



Cell phenomenology: The first phenomenon



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ABSTRACT

As a broad academic discipline phenomenology may be summarized as the study from a first person point of view of what appears to subjective human conscious experience. As a historical philosophical movement phenomenology was often motivated by the belief that subjective human experience is the proper foundation of all philosophy. I explore phenomena from a broader evolutionary and physical point of view. I consider a phenomenon as the subjective consequence of a physical interaction with an individual organism. In physical terms, a phenomenon requires some form of detection or measurement. What is detected is determined by the organism, and is potentially *functional* for the organism as a *self* or *subject*. The concept of function has meaning only for living organisms. The classical human *mind-body problem* is an ill-defined complicated case of the more general epistemic *subject-object problem*, which at the origin of life I reduce to the primitive *symbol-matter* problem. I argue that the first memory-based self-replicating unit, like a cell, is the most primitive case of a necessary symbol-matter distinction. The first phenomena, which include all forms of sensing, detection, and measurement, require a subject-object distinction, called the *epistemic cut*. It is only because of such a subject-object distinction that populations of individual subjects can selectively adapt to their environment by heritable variations. This basic evolutionary process requires distinguishing the individual's subjective *phenomena* from the objective *events* of inexorable physical laws.

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“Cells are, in a way, more complex than the embryo itself ... However clever you think cells are, they are almost always far cleverer.” Lewis Wolpert

1. Consciousness is not required

Most branches of philosophy have an explicit or tacit focus on the human level of thought, language, and behavior. Phenomenology has historically focused explicitly on the subjective conscious experience of the human individual. For many years I have found it instructive to explore phenomena from a broader and more elementary evolutionary and physical law-based point of view, defining it as those subjective events that appear to the simplest individual self as *functional*. At the cell level function cannot be precisely defined because what is functional ultimately depends on the course of evolution. Functional phenomena occur at all levels in evolution and are not limited to conscious awareness. Following the strategy of physics research, I have found that by

exploring the meanings of phenomena and the *subject-object problem* at the most primitive level, their meanings and problems are better understood at the higher levels (Pattee, 1969, 1982).

There are several reasons that human consciousness is not the most instructive or dependable level to study phenomena or the fundamental subject-object relation. First, there is very little knowledge, and certainly no agreement, about when or why any level of self-awareness or consciousness first evolved. From an evolutionary perspective consciousness does not appear to have any necessary role in any individual organism being alive.¹ Second, the cognitive sciences now provide convincing evidence that the phenomena that appear to our conscious mind are only a small fraction of the brain's unconscious perceptual and cognitive activity. There are many levels of consciousness, and what appears at the conscious level is under the control of the unconscious brain. We have no subjective access to any of the preconscious processing that results in conscious phenomenon (e.g., Churchland, 2002;

¹ “It [individuality] depends not on consciousness, but on *being*; not on thought, but on *life*; it depends on the individual's empirical development and manifestation of life, which in turn depends on the conditions existing in the world” (Karl Marx, 1845).

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Changeaux and Dehaene, 2011). Many of our basic sensorimotor activities are unconscious, such as balancing, walking, gesturing, etc. There is also good evidence that great discoveries in mathematics and physics and creativity in the arts arise in the unconscious mind by a search and incubation process that appears in consciousness as a sudden epiphany.² Third, conscious introspection is often deceptive and always reaches a dead end. Fourth, there is no fundamental physical theory that requires a conscious observer. I discuss the reasons for this in the section on *The necessity of the epistemic cut*.

Finally, in terms of the long term evolutionary future of our species, the adaptive value of phenomena appearing to human consciousness is far from clear. The products of conscious thought, that include reason, religion, the arts and sciences, are certainly considered as the species' greatest accomplishments. On the other hand, they are also responsible for deadly ideological conflicts and Promethean technologies that over evolutionary time scales have no certain survival value. So far, the lower species that lack the human level of consciousness have a far longer record of survival.

The phenomenologist's first objection to this approach is to point out that all our knowledge, including theories of evolution, physics, and the neurosciences, is still ultimately derived from subjective human phenomena, which are our only source of experience. This is obviously the case, but it is not the problem. The problem is that any concept of *subject* or *self* implies the existence of an *object* or *non-self*. For physics the relation of subject to object has always been the fundamental problem.

Modern physicists understand that all experience is subjective. Hertz (1891) recognized this fact, and he also recognized the fundamental problem:

Outside consciousness there lies the cold and alien world of actual things. Between the two stretches the narrow borderland of the senses. No communication between the two worlds is possible except across this narrow strip. For a proper understanding of ourselves and the world it is of the utmost importance that this borderland be explored. (Hertz, 1891)

Hertz (1894) was also clear on the limits of subjective knowledge: "As a matter of fact, we do not know, nor have we any means of knowing, whether our conception of things is in conformity with them," except by how our subjective images correspond to our experience. And Max Born (1964) said it succinctly, "fundamentally, everything is subjective – everything without exception." Consequently, the issue has always been the epistemological problem: How do we connect the subjective phenomena with objective existence?

Awareness and consciousness are not clear-cut concepts and certainly not measurable observables, but there is no doubt that the subjective self exists. There should also be no doubt that the non-self exists. My argument does not require a new theory. It conforms to established physics, molecular biology, and evolution theory. From the principles and experimental evidence of these fields I develop a view of subjective phenomenon that distinguishes it from all other objective lawful physical processes – processes that have no intrinsic function or meaning. This view requires irreducible complementarity between subjective and objective

models. I believe this complementarity must be made first at the level of self-replication, where the cell must distinguish *symbolic self* from *material non-self*. I call this the *symbol-matter problem*. This is the same epistemic distinction that must be made in physical theory between subjective measurements and objective physical laws. In physics, this is the distinction between laws and initial conditions. (I interpret boundary conditions and constraints as special initial conditions.) The unresolved interpretation of this distinction in quantum mechanics is called the *measurement problem*.

One should keep in mind that life not only began 4 billion years ago with single cells, but all evolved multicellular organisms, including humans, still develop from a single cell. In whatever sense multicellular life is "in the world" so is the single cell. Multicellular development is a remarkable and exceedingly complex process that requires many levels of coordinated symbolic constraints on lawful physical dynamics (e.g., Pattee, 1971). For the purpose of understanding how human-level subjective concepts like *events*, *awareness*, *interpretation*, *function*, and *meaning* arose, I will consider these concepts from the single-cell point of view. Rather than coining new words for these primitive levels, I prefer to generalize the meanings of common words retaining their core meanings. This often causes objections which I address in the section *The two-culture problem*.

The historical concept of a phenomenon assumed the existence of a human subject and conscious self, which implies a non-self environment. Brentano (1995) described one aspect of *intentionality* as the characteristic by which self conscious phenomena could be distinguished from non-self natural physical processes. There is no clear consensus on what Brentano meant by *intentional inexistence*, so I will not enter that discussion. However, there is general agreement that human intentionality has indefinitely many levels and interpretations (e.g., Jacob, 2014). To discuss phenomena below the level of human consciousness I generalize *intentionality* to include *functionality*, which also distinguishes phenomena from other natural physical processes that are lawful but not functional. There are also many levels of functionality. At the origin of life the essential function of *the self* was *self-replication*. Throughout most of evolution function must be associated with adaptation and survival value. Unfortunately, at the human level, cultural selection can appear to evade natural selection by technology. Over evolutionary time scales, this appears unlikely.

2. Life, intentionality, and functionality depend on symbolic informational constraints

There is also agreement that all phenomena arise initially from sensory information or from the memory of such information. In the cell this includes all forms of detection or acquisition of information from the environment, and information in genetic memory. In physical terms acquiring sensory information is a type of *measurement* process. Whatever the physical medium of this information – gravity, forces, particles, molecules, light, heat sound, etc. – the initial detection in all organisms occurs at the cell level. The result of any detection or measurement process is *symbolic information*. The primary symbol *vehicles* in cells are genetically dependent special molecules or electronic signals. It is arbitrary symbolic information because there are no physical or chemical laws that determine the relation between what is detected and the resulting symbol vehicle. The structure of symbol vehicles depends on genetic information.

I am using the common definition of *symbol* as an *arbitrary* local physical structure (the symbol vehicle) that is *interpreted* by the organism as standing for a separate process, structure, or event. A symbol is a record or carrier of information. What is missing from

² "It is certain that the combinations which present themselves to the mind in a kind of sudden illumination after a somewhat prolonged period of unconscious work are generally useful and fruitful combinations ... all the combinations are formed as a result of the automatic action of the subliminal ego, but those only which are interesting find their way into the field of consciousness" (Poincaré, 1914).

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