

# Eccles' Model of the Self Controlling Its Brain

## The Irrelevance of Dualist-Interactionism

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### Abstract

Sir John Eccles wrote that Descartes' dualist-interactionism guided his scientific career, yet his scientific work reached far beyond the bounds of this or any other philosophical proposition. Indeed, the untestable, metaphysical foundation of dualism in all its forms conflict with scientific thinking. Thus, if Eccles had concentrated on spirit as distinct from matter, he would have positioned himself to discover a scientific theory of the self. To illustrate how this is possible, we compare such a theory—the Theory of Enformed Systems—with dualist-interactionism.

**Key Words:** Eccles, Dualism, Mind-Brain

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### INTRODUCTION

As a young medical student, Sir John Eccles could not accept the “irreligious philosophy of monist-materialism.” He turned to Descartes' dualism because separating *res extensa* and *res cogitans* “gave a secure status to the human soul or self.” Though Eccles was motivated partly from his religious beliefs, it is clear from context that his concept of spirit was not confined to any particular religious or philosophical doctrine. That is, he equated the terms *spiritual* and *nonmaterial*, which disengaged his thinking from Cartesian dualism and placed it in the path of modern science. Given this insight, if he had not persistently returned to dualist-interactionism or any other philosophical model of mind, he would have been free to develop a scientific theory of the self and its relation to the brain.

Of course, given the lack of knowledge about the brain in the seventeenth century, Eccles rejected Descartes's proposal that the mind and brain interact at the pineal. Beyond that, his readings in philosophy had shown him that philosophers in general are pervasively

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ignorant of the “brain at the subtle level at which it could relate to conscious experiences.” Thus he decided to contribute to the philosophy of mind by making his career in neuroscience, in which his “dualist-interactionist philosophy was like a beacon light guiding my way through the complexities of my neuroscientific studies” (1994).

As it turned out, however, this beacon was irrelevant to his scientific work. In the preface to his book, *How the Self Controls its Brain*, he wrote, “A most important programme for this book is to challenge and negate materialism and to reinstate the spiritual self as the controller of the brain.” Yet this isn’t a single program. It is two separate programs in two radically diverse disciplines, philosophy and science.

### **PHILOSOPHIC PROPOSITIONS vs SCIENTIFIC THEORIES**

Although Eccles proclaimed himself a dualist-interactionist, his scientific work proclaims otherwise. In 1963, he received the Nobel Prize for his comprehensive pioneering work on synaptic neurophysiology. That work and his subsequent theory of psychons and quantum-based exocytosis result from scientific thinking, firmly grounded in the empirical method. These works neither follow nor precede the philosophic doctrine of dualist-interactionism. Nor do they reflect or support dualism's currently popular alternative, material monism. Dualism and monism, progeny of introspective, anthropocentric philosophy, are not relevant to the science of the brain, the self, and consciousness.

Although no scientific theory of the mind or self was available to Eccles, he remained true to the empirical method. Thus, if we follow his science, we can be propelled into the future of noetic science. But if we follow his philosophy, we find ourselves at a scientific dead end, looking backward into the metaphysics, knowledge, and religious beliefs of the seventeenth century.

The term *dualism* originated with Thomas Hyde around the end of the seventeenth century to label a metaphysical theory that paralleled the theological doctrine that the world consists of elements made of pairs of complementary but incommensurable components such as good and evil, light and dark, spirit and body. Whereas the popular rendering of dualism holds that incongruous entities such as mind and body cannot interact, Descartes posited that they do. The term *dualist-interactionism* indicates Descartes’s view.

Dualist-interactionism could not guide Eccles to accomplish his scientific program for two key reasons: The term *mind* was not well defined, and “dualist-interactionism” was not delimited in ways that it could generate hypotheses for empirical testing. Because dualist-interactionism can’t be tested, it is a scientific dead-end. Forcing it to mate with scientific thought yields a mule—a hybrid that can live its own life but cannot reproduce, much less evolve.

### **REDEFINING DUALIST-INTERACTIONISM**

Eccles’ implicit criticism of Descartes’ dualist-interactionism indicates that he was aware of the weakness of the philosophical proposition. Though he accepted the “dualist” part of dualist-interactionism “that the mind and brain are independent entities,” he amended the “interactionism” part by generalizing: “There is interaction of two distinct entities, the spiritual self (World 2) and the material brain (World 1), as defined by Popper and Eccles (1977).” Note that here he refers explicitly to self, not mind.

Eccles also rejected Descartes' concept that mind is a substance:

*The concept of substance leads to a materialist aspect of the mind. I speak instead of the spiritual existence of the self without mentioning any 'substance' properties. The great problem is 'how the self controls its brain'. This is dualistic, but not in terms of two substances. Instead it relates to the two worlds of Popper. (1995)*

That Popper's two categories, World 1 and World 2, are presumed to be parallel and co-existent is crucial to understanding the impediments that dualist-interactionism placed in the way of Eccles' thinking. When he considered mind and body as entities, his thinking was constrained to the notion that each of them requires the existence and operations of the other. That's why he anchored his concept of self to brain operations, namely the ultra-microphysiology of synapses. This parallel-dualism perspective precluded his developing a theory of nonmaterial systems that are operationally independent of material systems. As shown below, without such a model, there can be no scientific theory of survival of the self after death of the body—a phenomenon in which Eccles firmly believed.

Despite his dissatisfaction with dualist-interactionism, Eccles relied on it because he had no scientific theory of spirit to guide him. If the Theory of Enformed Systems (TES) (Watson, et al, 1999) had been available to him, he would have found that the notion of “mind” is superfluous. Under TES, which is empirically testable, the self performs all the operations attributed to mind.

Evidently Descartes agreed with the idea that it is the self that exhibits mental operations when he wrote his famous statement, “I think, therefore I am.” He did not say, “My mind thinks, therefore my mind is.” This statement evokes the question, “What is the referent for ‘my?’”

### **THE BINDING PROBLEM**

With Friedrich Beck, Eccles applied quantum theory to explain the synaptic exocytosis of neurotransmitters. Though this provided at least a hint of “spirit-matter” interaction, it did not solve the binding problem (Damasio, 1989). If TES had been available to him, Eccles would have avoided this perennial problem of neuroscience. That is, because TES is a theory of wholes—as opposed to collections of parts—he could have come much closer to realizing his objective than he did in trying to conform his interpretations to dualist-interactionism.

Eccles' approach to the binding problem is found in his concept of mental units:

*The hypothesis has been proposed (Eccles, 1990) that all mental events and experiences, in fact the whole of the outer and inner sensory experiences, are a composite of elemental or unitary mental experiences at all levels of intensity. Each of these mental units is reciprocally linked in some unitary manner to a dendron [a bundle of dendrites]. . . . Appropriately we name these proposed mental units 'psychons.' Psychons are not perceptual paths to experiences. They are the experiences in all their diversity and uniqueness. There could be millions of psychons each linked uniquely to the millions of dendrons. It is hypothesized that it is the very nature of psychons to link together in providing a unified experience. (1994)*

Though rudimentary, Eccles' notion of psychons linking together is consistent with one of the fundamental behaviors of SELFs under TES: cohering in space-time. The difference is in his considering psychons themselves as “experiences,” not entities. Under TES, SELFs

(acronym for Singular, Enformed, Living Fields) are the entities that contain experiences; i.e., SELFs are containers, not contents. We believe Eccles would agree with this view, because it's tortuous to think that experiences themselves form the "intentions" necessary for neurotransmitter exocytosis under his theory.

### THE MIND-BODY PROBLEM

The enduring "mind-body problem" is an artefact of philosophical reasoning. The premise of parallel dualism, together with the premise that spirit and matter can't interact, foster interminable arguments that can only reflect back to the premises—hence, the problem. That is, if one begins with these premises and remains faithful to their implications, one can only find results that mirror the premises. This is not science, because it is impossible to apply these premises to formulate a testable hypothesis of mind-body interaction. The only way around the mind-body problem is to generate dissimilar, competing propositions.

The "psychophysical identity" proposition is today's most popular model for working around the classical mind-body problem. It replaces dualism with material monism. Under the psychophysical identity proposition, mind is an unnecessary concept because mind states are actually brain states. Noting that Popper (Popper and Eccles, 1977) characterizes the psychophysical identity model as "promissory materialism," Eccles attacked this proposition thus:

*I regard this theory as being without foundation. The more we discover scientifically about the brain the more clearly do we distinguish between the brain events and the mental phenomena and the more wonderful do the mental phenomena become. Promissory materialism is simply a superstition held by dogmatic materialists. It has all the features of a Messianic prophecy, with the promise of a future freed of all problems—a kind of Nirvana for our unfortunate successors. (1994)*

Eccles didn't need to stop with characterizing promissory materialism as dogma. He could have used a scientific argument. Unlike the parallel-dualism premise, material monism implies a testable hypothesis, namely that local brain operations are necessary for all mental events. Had Eccles included nonlocal parapsychological findings among our "wonderful mental phenomena," he could have shown that material monism's essential implication has been falsified. The brain is not necessary for valid empirical data pointing to what Dossey labeled the "nonlocal mind" (1997), including telepathy (Bem and Honorton, 1994), psychokinesis (Jahn, et al, 1987), remote viewing (Targ, 1996), and many other nonlocal parapsychological phenomena (Radin, 1997).

### ORGANIZING AND THE CONSERVATION LAWS

Although Eccles didn't seize the opportunity to attack the basic premise of material monism with empirical evidence of nonlocality, he applied other aspects of quantum theory to address the long-held belief that the conservation laws preclude mind-body interaction:

*The materialist critics argue that insuperable difficulties are encountered by the hypothesis that immaterial mental events can act in any way on material structures such as neurons. Such a presumed action is alleged to be incompatible with the conservation laws of physics, in particular of the first law of thermodynamics. This objection would certainly be sustained by nineteenth century physicists, and by*

*neuroscientists and philosophers who are still ideologically in the physics of the nineteenth century, not recognizing the revolution wrought by quantum physicists in the twentieth century. (1994)*

Of course, not all nineteenth century physicists were ideologically identical. James Clerk Maxwell, who laid the foundation for modern physics, foresaw the solution to mind-matter interactions in his thought experiment that became known as “Maxwell's demon.” The metaphoric demon segregates fast (high-energy) molecules in a gas from slow ones, thereby creating an energy gradient in apparent violation of the first and second laws of thermodynamics. That the violation is only apparent is found in realizing that the demon organizes matter; it does not create or destroy energy. In other words, organizing an ensemble of material elements is the key to extracting usable energy from non-usable energy. Organizing, in this frame of reference, consists of derandomizing otherwise random events.

Szilard (1929) and Brillouin (1950) showed that Maxwell's demon can't operate under the prevailing renditions of physics and information theory. Yet Szilard, educated not only in physics, but in biology and biophysics, circumspectly acknowledged, “Presently, of course, we do not know whether we commit an error by not including the intervening man into the system and by disregarding his biological phenomena.” This is a critical caveat because the disregarded biological phenomena are the keys to this issue. Derandomization in opposition to the entropy law is necessary, not only for Maxwell's demon, but for life itself. We show below that the theoretical quantity, *enformy*, is the key to allowing derandomization.

## QUANTUM STATISTICS

With Beck, Eccles used the idea of derandomization in their model of synaptic neurotransmitter release (exocytosis) based on the statistics of quantum physics. Briefly, a quantum probability field associated with “intention” increases the likelihood for transmitter exocytosis and hence, an excitatory post-synaptic potential (EPSP). If a sufficient number of EPSPs sum within a time sufficiently brief that the neuron's threshold depolarization is reached, an action potential will ensue. This ultimately produces communication with other neurons or muscle fibers, the latter resulting in motor activity. Even so, as Chalmers (1995) points out, such a “whirl of information-processing” does not explain subjective experience. Ultimately, Chalmers' “hard problem” is the object of Eccles' work.

Eccles interpreted the quantum exocytosis model in terms of dualist-interactionism, but this explanation is neither necessary nor helpful. Quantum physics—and hence the theory of Eccles and Beck—does not depend on any philosophic concept of dualism.

## A SCIENTIFIC THEORY OF THE SELF

Although the contributions of Eccles can't be fully elaborated in the context of “dualist-interactionism,” his findings and thoughts can be appreciated when they are cast in the framework of the Theory of Enformed Systems (Watson, 1997a, Watson, et al, 1998; Schwartz, et al, 1998). Eccles found the rudiments of this theory intriguing (Watson, 1998).

TES is not induced from introspection or observation. It was developed by the hypothetico-deductive method advocated by Eccles:

*Induction was shown to be untenable as a scientific method by Popper in The Logic of Scientific Discovery (1959). Instead, advances in scientific understanding come*

*ideally from hypothetico-deductivism: firstly, development of a hypothesis in relation to a problem situation, and secondly, its testing in relation to all relevant knowledge and furthermore by its great explanatory power. (1994)*

The conceptual origin of TES is the posit that there exists a fundamental, conserved capacity to organize, denoted by the term *enformy* (Watson, 1993). Opposing the disorganizing operations implied by the second law of thermodynamics, *enformy* organizes and sustains four-dimensional fields of nonrandomness (termed *enformation*). These fields (domains of influence) are named SELF to indicate they are unique (singular), sustained by *enformy* (enformed), and capable of reproducing and evolving (living). Not coincidentally, the SELF corresponds to the “self” as described by Eccles:

*[The word “self”] will be used to connote an experienced unity that derives from a linking by memory of conscious states that are experienced at widely different times—spread over a lifetime. Thus, in order that a ‘self’ may exist there must be some continuity of mental experiences and, particularly, continuity bridging gaps of unconsciousness. For example, the continuity of our “self” is resumed after sleep, anaesthesia, and the temporary amnesias of concussion and convulsions.*

Under TES, SELFs are not limited to humans. They correspond to the organization inherent in all coherent, whole systems ranging in complexity from photons to humans and beyond. Because they are continuous in space-time, but discontinuous in three-space, their fundamental behaviors account for the nonlocal phenomena apparent in quantum physics (e.g., quantum entanglement) and parapsychology (e.g., telepathy).

SELFs exhibit three fundamental behaviors: (1) state-conforming—conforming to the SELF's own states; and (2) self-conforming—conforming to these states as the SELF's own, distinguishing them from states external to the SELF; and (3) cohering in space-time. Humans experience state-conforming and self-conforming as the rudiments of perception and self-awareness respectively. Cohering in space-time accounts for telepathy, remote viewing, precognition, and psychokinesis. As seen above, this is the aspect of TES that is consistent with Eccles' notion of psychons linking together.

SELFs are entities, but they do not necessarily co-exist with material entities. Instead, SELFs are prephysical, i.e., pre-existing and fundamental to physical systems. Yet their operations on physical systems are profound: *Enformy* enforms (organizes) elements of matter and energy/mass to conform to the *enformation* implicit in SELFs. In this way, SELFs act as maps for organizing physical systems in time and space, which is the basis of morphogenesis and the origin of life itself. Thus TES answers the question posed by Bertalanffy (1968): “What's the difference between a living body and a dead one?” A body that is enformed to conform to a SELF is living; a body that is not enformed in this way is dead. And because SELFs exist independently of any physical system, the question of their survival after death of the organism vanishes. The survival-of-SELF aspect of TES implies testable hypotheses concerning mediumship, i.e., telepathically communicating with the SELFs of deceased persons (e.g., Schwartz, 2002).

Because SELFs contain *enformation* that is continuously modified, augmented, and extinguished by conforming (Watson, et al, 1998), they contain the memory that provides the “continuity of mental experiences” to which Eccles referred. The brain, in other words, is not necessary for memory content—which explains why searching for it in the brain has

proven futile (Schacter, 1996). Moreover, operations of the SELF form the basis of all so-called “mind-brain interactions:” SELFs and ensembles of neurons concomitantly conform to one another, which requires conceptualizing SELF-body systems as wholes, rather than the sum of their parts.

In short, under TES, neither “mind” nor “body” is a primary topic of interest, yet the theory inheres a comprehensive theory of consciousness. That is, by explaining the organization of all holistic systems—including their fundamental properties and behaviors—TES explains, not only all the elements traditionally attributed to “mind” and “body,” but life itself, quantum mechanics, and parapsychology. It thereby avoids both the binding problem and the mind-body problem (Watson, 1993, 1997b).

### PSYCHONS AND FIELDS

Eccles' concept of psychons is partially consistent with two other theories of nonmaterial fields. Sheldrake's “morphic field” applies to biological systems in general, including mentality—though for species, not individuals. Sheldrake defines it as:

*a field within and around a morphic unit which organizes its characteristic structure and pattern of activity. . . . Morphic fields are shaped and stabilized by morphic resonance from previous similar morphic units, which were under the influence of fields of the same kind. They consequently contain a kind of cumulative memory and tend to become increasingly habitual. (1995, p. 371)*

Eccles' psychon theory appears to be a special case of the Egon Theory of Christy and Josties (1998), who apply their concept of egons, not only to biological and psychological phenomena, but to nonliving systems. Egon theory regards “all of the identities in nature as minds and their properties as communications of those minds. With this simple conceptual structure, Physics can be understood intuitively as a hierarchy of consciousness, and nature then consists of nothing but conscious experience.”

As Sheldrake points out, conceptualizing morphic fields as habits creates the “mystery of creativity;” i.e., no new forms can arise solely from habits. Sheldrake suggests that, consistent with the Platonic theory of creativity, all possible morphic fields exist timelessly, awaiting their expression in physical systems. Not only is this theory untestable, it presupposes that morphic fields are conserved—an implication that also applies to psychons and egons. Yet the notion that fields are conserved is counter to our experience with other types of fields. For example, electromagnetic fields are not themselves conserved, but sustained by energy.

TES, in contrast, does not presuppose that fields are conserved. Instead, SELFs and the enformation they contain are created and sustained by enformy, which, like energy, is conserved. If this distinction is taken into account, psychons, egons, and morphic fields can be construed to share the same theoretical foundation in TES, as shown by comparing predictions of TES with Eccles' postulate of psychons linking together to resolve the binding problem. Under TES, a fundamental behavior of SELFs and their subsets is to cohere in space-time to create new SELFs. These, in turn, are the enformational maps to which enformy conforms new individuals, new ideas, and occasionally, new species. They also account for telepathy, remote viewing, psychokinesis—and neurophysiological binding. Thus the psychons of Eccles, the egons of Christy and Josties, and the morphic fields of Sheldrake

are recast as elemental SELFs that cohere (“link together”) to produce unitary experience—and create new ideas and physical entities.

### **RECIPROCITY vs. SYMMETRY**

Eccles realized that asymmetry is implicit in his quantum psychon-exocytosis hypothesis. Noting that his theory explains only psychons acting on dendrons, not sensory input to psychons, he speculated that a two-stage process occurs: Psychons must be in the process of exciting dendrons when “some perceptual input” arrives. This input, in turn, influences the probability of the psychon's success in producing exocytosis. This model is asymmetrical because it requires that the psychon-dendrite link is sequential and unidirectional. To account for the reverse interaction—the effects of sensory neurons on psychons—Eccles was required to propose that “each of these psychons is reciprocally linked in some unitary manner to a dendron.” (1994) Consistent with parallel dualist-interactionism, this reciprocity connotes parallel one-way interactions.

TES, in contrast, directly predicts symmetry between sensory experiences and motor expressions of SELFs. Moreover, the following three aspects of TES liberate thinking, not only from dualism, but from materialism: (1) Concomitancy, not reciprocity, is the key concept, i.e., SELFs and their associated physical structures (“bodies”) are concomitants; (2) because SELFs are prephysical entities, they are ontologically fundamental to physical structures; and (3) because SELFs are concomitants of ensembles of neurons (or dendrons), not individual elements, neither psychon-dendron nor dendron-psychon interaction is necessary. These aspects of TES imply, not only symmetrical “mind-brain” operations, but nonlocal quantum and parapsychological phenomena.

### **CONCLUSION**

In sum, because Eccles grounded his scientific thinking on empirical observation, the brilliance of his life work is not diminished by his tenacious attention to the notion of dualist-interactionism. Yet parallel-dualism impeded his thinking in certain ways. We imagine that, if this scientific giant had ignored the obsolete, ambiguous, inbred, often self-contradictory philosophical progeny of Descartes, he would have carried his work even further to address the data produced by parapsychological research in the last few decades. In doing so, he would have positioned himself to answer the fundamental question that fosters many religions: “Does the self survive death?” The Theory of Enformed Systems predicts that Sir John's discarnate SELF has now answered that question empirically, i.e., from his own experience.



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