Consciousness, Cosmic Evolution, and the Technological Singularity

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In this essay I critically examine two influential evolutionary visions of the cosmos—those of Eric Chaisson and Ray Kurzweil—focusing on their explanations of consciousness within their evolutionary theoretical frameworks, and how they conceptualize the significance of consciousness within their respective views of the coming "technological singularity" (Vinge, 1993). My central argument is that a scientifically and philosophically credible understanding of the "technologically singularity" requires a satisfactory explanation of how consciousness fits into a cosmic evolutionary scheme. In examining both Chaisson and Kurzweil's ideas I conclude that neither Chaisson nor Kurzweil provides a satisfactory account of consciousness, and consequently neither one provides a scientific and philosophically satisfactory understanding of the "technological singularity." (I should note that this year Kurzweil (2012) is publishing a new book—*How to Create a Mind: The Secret of Human Thought Revealed*—that, given its title, is obviously relevant to this essay. I though have not been able to access or consider the arguments in his new book prior to completing this essay.)

Beginning with Eric Chaisson, I first encountered his writings back in the 1980s reading his book *Cosmic Dawn* (1981). The theory of evolutionary epochs within the universal saga of cosmic evolution—a central fixture in his scientific thinking up to the present—was clearly prominent in this early work. Years later, I discovered his excellent *Cosmic Evolution* website (organized in terms of his theory of evolutionary epochs) which I have since regularly included as a primary reading resource for students on presentations I have given on the theory of cosmic evolution. Further, I have highly recommended to both colleagues and students alike his book *The Life Era* (1987), which contains an excellent intellectual history of thinking on time and change, as well as a thought-provoking formulation of a global ethics within a scientific and evolutionary framework. Finally, his book *Epic of Evolution* (2005)—a highly condensed version to be found in his article "Cosmic Evolution" (2009)—is, in my opinion, one of the most comprehensive, profound, and integrative statements on the universality of cosmic evolution. All told, I have been repeatedly enlightened, informed, and inspired by the breadth and depth of Chaisson's scientific knowledge and thinking on cosmic evolution.

In his article “A Singular Universe of Many Singularities,” Chaisson (2012) summarizes his theory of cosmic evolution that, as I see it, attempts to philosophically synthesize the ontological principles of unity and plurality. On one hand, as a unifying principle, the evolution of complexity from quarks to technological civilizations can be described and understood in terms of ever-increasing “energy rate densities.” Complex structures, conceived as open systems, require a flow of energy through them to maintain themselves and further evolve; the greater the complexity, the greater the energetic flow through them per unit of matter. In essence, all systems in nature have self-sustaining metabolisms, and evolution is the ongoing emergence of more energetically dense metabolisms. This simple idea, illustrated with countless examples throughout many of Chaisson’s writings, is a powerful and thought provoking scientific synthesis that cuts across all levels of physical nature.

On the pluralistic side of things, within Chaisson’s cosmology each successive evolutionary epoch, from the particulate, to the galactic, solar, planetary, chemical, biological, and cultural-technological, is described as a relatively unique stage and configuration of constituents in the qualitative make-up of the universe. On this point, Chaisson is not alone, for many others, such as Gell-Mann (1994), Kauffman (2008), Kurzweil (2005), and Morowitz (2002), have argued for a series of qualitatively emergent stages in cosmic evolution. I should note that although Chaisson identifies these evolutionary epochs and levels of reality as distinctive, but he also at times describes them as just matters of degree. For example, he argues that the transition from non-life and the chemical epoch to life and the biological epoch—which appears to be a qualitatively emergent jump—is mostly a matter of degree. As he puts it, the transitions between epochal levels are filled with “shades of gray.”

Within this epochal cosmological framework Chaisson argues that the predicted “technological singularity,” whereby technologies surpass biological brains in intelligence and complexity, is but one singularity among many within the unfolding and open-ended history of the cosmos. For Chaisson, the “technological singularity” is simply the beginning of a new (relatively distinct) epoch—one that still follows the general evolutionary principle of increasing “energy rate density.” And since Chaisson sees evolution and the future as open with possibilities (a mixture of determinism and randomness), the anticipated emergence of transhuman AI should not be seen as an ultimate climax within the evolutionary saga. Evolution will go on; more singularities will come.

Though I clearly resonate in many ways with Chaisson’s theory of cosmological evolution and his “epochal” framework for delineating its stages, I wish to raise a puzzle with the whole scheme—a puzzle that applies just as much to evolutionary theories of the singularity that raise it to some unique and momentous event within the history of the universe, as well as to Chaisson’s view which treats it as but one of “many singularities.” The puzzle is how to fit “consciousness” into such cosmological visions.

A few years ago I listened to a very well known science writer argue that physics, through the development of string theory, was approaching a “theory of everything.”

Indeed, physicists have been promising this grand theoretical achievement for decades, if not centuries, at least since the time of Isaac Newton (Lombardo, 2006). I asked him how consciousness could be explained in terms of string theory. Whatever the presumed "theory of everything," if such a theory rested just the physical sciences, it's hard to see how one can derive consciousness from such a ontological framework. How can physical matter generate consciousness? The answer he gave me, which involved considerations of the observational dependency nature of quantum effects (Gell-Mann, 1994), was very disappointing; in fact, it appeared to me to be an out-and-out failure to even understand the puzzle. His paradigm seemed blind to the perplexity (Kuhn, 1962).

One could argue that at each new epoch in evolution, qualitatively new phenomena emerge that are unpredictable from the previous stage of evolution (Fraser, 1978; Kauffman, 2008); the universe—the saga of evolution—is indeed filled with (as Whitehead said) the "creative advance of novelty." Chaisson (2005), as noted above, agrees that the future is, at the cutting edge of evolution, unpredictable, since evolution brings with it an ongoing synthesis of determinism and randomness. Yet, when we come to consciousness, it seems that we enter into a different type of issue. It appears to make intuitive sense within a scientific and evolutionary framework, that as matter and informational systems have become increasingly more complex, consciousness emerged somewhere along the way in this process—perhaps with the emergence of sufficiently complex brains (Damasio, 2010). But consciousness seems to be a different kind of qualitative jump than life emerging out of chemistry or stars emerging out of clouds of atoms. The latter are jumps in physical qualities and complexity and commensurate; matter and life generating consciousness is incommensurable.

Though I am not a dualist, for consciousness does not seem to be a second substance (besides physical matter) (Lombardo, 2011), or a supernaturalist, believing that consciousness is some rarefied form of energy or transcendent spirit, I have yet to see anyone, past or present, explain satisfactorily how consciousness (that is experience or awareness) emerges out of a complex physical system of matter and energy (Blackmore, 2004). This ontological—in fact, scientific—puzzle is what David Chalmers (1996) refers to as the "hard problem" of consciousness. Though science has made great strides in understanding the phenomenological and psychological make-up and the physiological underpinnings and correlates of conscious states (Baars, 1997; Damasio, 1999, 2010; Koch, 2007), we still have no sense of how an electro-chemical process (for example, in the brain) yields a feeling of sadness, or how a conscious intention moves a muscle.

One could argue that consciousness is simply the subjective interiority of matter or the brain; it is what the brain feels like from the inside. This is the dual-aspect theory (Lombardo, 2011). But why does the brain feel like anything at all? Why is there a "light" inside? And more to the point, what is this amazing light? Being conscious (at the very least) is to be aware—to know—to be situated in an experiential field of revelation of existence. How can matter possess (or yield) such a quality, either from the inside, or in sufficiently complex interactions with the outside world?

To be fair, Chaisson does discuss the emergence of consciousness, at least in his *Epic of Evolution*, and though he details and highlights the evolution of nervous systems and brains, his specific treatment of consciousness per se is sketchy and vague (2005, pp. 419-421), and he definitely does not address the "hard problem" within his evolutionary framework.

To further complicate the conundrum of consciousness within the physical world, on the epistemological end of things, though it clearly seems to be the case that consciousness is always physically anchored and embodied (there are no disembodied minds), and though the realization of conscious minds probably requires certain fundamental physical conditions within the cosmos and a certain level of complexity of in brain-body biological systems (contra panpsychism), it is also true that the entire panoramic manifestation of the physical world, both is experienced and understood within the context of conscious minds. We may argue that consciousness arises from matter and energy, but it is equally true, that matter and energy (the physical world in all of its entirety) are experienced, conceptualized, and understood through consciousness (Lombardo, 2011). How can one phenomenon derive out of another phenomenon, if the latter phenomenon, in some deep sense, derives its meaning from the former? Mind may seem to depend on matter, but matter equally seems to depend on conscious minds.

Of course, most of us assume that there is an independently existing physical world that transcends the experiences and theories of conscious minds, that the cosmos existed way before the emergence of conscious minds, and that the vast and deep expanse of the universe goes way beyond the present grasp and limited perspective of the human mind. Contra Bishop Berkeley, most of us are not idealists, including myself; it does not seem plausible that consciousness creates (in its entirety) the physical universe.

But, in fact, it is the last point above that further reinforces the dilemma of how to fit consciousness into the big picture of things. The human mind experiences a highly selective differentiation and integration of reality. Though Chaisson argues that science strives for objectivity (a term that, notably, goes undefined), attempting to minimize or rid scientific knowledge of individual subjective biases, the fact is that the scientific community as a whole experiences and understands the physical world in the highly selective framework of human consciousness (that is a collective subjectivity). As Chaisson (2005), indeed, acknowledges in the conclusion of *Epic of Evolution*, "cosmic evolution is a human invention." It is probably the best theoretical invention we have, and we may be getting at the truth—at objectivity, whatever exactly that may mean—but it is still a conscious creation, albeit a thoughtful one supported by a great deal of observational evidence. In fact, the idea of objectivity, and attempts to maximize it, is a creation of thoughtful human consciousness.

Hence, we have a theory, created by conscious human minds, that postulates an independently existing and evolving physical universe that gives rise to the conscious minds that created the theory. We seem to be in an ontological loop. As I have suggested, perhaps the physical world and conscious minds, in some deep sense, form

a reciprocity—but this would change our whole way of looking at the evolution of the physical universe and conscious minds (Lombardo, 2011).

Let us now turn to Kurweil's (1999, 2005) evolutionary vision. Kurzweil proposes that cosmic evolution involves increasing informational complexity and processing speed, instantiated within increasingly complex physical systems. Further, evolving complexity feeds back on itself, generating an exponentially increasing rate of evolution—Kurzweil's "Law of Accelerative Returns". Hence, evolution (or the rate of evolution) is evolving. Finally, the emergence of the technological singularity will constitute a new level of exponential growth; things will move forward even faster. Just as with Chaisson, I have found Kurzweil's ideas highly thought provoking, and have incorporated his views into many of my presentations and writings, especially on the future of technology and the further evolution of the human mind (Lombardo, 2009).

As one central spokesperson of the "singularity" hypothesis, Kurzweil believes that as information technologies approach and eventually surpass humans in intelligence, they will increasingly appear to us as possessing consciousness. For Kurzweil, transhuman AI will indeed be conscious—even at a higher level than humans. Yet Kurzweil does acknowledge, much more so than Chaisson, the puzzle of consciousness in the grand scheme of things. For example, Kurzweil is well aware that there are critics that question how any kind machine could be conscious, regardless of how much memory, informational content, and processing speed it possesses. Further, he also discusses at length the intriguing possibility—a technological feat presumably achievable with the realization of the technological singularity—that human conscious minds and personal identities could be downloaded into sufficiently complex computers (or robots) whereby the machine would then "wake-up" possessing the personalized consciousness and subjectivity of the human. Again, critics question whether it is possible to "move" a person's consciousness and experienced personal identity from his or her biological body into a new body—one that in fact is made up out of silicon or other inorganic ingredients. Would the conscious "I" of the old body wake up in the new one? Addressing his critics, Kurzweil does believe that we will eventually accomplish this feat. (See the science fiction of Charles Stross (2005) and Robert Sawyer (2005, 2009) for some interesting speculative scenarios on the technological singularity and the downloading of conscious minds.)

Adopting a formalistic definition of mind, whereby a mind (and indeed a person) is nothing but the integrated and unique pattern of information stored in a brain, Kurzweil contends that the downloaded conscious person would, in fact, experience his or her self as the same self as before. This follows since the conscious mind, for Kurzweil, is the informational form of the body/brain and that form, in all of its complexity and uniqueness (if technologically it can be done), has been downloaded and recreated in the new technological body.

Although there are many critics of the technological or ontological credibility of this "downloading self, mind, and consciousness" futurist hypothesis, I would counter those critics on the grounds that they cannot convincingly argue that the computer/robotic

body wouldn't realize consciousness since no one has presented a scientifically convincing explanation of how a biological brain and body produces consciousness. (This is the "hard problem.") You can't say something is technologically impossible if you don't know how it's done in nature in the first place.

But contra Kurzweil, consciousness does not seem reducible to form or informational structure. There is a qualitative dimension—an existential reality—to experience that transcends form and information content. There is the raw fact of subjective awareness. Consciousness indeed does have informational structure, as also does the world of matter and energy, but this informational structure or form is manifested or revealed within consciousness, just as it is manifested within the physical world. Form can not hang suspended without a medium.

On the epistemological problem of consciousness and the world, Kurzweil (2005, p. 380) does acknowledge that the physical world (as we understand it) does in some deep sense depend on consciousness. To quote Kurzweil, "...if we truly imagine a world in which there is no subjective experience (a world in which there is swirling stuff but no conscious entity to experience it), that world may as well not exist." Hence, how can the evolutionary physical framework that the singularity rests upon (at least as Kurzweil and Chaisson understand it) hold itself up without consciousness?

Moreover, Kurzweil does puzzle over the issue of personal identity and individualized consciousness, which presumably our downloaded conscious minds would possess. Again, to quote him (2005, p.381), "...the mystery of why I am this particular person is what I really wonder about." (What is the "I" that asks this question?) The puzzle of the "I" and the unique conscious panorama within which this "I" lives—the puzzle of the self that both is conscious and within consciousness (Baars, 1997; Damasio, 2010)—simply adds to the mystery of how to fit consciousness into our scientific and evolutionary schemes. Consciousness, as far as I can determine, seems uniquely personalized; contrary to the mystics, de-personalized and non-subjective consciousness is impossible.

Finally, there is the causal efficacy problem of consciousness. What does consciousness do? Whenever and however it arose in evolution, how does it contribute to the successful functioning of intelligent life forms? When I observe the manifested intelligence of other human beings, or of myself, it clearly appears, at least in part, to be realized through consciousness. Clearly, I can see consciousness at work in my mind and others—impacting behavior and external events—when we think, when we observe, and when we feel. One could argue that intelligence can be completely described in terms of brain functioning, and that consciousness, indeed, may be just an epiphenomenon, but such a view does not make evolutionary or phenomenological sense. Why would it exist? Is it nothing but a colossal evolutionary "spandrel"?

Hence, since advocates of the technological singularity and transhuman AI all seem to believe that the superior intellects to come will be conscious, and I believe, correctly so, since consciousness is essential to the level of intelligence that humans (and probably

other higher life forms) possess, they need a good theory of the unique value and significance of consciousness—of what it is, how it works, and its place within the physical cosmos—and on all these counts I do not see satisfactory explanations.

The realization of the "technological singularity"—of conscious technological systems possessing minds that vastly exceed us in intelligence—is going to present (contra Chaisson) certain unique, if not unprecedented problems that as of yet are not understood within our contemporary scientific and philosophical mindset. Though I agree with Chaisson and Kurzweil that the technological singularity is coming, and that it is a further expression of the general evolutionary directionality of the cosmos, our most encompassing scientific frameworks of understanding of the universe, such as that articulated by Chaisson or Kurzweil, fail to satisfactorily incorporate the meaning and significance of consciousness. Such visions present "existence" as an independent reality without acknowledgement of the conscious mind that frames and interprets this vision, and cannot account for the how, what, and why of consciousness as it has arisen within the physical universe.

As some would argue, as conscious beings we may be incapable of understanding our very essence—the famous "mysterianism" hypothesis of Colin McGinn (Blackmore, 2004). Maybe it will require a transcendent intelligence—the intelligence envisioned within the technological singularity—that will be able to stand back from consciousness and gain the necessary perspective to answer the questions of consciousness (Bear, 1990). But such a machine would have to be conscious in the first place.

Perhaps we do not need to understand the reality of consciousness in order to transcend (or envelop) the human manifestation of it. Perhaps in the symbiotic coupling with our present machines (which do not appear conscious at all) we will be able to create conscious machines that exceed our mental horizons. I think not, though, since knowledge is power, and without knowledge we are whistling in the dark.

Finally, we should also ponder with much greater philosophical depth what it would mean to further evolve consciousness. It is not as simple as developing faster, more complex thinking and more memory (Lombardo, 2009). If we are going to transcend, let us thoughtfully, with wisdom and ethics, transcend. Though Chaisson presents a very brief treatment of the emergence of consciousness in his cosmological vision, he does (1987, 2005), highlight the importance of ethical evolution as one key dimension in our further mental evolution. Given that we can eventually get our heads around the deep, cosmological significance of consciousness, we must ask what it would mean to generate a higher level of consciousness, in both ethics and personal character, in the coupling of the biological and the technological, which is one of the great *hopes* and *fears* connected with the coming technological singularity (Lombardo and Blackwood, 2011).

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