Natural and social," 7th Session (Saturday), joshmay@uab.edu

Neuroscience is a massive and diverse discipline that straddles both the natural and social sciences. Is it's psychological and behavioral aspects particularly susceptible to questionable research practices and other biases? I defend a parity thesis: bias by values is roughly equivalent in the social and natural sciences, particularly because both are so prominently influenced by desires for social credit and status, including recognition and career advancement. Ultimately, bias in natural and social science is both natural and social—that is, a part of human nature and considerably motivated by a concern for social status (and its maintenance). Whether this is inimical to the sciences is a separate question. Although the paper is a contribution to the philosophy of science generally—specifically values in science—its thesis has implications for neuroscience given that it is both a natural and social science.

Narjenson, Jonathan, Hebrew University of Jerusalem, "What have we learned about the engram?" 1st Session (Friday), jonathan.najenson@gmail.com

The engram, a hypothetical store in which information is held in the brain, is the linchpin of the sciences of memory. The development of optogenetics, a new technology that enables the manipulation of neurons with light, is believed to have provided a principled way to locate the engram. The purpose of this talk is to evaluate whether results from optogenetic-based studies conflict with current philosophical views on memory storage. Philosophers of memory debate whether engrams persist from the moment of acquisition to subsequent retrieval, carrying information about the original past experience that caused the memory

formation. In my talk I argue that optogenetic studies reveal that engrams do persist but the information they carry changes over time and experience.

Nathan, Marco, University of Denver, "Fuhgeddaboudit! Neuroepigenetics and the future of the brain," 4th Session (Saturday), Marco.Nathan@du.edu

Neuroepigenetics—the study of how epigenetic changes to genes affect the nervous system—has a dual dimension. First, understood as an *ontological* claim, neuroepigenetics purports to identify the true causes of brain activity. Second, on a *methodological* interpretation, neuroepigenetics becomes an organizing framework. It aims to provide a novel style of explanation by pinpointing the mechanisms that allow neural gears to combine on unexpected timescales. In a slogan, it's not much how much genes, neurons, or brain power you have; it's how you sync them. This essay clarifies this distinction. Contemporary memory studies show how, placed in the appropriate methodological context, neuroepigenetic studies of memory can shed light on the core workings of the brain. In contrast, on the ontological reading, neuroepigenetics becomes just another footnote to a hackneyed philosophical agenda. Thus conceived, we might as well fuhgeddaboudit!

Pitt, J. Brian, University of Lincoln, University of South Carolina, University of Cambridge, "How does science constrain mind-body interaction?" 5th Session (Saturday), jamesbrianpitts@gmail.com

Dennett considers energy non-conservation "the inescapable and fatal flaw of dualism." This Leibnizian objection is affected by newer physics. (1) Conservation is local. (2) Energy (momentum) conservation holds iff 'laws' are uniform over time (space). If conservation fails in my brain, it still holds in refrigerators and stars, without Bunge's cataclysm. The conservation objection is circular; refuting interactionism requires neuroscience. "[P]hysicalists need to be wary of bad reasons to think physicalism is true.…" (Butterfield).

Pursuing "poetic naturalism," cosmologist Sean Carroll asks rhetorically how to modify the equations for electrons, electromagnetism and gravity to accommodate interactionism. Doing some mathematics, I found a new argument. Some say that General Relativity's supposed "nonlocalizability of gravitational energy" abolishes conservation laws, facilitating interactionism. But General Relativity resists interactionism somewhat, I find. The new argument might not move many interactionists but undermines parapsychology-as-physics.

Interactionism is mostly constrained a posteriori via neuroscience.

Purcell, Elyse, State University of New York, Oneonto, "Trauma, memory, and genetic enhancement," 7th Session (Saturday), Elyse.Purcell@oneonta.edu

Within the genetic enhancement debate, philosophers run into a problem of tradeoffs for enhancing memory capacity, especially in experiments on mice and rats. In a 2013 study, researchers Kerry Ressler and Brian Dias, however, wanted to test something different: the effect of epigenetic trauma on mouse generations. They discovered that fear of a particular traumatic event could be passed down genetically not only to the mouse pups but also to the "grandpups." While this research is still in its early stages, the possibility of epigenetic intergenerational trauma may give philosophers pause in the enhancement debate. What kind of tradeoffs could occur intergenerationally and could they be reversed?

The aim of this paper is to examine the relationship between enhanced memory and trauma on autobiographical identity. What the 2013 study shows is that one's identity may be partially shaped by one's biological parents' traumatic experiences.

Robins, Sarah, University of Kansas, "The Mendel of Memory? Richard Semon, Optogenetics, and the Concept of the Engram," 1st Session (Friday), skrobins@ku.edu

Richard Semon is a biologist, who coined the term "engram" in the early 20th century (1904/1921). Aside from keeping his term to characterize the mechanism of memory, Semon—and his broader work on memory—have been largely neglected. Until recently. A *Web of Science* search conducted in July 2020 reveals only 29 citations of Semon's book between its initial publication in 1904 and 2009. Since 2010, it has been cited 76 times. The return to Semon is in response to the discoveries made possible with optogenetics. In many ways, it parallels the return to Mendel and his work on the gene in response to the discovery of DNA. Philosophers and biologists recognized important issues in relating the Mendelian concept of the gene to DNA and our contemporary conception of genetics. In a similar fashion, this paper explores the ways in which recent discoveries about the engram may be unleashing a pluralism of engram concepts.

Tramacere, Antonella, Mississippi State University and the Max Planck Institute for the Science of Human History, Germany, "Epigenetics in the Nervous System: The Ayahuasca of the Mind," 4th Session (Saturday), a.tramacere@gmail.com

I consider Ayahuasca (a psychoactive mixture used in shamanic cultures for promoting self-knowledge and healing) as an interesting simile of the role of neuroepigenetics in mental states. Neuroepigenetic analysis highlights important

properties of mental states, such as developmental origin, neurobiological realization, plasticity and stability across time.
I discuss two experimental paradigms from neuroepigenetic research: the attenuation of remote and recent memories of fear and the transgenerational inheritance of trauma. This research uncovers how traumatic memories are passed across generations, consolidated, modified and eventually extinct. I interpret the role of epigenetics regulation as similar to the description of Ayahuasca in various ancient and modern shamanic cultures: a privileged access to the role of the causal factors at the basis of mental states, and the key for their transformation.
I conclude with a reflection on both the potential and difficulties of epigenetic explanations to discussion of the biological realization of mental events.

Viola, Marco, University of Turin, Italy, "Neuroscience beyond the Platonic brain: addressing the challenge of individual differences," 8th Session (Sunday), marco.viola@unito.it

In many cases, neuroscientists seem to aim at getting a single model which purportedly represents almost every human brain: a sort of "Platonic Brain Model" (PBM). In my talk, I stress some shortcomings of the PBM, and claim that it must be surpassed toward models capable of accounting for patterned individual brain differences. To do so, I examine a common investigative practice in cognitive neuroscience: functional localization, i.e. ascribing one or more functions to a given neural structure. Based on recent debates concerning the role of the so-called Fusiform Face Area, I will argue that function-structure mappings should be indexed to a given population of subjects. Lastly, I suggest some criteria for individuating populations.