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Summary of responses to dialog initiation “Curiosity as driver of extreme specialization in humans”

In this issue of the IEEE CIS Newsletter on Cognitive and Developmental Systems, thirteen researchers from highly varied backgrounds—neuroscience, psychology, education, philosophy, and cognitive science—respond to my position statement about how curiosity could enable extreme knowledge specialization in humans. Interestingly, almost every statement pointed to a nascent formal understanding of the cognitive and neural systems that govern curiosity as a major impediment to research progress in this area. The researchers’ proposals for next steps, however, varied as widely as their backgrounds. Some discuss whether humans are neurobiologically unique (Tobias Hauser, for example), while another takes a reinforcement learning approach to tackling the same question (Goren Gordon).

Many responses pointed out relevant components of learning that science has yet to integrate into existing broader theories of curiosity. The responses discuss these understudied components, and lay out the empirical evidence for how we know that they impact curiosity and, ultimately, the specialization of knowledge in humans. These understudied components include emotional states (as discussed by Elizabeth Bonawitz), motivation (Abigail Hsiung, Shabnam Hakimi, and R. Alison Adcock), and social connection (Moritz M. Daum).

The responses also indicate a lack of consensus on what should count as curiosity, a debate as old as scientific study of the topic (see Perry Zurn’s response for a compelling philosophical perspective on this question). Namely, researchers disagree as to whether a strict line should be drawn between an organism seeking information for utilitarian purposes (e.g., to solve a particular task, now or in the future) as opposed to for the sake of the information itself. The term curiosity is broad enough that it can be used to describe a wide range of behaviors—from the motivating force behind exploration during play, to the desire for answers to trivia questions, to

the strategic deployment of gaze in free-viewing, as a few examples. It may even be applicable to describing the probing behavior of plants (Perry Zurn), and a driving market force behind capitalism (Arjun Shankar).

Several responses point out that sharply delineating between curiosity and information-seeking is difficult for a number of different reasons (see the response by Maya Zhe Wang, Brian M. Sweis, and Benjamin Y. Hayden). First, it is not always possible to know the beliefs and motivations of organisms who clearly possess curiosity. For example, researchers may design tasks intended to present options for exploration that offer no specific utility, but it is difficult if not impossible to guarantee that participants (especially when they are children and monkeys) will share the same understanding of the tasks as the researchers. More generally, even if participants in these tasks do know that selecting certain options won’t help increase overt rewards within the task set-up, they cannot know that the information they obtain from exploring will never again be useful in any circumstance.

Another common response theme is that we still need to better understand the relationship between existing knowledge and curiosity, and the role of perceived knowledge utility on the part of the learner (see Goren Gordon’s response). Our knowledge in this areas is clearly hindered by a lack of longitudinal data across development (see, for discussion, the response by Susan Engel). In general, infants possess less knowledge of the world and subsequently are surprised by many things they encounter on a daily basis, which could be the explanation for why they appear to exhibit more intense curiosity than adults. By contrast, surprise is less ubiquitous in adulthood, and curiosity has become more specific. These dynamics are almost certainly relevant to understanding human specialization. However, we lack a precise understanding of these dynamics, and this is an area ripe for future research.