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Life & Cognition at the Intersection of Science, Philosophy, & Religion

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In 1980, biologist Humberto Maturana theorized that "[l]iving systems are cognitive systems and living as a process is a process of cognition. This statement is valid for all organisms with and without a nervous system."[1] Then in 1983, during her Nobel lecture, Barbara McClintock set a goal for 21st-century science to "determine the extent of knowledge the cell has of itself, and how it utilizes this knowledge in a 'thoughtful' manner when challenged."[2] Recently in 2021, molecular biologist James A. Shapiro, a former student and colleague of McClintock, published the paper "All living cells are cognitive" in *Biochemical and Biophysical Research Communications*, thus empirically verifying Maturana's hypothesis and making progress towards McClintock's goal.[3] Recognizing that cognition/consciousness is ubiquitous throughout all lifeforms frustrates reductionist attempts to describe consciousness in terms of neuronal correlates — "the minimum neuronal mechanisms jointly sufficient for any one specific conscious experience"[4] — because (1) a single neuron, which is a single eukaryotic cell, already demonstrates cognitive behavior and (2) correlation does not imply causation. Comprehending the cause of cognition/consciousness requires starting from a foundation embracing all four aspects of Aristotelean causality — material, efficient, formal, and final. The purpose that something serves is the reason that it exists and that for the sake of which cognition/consciousness exists is the self.

McClintock's goal for modern science to determine "the extent of knowledge the cell has of itself" has inspired enough momentum that self/nonself discrimination has become subject to scientific analysis. Two aspects of self seem to be observed in cellular activity — universal and individual — such that (1) a collective of bacteria demonstrate discrimination between those belonging to their particular colony and those who do not and (2) individual bacterial cells distinguish between their own genetic material and foreign material.[5] It is worth noting that although cells are cognizant of various aspects of their existence, being self-conscious — an accomplishment seen only in higher lifeforms like humans — requires being conscious of cognizant existence, which cells do not demonstrate. This groundbreaking work is apparently

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[1] Humberto Maturana, *Autopoiesis and Cognition: Realization of the Living* (Dordrecht: D. Reidel Publishing Company, 1980), 13.
[2] Barbara McClintock, "The Significance of Responses of the Genome to Challenge," Nobel Prize (1983): 193.
[3] James A. Shapiro, "All living cells are cognitive," *Biochemical and Biophysical Research Communications* 564 (2021): https://doi.org/10.1016/j.bbrc.2020.08.120
[4] Christof Koch et al., "Neural correlates of consciousness: progress and problems," *Nature Reviews Neuroscience* 17 (2016): https://www.nature.com/articles/nrn.2016.22
[5] Shapiro, "All living cells are cognitive," 3-7.

relevant to cancer research, where cancer is sometimes viewed as an effect of individual cells within an organism becoming disoriented and resorting to a "unicellular lifestyle."[6] The efforts described here have motivated other scientists to clarify the concept of "self" in a holistic manner.

Developmental/synthetic biologist Michael Levin recently proposed defining "self" as an emergent property of the collective goal-directed activity of parts/components where the self/individual is the emergent overarching system that practically executes the intended activity of the parts, where the extent of such activity's effect defines the cognitive boundary of the self. He specifies that examples of self as he defines it concern "functional, third-person, objective capacities, computations, and behaviors." He intentionally avoids consciousness, which he distinguishes from cognition by defining consciousness as "first person experience or a sense of self as qualia."[7] Levin emphasizes a non-reductionist approach that seems to be influenced by systems thinking.

In *Idols of the Mind vs. True Reality* (2020), Dr. Bhakti Madhava Puri — the inspiration behind this Science & Scientist conference series — describes that "[w]hen the unity of the whole is sentient or self-conscious, even a systems approach will not be sufficient to explain its existence. Systems are not self-conscious."[8] So, further progress in comprehending the self and discovering the implications this has for scientific research must transcend systems thinking. The perspective of first-person experience cannot be avoided when contemplating the self, since that is the only concrete account we have of the self, i.e. the direct experience of selfhood. All third-person perspectives are merely baseless speculation if not connected with our direct experience of selfhood. This kind of error evident in Levin's approach is a byproduct of the historical development of modern science, where Francis Bacon deterred future generations of scientists from considering the first-person perspective by declaring "Of ourselves we say nothing" (Latin: *de nobis ipsis silemus*).[9] Thus Dr. Puri recognizes that "science has lost its self-consciousness."[10]

Restoring self-consciousness to contemporary scientific investigation requires embracing a phenomenological approach — the "science of the experience of consciousness."[11] This extends beyond systems thinking and progresses onto conceptual thinking, as described by German philosopher G.W.F. Hegel. For those interested in clarifying (1) the differences between Edmund

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[6] Perry Marshall, "Biology transcends the limits of computation," *Progress in Biophysics and Molecular Biology* 165 (2021): https://doi.org/10.1016/j.pbiomolbio.2021.04.006

[7] Michael Levin, "The Computational Boundary of a "Self": Developmental Bioelectricity Drives Multicellularity and Scale-Free Cognition," *Frontiers in Psychology* 10 (2019): https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02688/full

[8] Puri, *Idols of the Mind*, 68.

[9] "Francis Bacon, The Great Instauration (excerpts)," 337, Hanover Hisorical Texts Project, accessed October 18, 2023, https://history.hanover.edu/texts/Bacon/gi.html

[10] Puri, *Idols of the Mind*, 79.

[11] "Georg Wilhelm Friedrich Hegel: Phenomenology of Mind/Spirit," §88, GWFHegel.org, accessed October 23, 2023, https://www.gwfhegel.org/PhenText/compare.html

Husserl and Hegel's approach to phenomenology and (2) the misconception that Husserl inaugurated phenomenology[12] despite being born 52 years after Hegel published the *Phenomenology of Spirit* (1807), we recommend reviewing *Hegel and Phenomenology* (2019) published by Springer Nature.[13] Hegel explains that there is a range of categorical thought inherent to both our immediate external sensuous experience and mediated internal contemplative experience. The logical, natural, and spiritual categories deduced through conceptual thinking are not ego-centric speculation but the result of thought's own inner necessity. The movement of thought proceeds forward, encounters opposition, progresses by reconciling opposition, and continues to develop in this manner, where "concepts indeed do give way necessarily to other succeeding concepts without which they would remain incomplete and to which they necessarily refer."[14] Within the scope of Hegel's methodology, the category of life arises in both Logic and Nature. Within Logic, life gives rise to the category of cognition, from which the Absolute Idea emerges. The transitions between logical life, cognition, and the Absolute Idea are not to be taken lightly, thus one of the goals of this conference is to seriously consider the development.

Hegel's philosophy has attracted the attention of humanities scholars at Princeton University several times since 2017,[15] [16] [17] including Alexander Englert, now a Research Associate at the Institute for Advanced Study in Princeton, who studies, among other topics, Hegel's logical category of life, its transition to the category of cognition, and the implications this has for comprehending organic life and artificial intelligence.[18] In summary, the transition from logical life to cognition, where the movement of pure logical thought remains free of sensuous limitations, involves:

1. Individual life — containing objectivity or the tendency to identify itself in static manner — absorbed in its own immediate being-for-self indifferent to otherness, recognizes its identity with otherness as an extended aspect of its being-for-self because it is dependent on that otherness in that it determines the individual as being not other than itself, thus serving to expand individual life's conception of wholeness beyond individuality to universality ("a 'big picture' conception of its [living] process as a whole"[19])

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[12] Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Science of Mind* (Cambridge: Harvard University Press, 2007), 14.
[13] Alfredo Ferrarin et al., *Hegel and Phenomenology* (Cham: Springer Nature Switzerland AG, 2019).
[14] Alexander T. Englert, "Life, Logic, and the Pursuit of Purity: Logically Restructuring the Transition to Cognition," *Hegel Studien* 50 (2016): https://philarchive.org/rec/ENGLLA-2
[15] "Hegel and the Humanities: A Symposium," Princeton University Humanities Council, accessed October 24, 2023, https://humanities.princeton.edu/event/hegel-and-the-humanities/
[16] "Gauss Seminar Discusses the Importance of Hegel's Legacy," Princeton University Humanities Council, accessed October 24, 2023, https://humanities.princeton.edu/2017/10/05/gauss-seminar-discusses-the-importance-of-hegels-legacy/
[17] "God & Infinity: Perspectives from Hegel and Kierkegaard," Princeton University Center for Human Values, accessed October 24, 2023, https://uchv.princeton.edu/events/god-infinity-perspectives-hegel-and-kierkegaard
[18] "Research," Alexander T. Englert, accessed October 24, 2023, https://alexanderenglert.com/research/
[19] Englert, "Life, Logic, and the Pursuit of Purity," 83

2. The universal (genus) aspect was always implicitly in the background of individual life, unbeknownst to it, and upon being recognized by the individual, universality becomes explicit and negates the living individual, i.e. it becomes implicit in the universal genus as a sublated moment of a unified activity where "the most basic logical unit of the big picture receives conceptual determination as one of the many (logically similar) units in the same process,"[20] serving to satisfy a sense of completion for the individual's being-for-self

3. The next shift in this process is motivated from the reconciliation of the contradiciton that arises when the individual recognizes that it is not merely for-itself, its sense of completion as a moment of the universal is not merely for the individual, but the universal is also for-itself, thus as a moment of it, the individual must be for the universal as well as for itself. The reconciliation of this contradiction reveals the dialectic interpenetrating relationship between the individual and universal, where the living individual realizes that its being-for-self is simultaneously identical with and different from the universal genus' being-for-self

4. So the individual and universal form a negative unity such that when individual life is explicit the universal genus is implicit, and when the universal is explicit the individual is implicit. This dynamic, interpenetrating, dialectic, purely logical activity as a totality is a "processual whole,"[21] i.e. the process itself is the whole and *not* any particular moment of it abstracted from the process and considered in static isolation

5. When the objective tendency to identify with a particular static moment of the processual whole is fully eradicated and replaced by complete absorption in the dynamic movement of the processual whole which is for itself, the transition to the logical category of cognition occurs

We hope to discuss this further, in addition to the logical transition from cognition to the Absolute Idea, the relationship between life in the logical sphere and natural sphere, and the significance of all this as relevant to the relation between science, philosophy, and religion.

"Embodied cognition" refers to the understanding that cognition/consciousness is enmeshed in the relationship between a body and interactions with its environment, as opposed to being isolated in the brain. In this regard, it is significant that although an individual's body is always

[20] Ibid 84.
[21] Ibid 83.

changing — where all cells that constitute a body,[22] including neurons,[23] are replaced several times throughout a single lifetime — we remain the same person. What does this imply for embodied cognition? Vedāntic knowledge explains that the self is the unchanging aspect that persists despite the constant change of the physical body, as described in *Bhagavad-gītā* 2.13:

> *dehino 'smin yathā dehe, kaumāraṁ yauvanaṁ jarā*
> *tathā dehāntara-prāptir, dhīras tatra na muhyati*
>
> As the embodied soul continuously passes, in this body, from boyhood to youth to old age, the soul similarly passes into another body at death. A sober person is not bewildered by such a change.

This verse explains that just as an individual soul/self remains the same self throughout the transitions of its aging material body, that same individual will also pass into a new body at the time of death (reincarnation). Here, the Sanskrit word "*dehino*" refers to the "embodied soul," where the constitution of the soul is *sat-cit-ānanda* — willing/volition, thinking/cogntion/consciousness, and feeling/emotion. The materially embodied soul is afflicted by forgetfulness of its original spiritual nature in the plane of dedication, where its capacity for willing, thinking, and feeling are absorbed in a loving serving relation to Supreme Spirit. Thus, the materially embodied soul engages in exploitive activities focused on self-centered sense enjoyment, which gives rise to bodily, mental, and emotional suffering includign the experience of death, due to exploitation being against the soul's intrinsically dedicative nature. Like a fish out of water. When the embodied soul actively cultivates remembrance of its constitutional position, it transcends material suffering.

Vedānta describes that our consciousness determines our experience; our knowledge of the world determines the world we live in; our knowledge of an object determines what the object is. The position of embodied cognition coincides with Vedāntic knowledge in that cognition/consciousness is intertwined in the relationship between a body and its interactions with the environment, but understanding the body as a material thing intended to exploit the environment to maximize individual enjoyment produces a very different experience than identifying as spirit fixed in uninterrupted joyful loving service to the Supreme.

In conclusion, another goal for this conference is clarifying the distinction between cognition and consciousness, as this will be useful in accurately determining the various behaviors of particular living entities. The word "cognition" comes from the Latin "*cognoscere*" which includes the root

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[22] "How do we know the lifespan of different tissue/cell types?," NPR: Skunk Bear, accessed October 22, 2023, https://skunkbear.tumblr.com/post/146593746334/c14

[23] "Does the human body replace itself every 7 years?," Live Science, accessed October 22, 2023, https://www.livescience.com/33179-does-human-body-replace-cells-seven-years.html

"*gno-*" indicating a general kind of knowing/knowledge as understood with the word "gnostic,"[24] while the word "consciousness" stems from the Latin "*conscire*" which includes "*scire*" referring to a more expert kind of knowing as seen in the word "science."[25] So, we suggest considering cognition as a less sophisticated faculty than consciousness.

Cognition is an initial step of mediated thought where an object is reflected into the mind and a preliminary mental representation is formed. This is sufficient to navigate the relatively simplistic experience of cellular life and other lower lifeforms such as insects and plants. The phrase "lower lifeforms" is not being used in a derogatory way but to denote living entities whose activities seem mainly absorbed in exercising volition and cognition while responding to immediate environmental circumstances without exhibiting symptoms of a sophisticated internal emotional experience. Consciousness, on the other hand, denotes an identity-in-difference between subject and object that requires a dialectic approach to comprehend. This is a further development of thought where the conscious agent knows apparently external objects as identical to itself, as well as recognizing its difference from objects. In addition to exercising volition and cognition, conscious entities like elephants,[26] cows,[27] and humans have a more mediated relationship with their environment allowing them to form emotional attachments to things other than themself. Scientists recognize that "there is continuity between humans and other animals in their emotional (and cognitive) lives; that there are transitional stages among species, not large gaps; and that the differences among many animals are differences in degree rather than in kind."[28] When one experiences an identity with something other than oneself, a feeling of inner connection is established. So, living cells may be volitional and cognitive, but not emotional. This indicates an evolution of consciousness throughout lifeforms where different stages of development are distinguished by the degree to which and particular manner in which a living entity expresses volitional, cognitive, and emotional activity.

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[24] "cognition (n.)," Online Etymology Dictionary, accessed October 25 2023, https://www.etymonline.com/word/cognition

[25] "consciousness (n.)," Online Etymology Dictionary, accessed October 25 2023, https://www.etymonline.com/word/consciousness

[26] Lucy Anne Bates, "Do Elephants Show Empathy?," *Journal of Consciousness Studies* 15, no. 10 (2008): https://www.researchgate.net/publication/37245197_Do_Elephants_Show_Empathy

[27] Lori Marino et al., "The Psychology of Cows," *Animal Behavior and Cognition* 4, no. 4 (2017): https://dx.doi.org/10.26451/abc.04.04.06.2017

[28] Marc Bekoff, "Animal Emotions: Exploring Passionate Natures: Current interdisciplinary research provides compelling evidence that many animals experience such emotions as joy, fear, love, despair, and grief—we are not alone." *Bioscience* 50, no. 10 (2000): https://doi.org/10.1641/0006-3568(2000)050[0861:AEEPN]2.0.CO;2