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The Two Arrows of Efficiency: A Commentary on Konstantin S. Khroutski's *BioCosmology – Science of the Universal Future*

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Abstract

Konstantin S. Khroutski (E-Logos 2006) has proposed a "Science of the Universal Future" moving away from an objectivist emphasis on evolutionary struggle espoused in current paradigms of understanding, and towards a comprehension of the universe as subjective and collaborative towards personal and universal ends. He argues that individuals are born with an inherent health design, which he labels their "basic cosmist functionality" (BCF). Contemporary science has drifted away from, and is actually adverse to arguments for design in nature, thus the need to explore more deeply what functionality means from a combined philosophical-scientific perspective. In this review I look at classical notions of causality in natural process through the eyes of philosophers like Plato, Aristotle, Friedrich Nietzsche, and Bertrand Russell. Among his four types of causes, Aristotle's notion of efficient cause is accepted as the most viable alternative for explaining universal process. Mechanisms of causal efficiency operate in the immediate future to instigate change and in the immediate past to finalize change at every point as the individual advances through time.

Teleology can be interpreted as the operation of physical and biological laws as well as more gross patterns of process in chaotic, complex, and living systems, which shape changes in the individual within the openness of the present moment. Modern science is capable of discerning bio-psychological and existential patterns that optimally fit the individual if health is to be maintained. The analysis concludes that a universe with occupants possessing personal functionality can be explained by causal efficiency connecting the open present with a naturally organizing immediate future and past, thus avoiding conflicts over design.

Key terms used: causality, determinism, teleology, structure, function, biology, systems, genes, evolution, health

Introduction: The Rise of BioCosmology

In 2005 the world celebrated the centennial anniversary of Einstein's special theory of relativity, an intellectual edifice which unsettled people's comfortable notions of space, time, matter and energy. Einstein's proposals became the subject of both theoretical speculation and empirical verification, giving rise decades later to increasingly abstract concepts like black holes, and on the opposite end of the scale, ultra-minute strings. Some modern-day physicists have called for a return to empirical roots in science. This is also the point where Konstantin Khroutski and his "Science of the Universal Future" depart from contemporary scientific practice. Khroutski endeavors to create a worldview based on a penetrating and generalizable understanding of objective data and subjective experiences of the world, on a posteriori observations as opposed to a priori principles (Khroutski 2006, 7). In so doing, he arrives at the universality of (macro)evolutionary process in all lasting events, with successive emergence and transcendence of one developmental level by the next. The reader is reminded of the dynamics of evolution presented by other historic thinkers like Michael Polanyi and Teilhard de Chardin. Teilhard postulated an Omega Point towards which consciousness is advancing (de Chardin 1975, 259). Khroutski contends we are entering a new stage of human development he calls the *Cosmist episteme*, inaugurating the widespread recognition of universal a posteriori principles. He labels his theory addressing this sea change "BioCosmology," given its prominent biomedical relevance.

Glorious Randomness

Khroutski writes that all human beings, and, indeed, all living processes, have a *basic cosmist functionality* (BCF). "This means that all subjects are intrinsically and basically dedicated for the realization and execution ultimately of its/her/his definite function" (Khroutski 2006, 13). The *cosmist* term refers to the integration of the person with the surrounding environment, the two possessing harmonious as opposed to disjoint functional directions. In one sense the BCF is a characteristic or property that always belongs to the organism, and assures its health so long as the BCF is being recognized and satisfied. In another, the BCF is an ideal towards which the organism aims. Once an organism fully attains its BCF, its role in the universal cosmic evolutionary process also clarifies. Is this property teleologic, as if the BCF were drawing the person or entity forward in time? For Khroutski it might be, since he is dead set against *presentism* and *historicism* – the notions that only the present and the past events which comprise it have reality – and the traditional notion of evolution that support these doctrines. In contradistinction to Khroutski, philosopher Bertrand Russell looked at the question of whether causality happens in any predictable sort of way, and concluded that a total look at the environment will show too many intervening variables exist to say with specificity that a given chain of events will precisely lead to outcome X or eventuality Y (Russell 1981, 136, 7). Darwinian evolution likewise argues for natural selection of morphologies and capacities that arise by random variation. Darwin held that all the evidence from plant and animal breeders indicates that individual variations are purposeless (Bowler 2002, 227). In Khroutski's words, however, "… every living subject (organism) has the ultimate health-design ... all biological and social needs of humans conform to the ultimate end of his/her specific functionalist contribution to EvoProcess's wellness" (Khroutski 2006, 13, 15). Although he owes it to the reader to give more examples of what he proposes, Kroutski's belief in personal function combined with universal function is what individuals normally experience. We all feel happy and remain fairly healthy when complying with what are in our own best interests (according to Adam Smith) and eating and exercising in a way that respects the needs of the body as one goes about the world. To ignore these mental and physical functions is to invite illness. Is there a way to interpret the doctrine of functionality in a modern sense such that Darwinian evolution is respected rather than bypassed?

Causality, Efficiency, and the Will to Live

The Darwinian scheme outlaws design in nature, not scientific laws. Indeed, evolution is often referred to as "the law of evolution," and contemporary biology refers to principles of segregation and independent assortment in the way that chromosomes and genes operate. Physics has its own laws, such as Newton's laws of motion, which elementary as they are have not been supplanted by Einstein's principles of relativity, also behaving in law-like fashion. Major theories come and go and are challenged to stand the empirical test of time. Laws are created by scientific inference and read into nature. The unpredictability of which Russell wrote continues to remain at the microscopic and macroscopic levels and in scientific inference. Nonetheless, phenomena, especially established biological processes, tend to operate with some observable level of regularity. Of Aristotle's four types of causes, modern science accepts two; dithers on one; and rejects the last one. Entities have a *material cause* out of which they are made; and observable events beyond the quantum level have an *efficient cause* resulting in change (Bambrough 1963, 214-5). Phenomena tend to conform to various patterns in nature (*formal cause*), but whether they have an essence or *entelecheia* (the vitalistic school was revered through the late seventeenth century) is usually debated until a modern correlate (some sort of genetic action or metabolic exchange) is found (Cassell 1992, 235). Science rejects the notion that phenomena have a *final cause* compelling them to proceed in a certain way to achieve an inevitable end.

Aristotle defends his notion of a final cause by asking what is the cause of a person going for a walk? The answer: "For the good of his health" (ibid., 214). Further, in Aristotle, a doctor may bring about his own good health (Bambrough 1963, 209). Other modern-day examples would be the restoring physiologic and metabolic forces programmed into the body allowing it to maintain homeostasis, and cells' abilities to turn genes off and on as they regulate protein production. These examples do not dictate highly designed ends. They do not suggest mechanisms to destine a person to win a debate about the privatization of health care, or instruct a cell to produce a particular amount of pyruvate then switch off. Nonetheless, principles of survival and health maintenance seem to be operating, albeit through a series of linked efficient causes. Nietzsche was sensitive to the implications of Darwinian thought when he spoke of power-seeking quanta or monads (Nietzsche 1974, 16-7). In his book *The Will to Power*, Nietzsche explained:

> "That the apparent 'purposiveness' ('that purposiveness which endlessly surpasses all the arts of man') is merely the consequence of the will to power manifest in all events; that becoming stronger involves an ordering process which looks like a sketchy purposiveness; that apparent ends are not intentional but, as soon as dominion is established over a lesser power and the latter operates as a function of the greater power, and order of rank, of organization is bound to produce the appearance of an order of means and ends." (Nietzsche 1968, 299-300)

The overriding inclination to survive has no doubt been built into the machinery of life from the very beginning. Indeed, the concept of body parts performing according to their natural functions is a Platonic one, and contemporary philosophers of biology have built the notion of life's goal-directedness into the very definitions of health and disease (Boorse 2004, 81-2). The body displays a myriad of restoring forces – DNA repair mechanisms at the molecular level, B- and T-lymphocytes at the cellular immune level, and physiologic adaptations at the metabolic and neurologic levels. As Darwin would say, the inclination to survive and prosper evolved through an efficiency of forces competing with each other, with those organisms having characteristics most likely to guarantee survival out-competing other organisms in the game of reproduction. It is quite possible that one day some temporal or supra-temporal cosmologic evolutionary equivalent will be discovered that also explains the balance of physical forces in the universe (Wheeler 1990, 16).

The idea of evolution driving individual identity was picked up by physician-philosopher Alfred I. Tauber, who views it as a telling descriptor of the nature of individuals. Personal identity is not static but dynamic, ever shifting throughout "various settings and in different functions" (Tauber 2000, 39). The autonomous self is continually in tension with the outside environment, which introduces a perpetual indeterminacy into its functions. Tauber ultimately concludes along with Levinas that we are persons only in relationship with others (ibid., 86). This realization leads to a focus on the collaborative relationship between patient and doctor in attaining health, analogous to Khroutski's mention of the individual's health in relation to universal health, but still constrained to a dyadic relationship. An ethos of medicine can be an outgrowth of Aristotle's original notion of efficient causes, with the added recognition that the sum total of forces can result in mechanisms geared towards health and survival.

Avoiding Temporal Bias

How do efficient causes operate, holding in mind the philosophical proviso that what we think are causes may be regularities we ourselves may be reading into chains of events? Here we are called upon to consider the manner in which change comes about in that infinitesimally small sliver of time called the present. In philosopher Irwin Lieb's view, time and the individual dynamically merge into one another (Lieb 1991, 60, 68-9). The individual advances forward in the direction of change, and time in a countervailing way flows into the individual, ever so minutely extends the individual so that change comes about within the present, then flows beyond the individual as past time. Spatiality "comes about continually" as the individual persists in time, with individual space being an "intensity" of the space that extends beyond them. Lieb invokes a folded sheet of paper in the region of the individual to represent the intensification of space resulting from the individual's activity. Another way in which the dynamics of change might be visualized is a boat in a river. The boat surges forward, with water slightly compressing against the bow of the boat, bending underneath the boat as it moves forward, and slightly stretching past the boat as it flows past the stern. The reorganization of water occurs in the present (where the boat is), but water also begins to change and completes changing in commensurate ways as it merges with and departs from the immediate vicinity of the boat.

I mention Lieb's thought because it illustrates that efficient cause does not operate on the present exclusively from the position of one temporal direction. Efficient action glances two sides of a coin. On the future side, the opportunity for change in the individual does not pre-exist but is just starting to be arranged in conformity with what modern science recognizes as principles and laws. The actual reconstitution of the individual occurs in the present. In the immediate past, whatever changes have come about finalize. The aggregation of forces in the universe does not occupy the immediate past any more than it occupies the immediate future, and the individual is influenced neither more nor less by causal influence in either direction. A contemporary notion of causal efficiency would recognize the existence of teleologic action in direct correspondence with the traditional notion of determinism, that both are operating in the region of the immediate present. The "push" of causality for current events to form on past occurrences, and the "pull" of teleology for current events to conform to future eventualities are simply the modus of change operating through scientific law in a present

bounded on either side (Modell 1994, 211-3). The individual is the node of change or openness in this flux.

Patterns of Emergence

Khroutski speaks of the role of the *philosopher-cosmist* in bringing about ultimate self-realization, somewhat reminiscent of Plato's philosopher-statesman charged with wise guardianship of the polis (Khroutski 2006, 19; Rouse 1956, 121). What mechanisms, in the purely scientific sense now – soon to be combined with cosmist considerations – create change as we see it? The aggregate of countless microscopic forces operating on the individual must, of course, be taken into account. For physicists and chemists, forces like the strong and weak nuclear force, electric charge, and gravity occupy the universe. Above the quantum level, single particle – single object systems often behave in a predictable and periodic sort of way due to these forces. The world is multi-particle, however. In some instances, the Brownian motion of suspended particles studied by Einstein, for example, motion is truly random. Often times, however, laws of mass action hold sway in a nether region predominated by chaotic systems. Chaotic systems, weather patterns, for instance, differ from simple particle systems in that the former do not exhibit a predictable periodicity. Nor are their motions entirely random, however. Rather, chaotic dynamics lies in between regularity and randomness. Such systems are fundamentally deterministic, but lacking regularity in their overall motion or behavior, display a random quality. Patterns do appear in their temporal or spatial behavior, often repeated at various scales of measurement (Baker 1996, 3). Finally, there are complex systems into which information is programmed. This description applies to biologic and engineered systems, which adhere to organized patterns of development and/or behavior at assorted levels. In the biologic domain, phenotype follows from genotype. Particular genes – ACTA1 and MYH2 – can be predicted to lead to the production of actin and myosin, the two major proteins making up the contractile elements of skeletal muscle fiber. Fast twitch muscles can be distinguished from slow twitch muscles, and their ratio plotted in a given individual. In humans, various general psychological functions – thinking, feeling, sensation-oriented, intuitive (Jung) – can also be discerned (Sharp 1987). Life overlays spatio-temporally arranged sequences into the patterns emerging from organized chaos.

Towards a Personalized Medicine

At this stage in scientific knowledge, development of organization out of loose chaos can be understood within the context of autopoietic theory covering laws of self-organization and self-replication (Emmeche 1997, 257). The repeating patterns of physical, chemical, and biological systems have also been extensively mapped (Lima-de-Faria 1995, 1988). Patterning allows classification into various taxa, where structural and functional rhythms can be discerned and predictions made. With life in particular, development and metabolism can be understood within the framework of molecular biologic theory. Although we do not have a Babbage engine that can crank-out the position of every protein, physicians regularly make predictions on the course of heart disease and cancer in individual patients, based on statistical interpretations of molecular interactions. Further, psychologic inventories and diagnostic categories allow assessment of the mental profile of the individual. We cannot say that a particular individual is destined to a particular fate, such as being the governor of Rhode Island or a prize-winning journalist. However, lack of perfect predictability does not hinder the ability to infer the general physical and psychological needs of the person, what Khroutski refers to as the basic cosmist functionality or *biotypology* that will allow one to flourish. Respect for the individual's existential needs, their perceived purpose for living, can also be a part of the personalized medicine Khroutski advocates (Khroutski 2006, 14; Cassell 1992, 242-3).

Conclusion: Health and Fate From a Fresh Perspective

The forces interlinking the past with the future are thus chartable on the microscopic level – as physical forces and genes, as well as on the macroscopic level – as patterns of chaos and categorical classes. They do not "pull" an individual or entity into an organized future any more than they "push" them from a patterned past, yet they do govern an individual's emergence into the future and to some degree foreshadow that future. Openness of possibility depends on the individual (and in the medical context, their healthcare giver); it is neither more clearly constrained by the future nor the past. Russell's countless intervening variables apply when we try to make predictions, say for health or disease, but these factors are taken into account within the model of the system, rather than being extraneous to it. Deeper philosophical arguments exist, based on questions about the shape

and symmetry of time, regarding whether entities have a unique and singular fate towards which they are hurtling comparable to their point of origin, but even here, one must be on guard to avoid interpreting these arguments simplistically as a fate towards which entities are being pulled (Modell 1994, 212-3).

Aristotle's notion of efficient cause is sufficient to explain the movement of bodies and people towards their inherent function. Human beings advance towards greater degrees of personal unfoldment as time moves through them. It is because change is not always random that function exists, and is chartable on the human level. The classic notion of evolution as competition among fighting forces has in textbooks and in practice already been modified to take into account what we know of the operation and preservation of complex and living systems at the microscopic and gross levels. Even without brute competition or divine design, the outline of an individual's healthy pattern in life can be discerned, and he or she may reach the stage in life where they can make a contribution to world knowledge and events, as the author of "BioCosmology" has done.

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