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Living science: Science as an activity of living beings



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ABSTRACT

The philosophy of science should accommodate itself to the facts of human existence, using all aspects of human experience to adapt more effectively, as individuals, species, and global ecosystem. This has several implications: (1) Our nature as sentient beings interacting with other sentient beings requires the use of phenomenological methods to investigate consciousness. (2) Our embodied, situated, purposeful physical interactions with the world are the foundation of scientific understanding. (3) Aristotle's four causes are essential for understanding living systems and, in particular, the final cause aids understanding the role of humankind, and especially science, in the global ecosystem. (4) In order to fulfill this role well, scientists need to employ the full panoply of human faculties. These include the consciousness faculties (thinking, sensation, feeling, intuition), and therefore, as advocated by many famous scientists, we should cultivate our aesthetic sense, emotions, imagination, and intuition. Our unconscious faculties include archetypal structures common to all humans, which can guide scientific discovery. By striving to engage the whole of human nature, science will fulfill better its function for humans and the global ecosystem.

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1. Introduction

My topic is an approach to the life sciences, and to science in general, that is grounded in the fact that humans are living beings interacting with each other and with the global ecosystem of which we are part. From this perspective, science is an important behavior by which humankind adapts as a part of the larger ecosystem. Moreover, since human survival depends on earth's ecosystem, I argue that the principal goal of science should be the adaptation and flourishing of the global ecosystem. In other words, humans and our science should be one of the “organs” by which nature adapts and evolves. I call this approach “living science” because it is grounded in the fact that we are living beings interacting as parts of a living ecosystem, which should define the primary purpose and method of science.

In his creation myth in the *Timaeus* (30d), Plato says that

the god, wishing to make this world most nearly like that intelligible thing which is best and in every way complete,

fashioned it as a single visible living creature containing within itself all living things whose nature is of the same order. (tr. Cornford, 1935, p. 40)

In contemporary scientific terms, this is the Gaia hypothesis (Lovelock and Margulis, 1974). That is, the earth's ecosystem is a complex living system — self-sustaining and self-regulating — of mutually interdependent living parts, in which the life of the whole comprises the lives of its parts, and the lives of its parts depend on the life of the whole. Moreover, Gregory Bateson argued that consciousness couples our individual minds to this global cybernetic system, which he called “Mind” (Bateson, 1987, pp. 447–454). In particular, science can facilitate to this self-sustaining, self-regulating process.

Since I will argue how science *ought* to be conducted, it is necessary to begin with a prescriptive premise, which I take to be uncontroversial: that humankind *ought* to survive. Therefore, since humans depend on the global ecosystem for our survival, we should understand our scientific enterprise in terms of what it contributes to the flourishing of the whole.

In the remainder of this paper I will explain some of the

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implications of this approach for science. In the next section I call attention to some obvious characteristics of humankind that, if taken seriously, have implications for the way we do science. They are developed in the remaining sections and include increased use of phenomenological methods, recognition of the role of situated embodiment in cognition, expanded notions of causality, and cultivation of aesthetics, emotion, intuition, imagination, and the unconscious faculties of our minds. As I will mention later, others have reached similar conclusions individually and in combination, but the premises and arguments here are different.¹

2. Science as a human activity

Since science is a human activity, it must accommodate the characteristics of humans as they are, not as idealized epistemic agents. I will review several that are especially relevant to living science.

First is the obvious fact that humans are living beings, which brings with it a set of special concerns, such as securing the necessities of life, including food, shelter, and health. Further, living beings are mortal, which implies that to preserve humankind, we must promote the continuation of life beyond our individual lives. The maintenance of life requires a healthy ecosystem, which unites our concerns with the concerns of the larger living world. Therefore, we must also consider how human acquisition of knowledge and understanding can support the global ecosystem, for humans are unique among living things in their ability to adapt and to transform the environment (for good or ill). That is, we can understand science as an activity peculiar to *Homo sapiens* in its role as one of the “organs” (organized functional subsystems) by which the global ecosystem adapts and evolves. Thus science serves as an adaptive mechanism, which can enhance the survival and flourishing of humankind in the larger ecosystem, but also enhance the survival and flourishing of the global ecosystem itself. (Of course, science can serve other ends as well, such as satisfying intellectual curiosity.)

All humans — indeed, all living things — are purposeful. This is not meant to claim that humans and other animals do not sometimes act aimlessly or refrain from acting at all; it does not imply that we never contemplate in a disinterested way. Rather, it is meant to call attention to the fact that living things must act in order to survive as individuals, to promote the survival of their species, or to promote the health of the larger ecosystem on which they depend. Their behavior is directed toward *ends* (goals). (Biologists are rightfully wary of “purpose” and prefer the vocabulary of “adaptation,” a topic considered in more detail below: “Four Whys”) Therefore we must consider the scientific enterprise in the context of the functions it serves.

Because humans are purposeful, human cognition is fundamentally *situated*, that is, it arises in particular situations (social, cultural, physical) and is applied in particular situations (Brown et al., 1989). Indeed, all animals need to use their knowledge, skills, and understanding in the context of specific situations in order to survive. In contrast, general knowledge, which is abstracted from situations and independent of any context, is harder to acquire and less immediately useful. Traditionally, science has privileged unsituated knowledge, but the reality of human

cognition is that it is primarily situated, and denying this reality leads to unconscious biases (e.g., mistaking tacit interest for the absence of interest).

As Aristotle famously wrote, “the human is by nature a social animal” (*ho anthrōpos phusei politikon zōon*, Pol. I.1.9, 1253a.). Evolutionary psychologists likewise have concluded that social behavior is characteristic of *H. sapiens*. Many of our activities are group activities and serve some collective purpose. This is especially true of science, which seeks public knowledge that is equally valid for all people. Moreover, culture is fundamental to human nature. Our social behavior and interactions with the larger world are conditioned by the culture in which we have been born and raised. Although we can adapt to other cultures, some of our fundamental psychological structures result from early enculturation and affect our scientific interaction with the world. Moreover, science itself is a culture, which overlays our native cultures. Therefore, we should not ignore the cultural context of science, or pretend it doesn't exist.

Human beings are sentient, by which I mean that they are sensitive to their environments, bodies, and interior states, and that they consciously experience this sensitivity. This is obvious, but sometimes forgotten when we focus on the objective, empirical, and public character of science. Conscious experience is fundamental to science as a human activity, for all observation is ultimately observation by a sentient being. (Recall that “empirical” derives from Greek *empeiria*, experience.) Therefore, the investigation of conscious experience is fundamental to science; it cannot be ignored or considered beyond the scientific pale. Rather, the scientific enterprise must be expanded to embrace the study of consciousness (see “Three Perspectives” below).

The following sections will explore some of the implications of these human characteristics on the concept and conduct of science. Many of them will be familiar from, for example, Husserl's *Crisis* (Husserl, 1970). His conclusions, however, were based on a teleological-historical analysis of Western science; mine are based primarily on recent progress in cognitive science and evolutionary psychology.

3. Three perspectives

Remaining true to human existence requires science to integrate three perspectives, sometimes called first-, second-, and third-person, by analogy with grammar. The traditional perspective of science is *third-person*; that is, it talks *about* the subject of investigation. Science generally treats its subject matter as objects externally related to each other. That is, scientific facts are expressed as properties and relationships that are publicly visible (observable, experienceable) from outside of the objects themselves. Even when we look (spatially) inside an object, it is to observe the relations among the objects inside of it, that is, relations external to the sub-objects.

The usual third-person perspective is too limited when trying to understand conscious experience, which is fundamental to human nature. (I am referring here to *phenomenal consciousness* — our experience of subjective awareness — not to the epistemologically less problematic notion of *functional* or *access consciousness* (Block, 1995).) Science has neglected the investigation of consciousness due to the difficulty of making publicly verifiable observations of conscious experience, which seems to be private. Nevertheless, without a scientific theory of consciousness and how it relates to the physical world, our understanding of existence is radically incomplete. This is the “hard problem” of consciousness (Chalmers, 1995). Consciousness is not simply one of the many phenomena still inadequately explained by science; rather, it is *the* fundamental

¹ My arguments are based on two facts from consensus science that are true now and likely to remain true in the foreseeable future: (1) there is currently only one species of agents (natural or artificial) on earth capable of doing science in the strict sense: *Homo sapiens* (of course many species learn from experience and adapt; that is not science *sensu stricto*), and (2) the vast majority of the humanity is confined to earth. If these facts change in the future, then my argument will need to be revised.

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