Jerison

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Questions about the nature of reality have long been at the center of debate between philosophers, theologians and scientists. Not surprisingly, propositions in those debates have spawned an incredible range of ideas and perspectives, all defended fervently under the more or less universal presumption that only one of them (typically the one advocated) is actually true. Modern science turned the pursuit of reality into a structured program of repeatable measurements and verifiable predictions, together with an orthodoxy that anything that could not be verified through science could not be real.

For most of its several century life, the modern scientific program has been firmly rooted in the presumption of a single canonical reality that could in principle be fully understood through the laws of physics. Galileo referred to it as "the book of nature" an ultimately complete description and explanation of the universe (albeit written in mathematics).[1] With the advent of quantum mechanics, however, that presumption has been shown to be wrong. Kafatos and Nadeau point out that:

> The hard lesson here from the point of view of classical epistemology is that there is no godlike perspective from which we can know physical reality "absolutely in itself". What we have instead is a mathematical formalism through which we seek to unify experimental arrangements and descriptions of results.[2]

Marcus Appleby takes it a step further, claiming that our descriptions of reality are only partial constructions:

> " It seems to me that the lesson of quantum mechanics is that we should drop the whole idea of there being a canonical description [of reality]. Galilei's book metaphor is profoundly misleading. There is no mathematical description in the sky. The only descriptions around are the ones we humanly construct and which, being human, are necessarily partial.[3]"

This view does not hold that rocks, trees and penguins do not exist, only that our knowledge of them is partial and provisional— and that it likely will always remain so. As Appleby puts it:

> "To say that there is no canonical description with which reality can be identified is not to deny the existence of reality. Supposing there to be a canonical description, we have never known it. Such knowledge of reality as we possess right now is entirely expressed in terms of our ordinary, humanly constructed descriptions. It is not skepticism to suggest that knowledge so expressed is all we will ever possess."

[1] "Reading the Book of Nature: The Ontological and Epistemological Under pinnings of Galileo's Mathematical Realism" by Carla Rita Palmerino

[2] Conscious Universe, p. 76 (Kafatos & Nadeau)

[3] Marcus Appleby, "Mind and Matter: A Critique of Cartesian Thinking", in "The Pauli-Jung Conjecture", p, 31

Just about all substantive descriptions in physics, let's remember, are exclusively mathematical abstractions. Although Newton's laws of motion could be visualized with planets and projectiles (as very rough approximations), the essentials of quantum theory—probability distributions or the "spin" of a particle, for example— are impossible to imagine. Modern physics was decoupled from day-to-day experience 100 years ago, and there is no realistic hope for ever returning to a visualizable physics. String theory, for example, has taken ideas about the fundamental nature of physics to an entirely differnt level of abstration. But even if string theory becomes as widely accepted as quantum theory, it won't provide any further explanatory value for a worldview that can inform or frame one's perspectives on life and the world.[4]

[4] There are a few rays of hope here, however. The implications of some aspects of quantum theory such as non-locality and entanglement are potential doorways into ways of seeing the world that could very well have an effect on attitudes and behaviors. Some have even suggested that monism offers insights that could help resolve some of the seemingly intractable issues in quantum physics (see *The One* by Heinrich Päs, for example)

There is such an idea, however, one that goes back several decades to H.J. Jerison, a professor at UCSD perhaps most famous for the encephalization quotient, a numerical method that, ostensibly, compares the intelligence of different species of animals.

JERISON'S 1985 PAPER "Animal intelligence as encephalization" is often quoted as the source of his idea that the relative level of intelligence of a species can be measured from the ratio of an average animal's body mass and brain mass. Biologists had previously recognized that different species of animals had very different brain sizes. Plots of the ratio of brain weight to body weight had shown that those ratios could roughly be categorized into groups with roughly similar ratios of brain to body weight. Those categories were, in ascending order, bony fish, amphibians, reptiles, birds, and mammals.[5] When plotted together, these groups formed a distinctive set of polygons that led to the labelling of "lower' and"higher" groups based on the brain-body weight ratio.

[5] H.J. Jerison, "Animal intelligence as encephalization" 1985 Note: further quotes from this paper are not explicitly cited; if no citation is given, the quote is from this paper.

Jerison proposed that brain mass could be separated into two "fractions," an allometric fraction related to body size and another related to what he termed "encephalization." The allometric fraction dealt with the basic motor and other functions necessary for survival, whereas the encephalized fraction dealt with "higher" functions such as cognitive capacity. When Jerison plotted the ratio of brain weight and body weight for different animals, he observed that the points on the plot produced a relatively straight line between most species— brain weight was relatively proportional to body weight, as one would expect if brains were performing only somatic functions.

Several species, however, were significant outliers: humans, dolphins, elephants, several species of birds (amongst others) had brains that weighed more than would have been expected for their body weight. Jerison believed that this additional neural tissue, known as "encephalization," represented an increased capacity for processing information beyond somatic requirements.

The idea that there was a behavioral correlation with brain size had been proposed in 1949 by Karl Lashley, then the President of the American Society of Naturalists:

> "The only neurological character for which a correlation with behavioral capacity is supported by significant evidence is the total mass of tissue, or rather, the index of cephalization… which seems to represent the amount of tissue in excess of that required for transmitting impulses to and from the integrative centers."[6]

[6] Lashley, "Persistent problems in the evolution of mind", 1949

Jerison built on Lashley's idea, proposing a broad perspective on consciousness and animal intelligence. Oddly (at least to me), Jerison's broader ideas on consciousness have been largely ignored; Jerison is known primarily if not exclusively for developing the encephalization quotient (EQ) a formula for comparing relative intelligence between species. But Jerison's notions of consciousness have far-ranging consequences that should be more widely considered.

In his 1985 paper Jerison only briefly mentions a mathematical relationship (EQ) for describing the relative differences in intelligence between species— the idea he is mostly known for. And he does it in the context of suggesting that EQ should be considered in "a qualitative, pictorial way" because a (presumably more rigourous) numerical approach would require assumptions that "unnecessarily complicate the analysis and are not really needed here." Jerison rightfully acknowledges that numerical comparisons between the intelligence of different species are at best crude approximations. He was the one that introduced the EQ, but he fully award of its limits.

Jerison also acknowledged that we have much more to learn about "the nature of intelligence as a biological phenomenon." He accepts that intelligence is the same as behavioral capacity, but in apparent recognition of the deep and inherent complexity of trying to understand the intelligence of other species, suggests that a qualitative approach is more appropriate than a quantitative one. He begins by pointing out that although there is no consensus on the meaning of "intelligence," many researchers in the field use the term as though there was. Jerison also noted that although there was an expectation of finding neurological correlates to intelligence (in middle of the 20th century), encephalization was the only correlate that had been established at that time.[7]

[7] Ashley's 1949 comments on encephalization were the genesis of Jerison's expansion of the idea.

There was then, as there is now, an expectation that "further research would presumably lead to the discover of more and finer correlates." It was, however, a presumption that Jerison took issue with, proposing instead that "encephalization is, in fact, the fundamental trait and that it may be fruitless to seek finer correlates of intelligence." Although Jerison's view on the fundamental nature of encephalization has largely been lost to history, it seems to be a strong counterweight to the popular status that his numerical formula for comparing inter-species intelligence has attained. It is hard to escape the irony that today's widely-adopted formula for comparing inter-species intelligence was developed by someone who believed that the real "measure" of cognitive capacity was simply the size of the brain. Even more remarkable is that Jerison believed, reasonably enough it seems, that even such a simple measure was largely irrelevant because different species perceived completely different realities.

THIS CERTAINLY APPEARS TO MAKE SENSE, that the reality of an octopus would be fundamentally different from that of, say a chimpanzee. But lurking behind that implicit understanding lies the assumption that the chimpanzee is somehow a "higher" life-form—that is to say, more like human.

Although written almost forty years ago, and antithetical to mainstream neuroscience, Jerison's conclusion that excess brain tissue is a fundamental trait and that more detailed investigations are unlikely to reveal substantive insights sets the stage for his broader conception of reality.

That conception is relatively simple: what we (using humans as the example, but not exclusively) think of as "reality" has two levels (for lack of a better term). The first are general representations of the external world around us, representations that we have in common with conspecifics[8] and other species with the same basic sensory input. Jerison points out that "The fact of an external reality explains the uniformities in social behavior and shared experiences." The representation (reality) must be

> "… similar for different species and very similar for individuals of the same species. Your reality and mine are similar enough to leave little doubt that we share a view of a real external world that remains constant as we live our lives. Our perceptions and experiences are referred to that reality, and it is only in our more metaphysical moments that we question it."

*** The second level is where the realm of intelligence begins, an immensely more expansive and experiential "reality" produced in individual brains of encephalized animals. Although not the sort of thing that is likely to take hold in quantitatively-focused academic circles, it is a concept that appears to have significant explanatory value when considered through the lens of more qualitative conceptions of consciousness.

====== Questions about the nature of reality, historically the

[8] "Conspecifics" are members of the same species.

domain of philosophers and theologians, are now a legitimate topic for scientific discussion thanks to a greater appreciation of the reality-challenging nature of quantum mechanics that's taken place over the last few decades. And those discussion can be really bizarre.[9] They are also very academic: none of them seem likely to lead to anything that could be incorporated into a ground-level perspective on, well, reality. Ditto for just about everything written about reality by contemporary philosophers. Just about all of them, however, appear to presume that reality is something we can "know" in the same way we know penguins or planets, that there is a sufficiently complete and knowable definition, description or explanation of "reality"— a final Answer that accommodates everything. That may be possible, but it seems rather implausible.

[9] Nick Herbert's *Quantum Realities* for example, (or my brief summary of it at "Quantum Realities")

++++++ The idea of many worlds sounds preposterous— This essay briefly considers a conception of reality raised by H.J. Jerison in 1985. Jerison, a professor emeritus at UCLA, developed a formula for comparing the animals with brains larger than would be expected for their body size. The basic idea behind the EQ is that brain size in vertebrate species is generally proportional to body size. Biologists in the middle of the twentieth century generally agreed that the size of a brain required for basic survival functions, or "transmitting impulses to and from the integrative centers"[10] was about the same for any given body size.

[10] Karl Lashley, in his presidential address to the American Society of Naturalists in 1949— cited in H.J. Jerison, "Animal intelligence as encephalization" 1985

A few species, however, evolved with brains substantially larger than would be expected for an animal of their size. Primates, elephants, and Odontocetes (toothed whales, a sub-order of Cetaceans) have particularly large brains for animals of their size. The EQ has come to be widely used as a means of comparing relative intelligence between species. This use of EQ has been criticized (see Rothe, Dicke), but is widely cited in technical papers. EQ is very often presented as a relatively accurate means of comparing intelligence.[11] His formula, known as the encephalization quotient (EQ), was derived by fitting ???

[11] EQ references are typically made with three significant

idea of reality as a fluid concept that reality can be thought of simultaneously as external and internal, and that it is largely species specific. The external reality is what we share with other members of our species. The internal reality is what we experience through our brain. Jerison says that:???

But our individual perceptions of the world are vastly greater, and perhaps often quite different, than the reality we share with others. We may each experience (see) the same penguin, but we could very well have rather large differences in our individual reality of that experience. We will notice different aspects and pay attention to different details. If one of us has extensive prior knowledge about and experience with penguins, that will likely cause us to perceive things that the other person is completely unaware of. And beyond the narrow experience specifically related to observations of the penguin, the setting and our personal circumstances (conditions of the zoo, current weather, thoughts about a recent personal tragedy or euphoria) all combine to create a complex and unique experience for each individual. There is simply no way that either of us could possibly share the entirety of either of our realities, or even a small portion.

It seems quite unlikely that any of that will change. Questions about the broad nature of reality— more specifically, questions about meaning, place and other subjective ideas that matter most to most people— simply cannot be addressed through science (or, regrettably, by most of today's academic philosophers). There are, of course, channels through which such ideas can take root and flourish in daily life, but they are mostly outside of the conventional, secular boundaries that many feel compelled to stay within.[12]

[12] Indigenous traditions, sincerely applied religions (most of them), ancient philosophies such as stoicism, and esoteric or occult narratives all speak to how to best live one's life, regardless of the extent to which they address questions about the way the world really is.

Quantum theory has proven to be true