Article

The Hard Problem of Consciousness & the Fundamental Abstraction

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Abstract

The assumption that all behavior is ultimately neurophysical may be called the Standard Model (SM) of neurophilosophy. Yet, in the years since David Chalmers distinguished the Hard Problem of Consciousness from the easy problems of neuroscience, no progress has been made toward a physical reduction of consciousness. This, together with collateral shortcomings Chalmers missed, show that the SM is inadequate to experience. I outline the logical prerequisites for reduction and show that they are missing from the SM. Their absence is traced to representational problems implicit in: (1) The Fundamental Abstraction of natural science (attending to the object to the exclusion of the subject); and (2) The limits of a Cartesian conceptual space. Adding pre-Cartesian concepts allows us to construct an integrated representation bridging the dualistic gap. In particular, Aristotle's projection of mind provides a paradigm integrating intentional and physical operations.

Keywords: Consciousness, neuroscience, agent intellect, dualism, reduction, emergence.

Reductive materialism has struck an impasse David Chalmers calls the Hard Problem of Consciousness.[1] I shall argue that the Hard Problem, and Chalmers' explanation, are symptomatic of wider deficiencies in neurophilosophy. This article identifies the historically understandable, but logically unjustifiable, assumptions underlying these deficiencies and suggests a new paradigm in response.[2]

I see two sources of difficulty: the post-Cartesian conceptual space, and the Fundamental Abstraction of natural science. A *conceptual space* is the set of ideas onto which we normally project experience. The *Fundamental Abstraction* is a generally useful narrowing of mental focus which can limit our conceptual space. An inadequate conceptual space can create problematic representational artifacts, such as the pre-relativistic notion of simultaneity. While hard to see from within a tradition, representational problems can be identified by comparing diverse cultural, disciplinary and historical perspectives.[3]

Physicists represent problems using various coordinate systems. Some of these representations simplify the solution, while others make it almost unattainable. Similarly, metaphysical naturalists project nature onto an *a priori* model defined over a restricted conceptual space. With historical myopia, they tend to see dualism as the as the sole alternative to physicalism.[4]

Aristotle's conceptual space is unburdened by dualism. By analyzing mind in terms of potency and act, rather than structure and mechanism, he discovered the need for an *agent intellect* to understand intelligible contents. His framework allows us to place neuroscience in a larger

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context without restricting it, and to see consciousness, not as a puzzling side-effect of neural activity, but as the essence of effective thought.

1. The Hard Problem

As Chalmers explains,

> The easy problems of consciousness are those that seem directly susceptible to the standard methods of cognitive science, whereby a phenomenon is explained in terms of computational or neural, mechanisms. The hard problems are those that seem to resist those methods.…
>
> The really hard problem of consciousness is the problem of experience. When we think and perceive, there is a whir of information-processing, but there is also a subjective aspect.
>
> … the hard problem is hard precisely because it is not a problem about the performance of functions. The problem persists even when the performance of all the relevant functions is explained.[5]

Here, '"function" is not used in the narrow teleological sense of something that a system is designed to do, but in the broader sense of any causal role in the production of behaviour that a system might perform.'[6]

His point is that analyses of function do not explain the *feel* of experience, the qualia of subjective awareness – which is certainly true. However, qualia *are not* subjective awareness, but contingent forms of sensory experience. Still, he claims, 'The problem of explaining [qualia] is the problem of explaining consciousness.'[7] Similarly, Christof Koch and Klaus Hepp see qualia as 'the constitutive elements of consciousness.'[8] However, consciousness of abstract truths, such as 'the square root of 2 is a surd,' have no quale. Only sensations have qualia, and not even all of them. Blindsight and proprioception have none. Consciousness is neither the contents we apprehend, nor the resulting qualia, but *being aware of information*.

That consciousness represents a scientific impasse is not universally accepted. Stanislas Dehaene writes:

> In the last twenty years, the fields of cognitive science, neurophysiology and brain imaging have mounted a solid empirical attack on consciousness. As a result, the problem has lost its speculative status and become an issue of experimental ingenuity.[9]

This bespeaks solid progress, but not with the Hard Problem. Chalmers' analysis centers on subjective awareness. Dehaene's 'consciousness' is delimited by the need 'to narrow our subject matter to a definite point that can be subjected to precise experiments.'[10] These are Chalmers' 'easy problems.'

'Easy problems' exemplify Thomas S. Kuhn's 'normal research problems,' which do not 'aim to produce major novelties,'[11] while the Hard Problem points toward a paradigm shift. Imre

Lakatos offers a more sophisticated model of theory revision[12] in which auxiliary hypotheses are added to defend threatened 'hard core' assumptions. These can be progressive, enhancing a theory's explanatory power, or degenerative, *ad hoc* defenses leading to a theory's eventual replacement. On either model, if a paradigm shift is required, the received view should have further shortcomings.

2. The Standard Model

I agree with Chalmers that '[t]he usual explanatory methods of cognitive science and neuroscience do not suffice'[13] to explain consciousness. I disagree that they explain cognitive functions adequately. The 'Standard Model' (SM) of neurophilosophy assumes that behavior is entirely neurophysical.[14] It is rational to apply the SM to data it is capable of explaining, *viz*. behavior lacking evidence of subjectivity.

Still, its explanatory power is more limited than generally realized. For example, Chalmers claims it provides a good account of verbal reports. It does not. Just as Jupiter's moons played a causal role in Galileo's reports of them, so consciousness must play a causal role in reports of it. How could we verbalize it if it did not modify our brain state? Paul M. Churchland raises a related inadequacy, *viz.* that no neural structures correspond to propositional attitudes.[15]

In *Consciousness Explained,* Daniel Dennett models consciousness with a *Cartesian Theater*. It has a stage for presenting unified contents, and a homunculus to provide awareness – thus distinguishing contents from awareness of contents, the intelligible from the known. He argues convincingly that any attempt to reduce consciousness to a physical basis must fail. Having shown the impossibility of a physical reduction of consciousness, he discards the scientific method – rejecting the data of consciousness rather than the falsified hypothesis of metaphysical naturalism.[16] Were we to concur, we would have to deny all knowledge, for knowledge is consciousness of intelligibility.

David M. Armstrong proposed an auxiliary hypothesis replacing Dennett's homunculus. As J. J. C. Smart explains:

> … Armstrong compared consciousness with proprioception. … proprioception is a special sense, different from that of bodily sensation, in which we become aware of parts of our body. Now the brain is part of our body and so perhaps immediate awareness of a process in, or a state of, our brain may here for present purposes be called 'proprioception'. … Thus the proprioception which constitutes consciousness, as distinguished from mere awareness, is a higher order awareness, a perception of one part of (or configuration in) our brain by the brain itself.[17]

This has two principal problems. First, brain proprioception would perceive brain state (neural connections, firing rates, neurotransmitter concentrations, etc.), not the information encoded by it. Second, even if propriocepted information were placed on the Cartesian stage, the model does not explain how we become aware of it.

The genesis of awareness raises further difficulties. A causally impotent consciousness cannot enhance reproductive fitness. Making it a correlate of a selectable trait is hand waving absent an explanation of how the correlate effects subjectivity, *i.e.* a solution of the Hard Problem.

The genesis of environmental knowledge poses another problem. Antonio Damasio suggests that our knowledge of the external world evolved from representations of body state into representations of the external world:

> ... to ensure body survival as effectively as possible, nature, I suggest, stumbled on a highly effective solution: *representing the outside world in terms of the modifications it causes in the body proper*, that is representing the environment by modifying the primordial representations of the body proper whenever an interaction between organism and environment takes place.[18]

Accordingly, environmental representation *is* body state representation. For example, to see an apple is to experience an apple modifying our retina.

Two questions arise: why represent the external world at all, and how do we distinguish environmental from body state representation? Since environmental representation is *identically* body state representation, there can be no evolutionary advantage to separating them. An organism need only respond to body state changes, sparing itself the overhead of environmental representation. Moreover, physical processing cannot separate these representations since they are identical. How can one physical state produce two intentional states if intentional states are ultimately physical? Consider a connectionist model. Since one input represents both a body state and an environment state, the same activation weights will encode both.

This is fatal to David Lewis's Humean supervenience.[19] Intentional states supervene on brain states if and only if a difference in brain state is necessary for any difference in intention; however, in environmental sensing one neural state underpins two intentional states.

Thus, three auxiliary hypotheses, Armstrong's, Damasio's, and Lewis's, fail to plug critical holes in the SM, evidencing that it is degenerating.

Teleology and Survival

Perhaps the most profound shortcoming of the SM is its failure to account for Aristotle's *final cause*[20] in human behavior. Teleological explanation is frequent[21] and defended[22] in biology, although there are stock standard objections.[23] Naturalists also oppose 'anthropomorphizing' biology with final causality, but one can hardly anthropomorphize humans. Either final causality is natural or we are supernatural. We cannot fully understand a process without knowing its result and how that result contributes to higher level processes. Finality often explains behavior, such as web and nest building, for which mechanistic prediction is only a dream. Yet, were they not immanent, we could not predict ends. Thus, final causes are real.

Objecting that ends are mechanically determined fails to appreciate that every mechanically determined final state is, in a different projection, an end achieved through sufficient means. So, teleology and mechanism are not opposed, but complementary understandings, similar to the

wave and matrix formulations of quantum physics. Teleology focuses on the final state, mechanism on the means effecting it. Ends require means, and specific means yield determinate ends.

Consciousness makes humans teleologic in a unique way. There is no adaptive advantage in being aware of a physically determined role, because such awareness is impotent. There is an advantage in being able to conceptualize, evaluate and *effect* alternative responses, for that *can* improve reproductive success. Thus, to be selected consciousness must be physically potent and able to improve upon physical determination.

We employ the recursive, goal-driven process Aristotle called *proaresis*, in which 'we deliberate not about ends but means.'[24] We begin with a desideratum, conceive intermediate goals as means, and recurse until we find means within our immediate power – making finality the 'cause of causes' in rational conduct. Unless *proaresis* were effective, this would be a waste of energy instead of the essence of practical reason. Naturalists who deny final causality in theory practice it in structuring their careers.

The SM is inadequate to this phenomenology. First, since commitment ('I will *x*') is a propositional attitude, it can model neither it, nor proaretic judgements. Second, while physical outcomes pre-exist *potentially in unknowable* quantum states and the laws of nature, willed ends pre-exist in *actual*, *known intentions*. Third, their means of realization differ. If a satellite or projectile is knocked off course, it will not attain its otherwise predetermined state. If an obstacle blocks planned means, other means will be sought. This makes intended ends, and not initial physical states, the explanatory invariants of rational behavior.

In *The Intentional Stance* Dennett argues that the attribution of intentionality is metaphorical – that we think of natural systems *as if* their ends were intended. This analysis is inapplicable to humans. First, *understanding* the analogy requires knowing the prime analogue (human intentionality), but we cannot unless it exists. Second, *attributing* intentional behavior can only be motivated by having experienced it. We would never say processes were guck-like if we never experienced guck.

3. Why is Consciousness Hard?

Thus, the Hard Problem is symptomatic of deeper difficulties. Since consciousness is neither a 'feel' nor a structure built of qualia, and has a functional role in human behavior, Chalmers' explanation of the Hard Problem (that neuroscience is concerned with function, not 'feels') fails. I shall argue that it is *logically impossible* to reduce consciousness, and the intentional realities flowing out of it, to a physical basis.

The first hint of irreducibility is the failure of neural data processing to be the explanatory invariant of awareness. If A => B, every case of A entails a case of B. So, if any neural processing fails to elicit consciousness, it alone cannot explain awareness. Clearly, we are unconscious of much neural processing, *e.g.* processing vibrations of cochlear cilia into perceived sounds.

More pointedly, large blocks of complex and effective behavior are unconscious. When I am driving and engaged in thought, I can process sensory inputs into driving outputs well enough to navigate safely. Still, I am likely to miss my intended exit, because 'I am not paying attention.' Observations of automatic sensory processing have a long history, having been noted by St. Thomas Aquinas,[25] William James,[26] Roger Penrose,[27] and J. J. C. Smart.[28] Psychologist Graham Reed studied *time-gap experiences* in which we become aware of the passage of time after being lost in thought.[29] Jacques Hadamard provides examples of unconscious thought in mathematical research.[30] Bernard Baars documented functional differences between conscious and unconscious processing,[31] and found consciousness necessary for understanding word combinations, the operation of working memory, and the selection of contents for attention. Such observations show first, that consciousness is not a consequence of even complex sensory processing, and, second, that conscious attention plays a functional role in cognition.

Reduction and Emergence

Does the Hard Problem reflect a failure of the reductive paradigm? Reductionism assumes that to know the parts is, implicitly, to know the whole, but Aristotle showed in *Topics* IV, 13 that the whole is not the sum of its parts, for building materials are not a house. Consider a thesis I held as a teen, *viz*. that biology is reducible to physics via chemistry. Indeed, this seems to follow from physical determinism.

A standard objection invokes quantum indeterminism; however, it misunderstands quantum theory. As P. A. M. Dirac makes clear,[32] only the results of quantum *measurements* are indeterminate. Between measurements, quantum systems evolve deterministically, and there were no quantum measurements before the last century.

My teenage faith in reductionism fails for a different reason. As Alfred North Whitehead notes,[33] physics is limited by an abstraction: it considers particles independently of structural context. Physicists don't care if an electron is in a cathode ray, a crystal or an organism, so they prescind from the very data that biologists study. Consequently, physics has no information on, and so cannot explain, biological phenomena. It can only limit the possibilities – just as building materials limit, but do not necessitate, architectural form.

Timothy O'Conner sees consciousness as possibly emergent, but notes that 'that various formulations of the very notion of 'emergence' have been imprecise and not obviously reconcilable with one another.'[34] Mark A. Bedau observes that 'aside from precisely defining what emergence is, any philosophical defense of emergence should aim to explain—ideally, explain away—its apparently illegitimate metaphysics.'[35]

I define 'emergence' as a logical property, *viz*. the impossibility of deducing a phenomenon from fundamental principles, especially those of physics. Emergence can be physical, epistemological, or ontological.

While Bedau says emergence claims 'raise the specter of illegitimately getting something from nothing,'[36] *physical emergence* is not creation *ex nihilo*, but the actualization of previously

unexpressed potential. Since only actual phenomena are observable, previously unexpressed potentials are unpredictable. A common physical emergent is seed germination, which abstract structural knowledge cannot predict – for many *isolated* viable seeds never germinate.[37] Seeds germinate in response to external factors, *viz*. a suitable environment. Particle interactions are a more fundamental example. No observation of electrons *in isolation* can reveal the repulsion of two electrons. Multi-body interactions also affect behavior. Both meson and quark nucleon models involve multi-body interactions in addition to two-body interactions.[38] Similar effects occur in biochemistry, for example, in proteins.[39]

Epistemological emergence occurs when the consequences of known principles cannot be deduced. We often assume, but cannot prove, that system behavior is the result of isolated component behavior. This is exemplified by chaotic nonlinear dynamics.[40] Since the Hartree-Fock and other many-electron models are nonlinear,[41] we cannot calculate the precise structure and behavior of bulk matter, including organisms, from first principles. Neurons also respond nonlinearly.[42] Brain dynamics is not only chaotic, but too complex for detailed modeling.[43] Thus, reductionism is often untestable, for testing compares deduced with observed behavior.

So far a physical potential may be unknown, or known but have unpredictable consequences. *Ontological emergence* is a third possibility. It would occur when a phenomenon cannot be due to physical processes. While logically possible, this is heresy to metaphysical naturalists, who exclude it *a priori*. Empiricism forces its acceptance.

Bedau observes that we study emergent phenomena as occurrent actualities, offering tornadoes as an example.[44] Consciousness is also an occurrent actuality, to be studied as such. Still, there is a difference. The Navier-Stokes equation describes the (nonlinear) mechanics of continuous media, and tornados are mechanical phenomena in a medium described by it, giving us reason to believe it applies. However, absent a solution to the Hard Problem, believing consciousness to be purely neural requires an act of faith.

Like electron-electron repulsion, consciousness emerges in a specific kind of interaction: that between a rational subject and present intelligibility. Without intelligibility to be aware of, we are conscious of nothing, which is to say, we are not conscious at all. We can only conclude this from subjective experience, which brings us to the physicality/intentionality distinction.

Physicality and Intentionality

Chalmers argues, 'The facts about experience cannot be an automatic consequence of any physical account, as it is conceptually coherent that any given process could exist without experience.'[45] This seems sound for physical processes, but conceptual coherence arguments must be treated gingerly, for they depend on the adequacy of our conceptual space. A thinker with a pre-Newtonian conceptual space might argue: 'It is conceptual incoherent for celestial and sublunary matter to have the same nature.' If we misconceive nature, conceptual coherence means nothing. Empirical arguments are cleaner.

Many argue that intentional being is too different from physical being to be reduced to it – a position performatively affirmed by eliminative materialists. Matter is essentially extended and mutable. As extended, it has parts outside of parts, and is measurable. As mutable, no form of matter or energy is permanent. Intentions lack these characteristics. Having no parts outside of parts, they are immeasurable. Concepts, such as that of a triangle, and necessary truths, such as the principles of logic, are immutable[46] even though the physical states from which they are abstracted are not. Forming a new idea does not destroy a previous idea, it only obsoletes it.

Similarly, physical objects lack essential intentional properties. Franz Brentano notes an essential characteristic of intentions is their *aboutness*, the 'intentional inexistence' of a target.[47] We do not just know, will or hope, we know, will or hope something. Physical states intend nothing beyond themselves. Any symbolism they may have derives from outside agents. There are natural signs, such as smoke, but smoke is not 'about' the fire it signifies. Rather, it is data that must be supplemented by propositions such as 'Smoke is usually caused by fire.'

The physical/intentional division has been attacked in three ways. First, that introspection is unreliable; second, that other aspects of subjectivity, such as the qualia of hot and cold, have been reduced to a physical basis; and third, that purely physical computers process information like human minds.

The attack on introspection[48] began with the Vienna Circle's demand for intersubjectively accessible observations, and behaviorists' criticism of the analogous introspection of other species. While both schools have been deprecated, their spirit survives. Gilbert Ryle argued against the reliability of introspection in *The Concept of Mind*. Paul and Patricia Churchland denigrated 'folk psychology' as a theory rather than an account of experience.[49] Daniel Dennett published tightly argued defenses of eliminative materialism.[50]

Deconstructing their arguments is beyond my present scope; however, their conclusions are problematic. First, attacks on subjective experience prove far too much. If introspection and consequent judgements are unreliable, then our belief that we observed what we believe we observed, as well as our belief that we reasoned correctly in analyzing our observations, are equally unreliable – for these are judgements based on introspection.

Second, Ryle mischaracterizes introspection as a separate act of attention.[51] It is not. Just as we know we see by seeing, we know we know by knowing. It takes no more or different experience to affirm an empirical proposition, *p*, than to affirm 'It is true that *p*.' Yet, while *p* specifies an objective state, 'It is true that *p*' says that the mental state expressed by *p* is adequate to reality. As with environmental representation, the same experience can be articulated as objective or subjective information.[52]

Turning to the reductionist objection, the proffered example does not reduce our *experience* of hot and cold. It merely clarifies what is experienced and how it is represented, but being represented is not being known. Representations, are intelligible, not actual knowledge. So, the objection fails to distinguish potency and act – the intelligible from the known.

Finally, what computers process is not information in virtue of any physical property. Label a bit's physical states *a* and *b*, and ask what the byte *aababbab* means? Reading left to right and interpreting *a* as 0, and *b* as 1, the byte means 00101101. Interpreting *a* as 1 and *b* as 0, it is 11010010. Reading right to left, it means 10110100 or 01001011. Thus, *a*, an arbitrary material state, lacks intrinsic meaning. Computer states signify only because humans endow them with meaning.

Claude Shannon, the founder of information theory, defined information as a reduction of possibility, but there are many kinds of possibility. Imagine a binary message transmitted over such a distance that it is entirely transmitted before any of it is received. As each bit is received, the number of possible messages is reduced by one half, but physical possibility is not reduced, because the signal already exists. What has changed is logical possibility. Before reception, it is logically possible for a bit to be an *a* or a *b*, but not after reception. Thus, information is a logical, not a physical property.

We may speak of physical processes that bring us closer to understanding in terms of sending and receiving 'information,' but not univocally, because logical possibility is not reduced until the received bit is known. What exists before then is intelligibility, not knowledge. So, it is equivocating to say that both computers and minds process 'information.'

The equivocation might be eliminated if logical properties were reducible to physical properties. Since the cogency of the essential difference argument remains unclear, this seems possible. It is unclear because we know obviously different phenomena which are causally related by obscure links, *e.g.* tides and celestial motion. Yet, Isaac Newton showed the Sun and Moon caused the tides.

How did he do so? The *physical definition* of tides as the periodic variation of average sea level allowed him to apply his laws, developing the Equilibrium Theory of tides. Absent physical definitions of intentional concepts, we cannot do the same. As Aristotle explains in *Posterior Analytics*, reasoning requires middle terms or connections. If *A* is related to *B*, and *B* to *C*, we may be able to connect *A* to *C*, but without a mediating *B*, a logical connection, we cannot do so. This makes the essential difference argument cogent. My thesis is that *conceptual orthogonality*, the absence of concepts common to the intentional and physical conceptual subspaces (middle terms) in the Cartesian framework, rather than Chalmers' function *versus* 'feeling,' explains the irreducibility of consciousness.

4. The Fundamental Abstraction

The human mind has limited representational resources. Eric of Auxerre (841-76) was perhaps the first to recognize that these limitations force the resort to abstract, universal concepts.[53] Our working memories can only maintain 5-9 'chunks' of information.[54] Unable to apprehend the overwhelming complexity of nature, we employ abstractions – attending to features of interest while ignoring others. Thus, natural science begins with a *Fundamental Abstraction*.

Knowledge is a subject-object relation, entailing a knowing subject and a known object. The initial moment of natural science is the abstraction of the object from the subject – our choice to attend to physical objects to the exclusion of inseparable subjectivity. Natural scientists care about what was experienced, not the act of experiencing. Thus, science is, by design and appropriately, is bereft of data and concepts on knowing subjects and their mental acts. Yet, these data and concepts are required to connect physical findings to awareness. Consequently, physics lacks intentional causes and effects – not because the physical and intentional are independent, but because we have abstracted their interdependence away in constructing physics.

So, it is logically impossible for science, as limited by its Fundamental Abstraction, to explain awareness. We see this in Dehaene's need 'to narrow our subject matter' in studying consciousness. Forgetting this exemplifies Whitehead's *Fallacy of Misplaced Concreteness* (thinking that abstractions are reality).[55] Since consciousness does not actualize a *physical* possibility, it is ontologically emergent.

Early modern psychologists, such as Brentano and James, recognized the limitations of the third person perspective, and freely employed introspection. More recent psychologists have largely abandoned introspection and modeled their work on physics. Still, introspection alone provides the data to understand consciousness.

In defense of the third person perspective, it is often urged that introspective data, as subjective and private, cannot be objective. This is specious, trading in part on an equivocation. Since introspection gives access to the knowing subject, its object is not 'objective' in the sense of being external, but that is epistemological irrelevant. Anything known, including subjective experience, is an *object* of thought – part of the web of human experience.

What is at stake is *replicability*. Since science seeks universal knowledge, data must, with few exceptions, be replicable by competent observers. Replicability is a type, rather than a token, property. We can never replicate a token observation, only the same type of observation. It is as absurd to reject replicable introspection because its token is private, as to reject Galileo's observations because he made them in solitude.

Thus, the consciousness impasse is a representational, not an ontological, issue. Since humans are psychophysical organisms who perceive to know and conceptualize to act, physicality and intentionality are dynamically integrated. Ignoring this seamless unity, post-Cartesian thought *conceives* them separately – creating representational problems. The Hard Problem and the mind-body problem both arose in the post-Cartesian era, and precisely because of conceptual dualism. To resolve them, we need only drop the Fundamental Abstraction in studying mind.

Seeing dualism as a representational artifact disposes of both ontological and property dualism. Properties depend not only on an object's nature, but also on how we conceptualize it. For example, we can justifiably think of an apple as red, or as having a certain spectral response. While the intentional and physical theaters of operation seem disjoint, our abilities to know material objects and to will physical acts spans them. Thus, a conceptual rather than an ontological partitioning of human nature underlies both the Hard and mind-body problems.

The notion of representational artifacts is not new. Eliminating them motivated tensor analysis and its use in relativity. Since representation-dependant properties, such as the simultaneity of separate events, cannot be properties of nature, all physical variables must have well-defined tensor properties – meaning that they, and their relations, can be formulated independently of representation. I am suggesting that dualism, and its associated problems, are artifacts of Cartesian representation. As we have seen, even non-dualists formulate their arguments using Cartesian concepts. The absence of orthogonal conceptualization in the Aristotelian-Thomistic tradition,[56] shows it is a Cartesian inheritance.

Aristotle employed a unified, multidisciplinary model of cognitive research. While normally employing the Fundamental Abstraction, in *De Anima* he moves seamlessly from physical sensation to intentional cognition.[57] He integrated first-person reflection with anatomical research seeking sensory mechanisms, signal conduits (*πόροι*) and a central processing organ[58] – matching method to object.

Still, doesn't the very existence of the intentional/physical distinction imply dualism and a repudiation of methodological naturalism? How can we account for psychophysical humans without *res exensa* and *res congitans*, or a corresponding division?

5. The Aristotelian Projection

Consider Aristotle's projection of mind. He begins his *Metaphysics* with the observation that 'All humans by nature desire to know.' An account of his predecessors follows. This is a psycho-historical study of what satisfies the desire to know. He finds only four modes of explanation: material, formal, actualizing and teleological.[59] While called his 'four causes,' these are not causes in the modern sense, but the ontological roots (*ἀρχή* = source) of phenomena.

Thus, Aristotle's model of explanation is not ours. Post-Cartesian science focuses on material and efficient causality, structure and mechanism, largely ignoring formal and teleological factors. This is not only blinkered (we have seen final causality in aspirational goals, and biology studying actual forms), but also problematic, for formal explanation eliminates dualism.[60] The fixation on 'stuff' is seen in the Cartesian conception of the soul as thinking stuff (*res cogitans*). The Aristotelian and Thomistic traditions avoid this trap.

In *De Anima* Aristotle seeks a philosophical definition of *psyche* and concludes that is not it a 'thing,' but 'the first actuality of a natural body potentially possessing life.'[61] This makes *psyche* a species of form (*εἶδος*), which Aristotle defines as actuality (*DA* II, 1, 412^{a}10). Thus, 'to have a soul' means 'to be alive.' Minimally, life is marked by nutrition, growth and reproduction, and, in higher forms, by sensation and thought.

Given this definition, one cannot consistently affirm that something is alive and deny it a soul. Indeed, Aristotle sees a *psyche* in all living things. This involves neither vitalism, for nothing beyond the actual organism is invoked, nor a *res cogitans,* for *psyche* need not include mind. Aristotle takes as a contingent fact that only humans have the inner vision (*νοῦς* derives from

νόος = vision[62]) we call intellect. It may seem philosophical slight of hand to identify soul with actuality, but doing so continues to provide a rational basis for discussing issues such as brain death.[63] Being alive is objectively different from being lifeless, and that difference, which is a kind of actuality, is what '*psyche'* names.

While Aristotle's definition explains neither the genesis nor the dynamics of consciousness, it changes our conceptual space, the source of the problem. For him, form and 'matter' (*ὕλη*) are not things, but the foundations for two modes of conceptualization. Considering a tree as an actuality, as a living organism, is thinking of its form or *eidos*. Considering it as potential lumber, fuel, or anything else, is thinking of its *hyle* (literally, timber). While 'matter' is the standard translation of *hyle*, it is not just 'stuff,' but anything 'out of which' something may be formed, including premises implying a conclusion. The matter and form of a tree, while having the same extension, are conceptually independent and complementary. Some speak of bodies as 'compounded' of matter and form, but the compounding is logical, not physical. Matter and form are logically distinguishable, but physically inseparable, aspects of bodies – another one-to-many mapping from the physical to the intentional.

Matter and form, potency and act, are the core of Aristotle's conceptual space. It is in terms of these concepts, rather than structure and mechanism, that he analyzes cognition. Because 'matter' is a poor translation of *hyle,* we are liable to misunderstand Aristotle when he says, 'For the sense-organ is in every case receptive of the sensible object without its matter.'[64] We might think the object's 'stuff' does not enter the sense, but he equally means that we sense the object's actuality, its *eidos*, not its potentiality or *hyle.* This is because the acts informing sense organs express an object's actuality, while its potential remains unexpressed.

Sensation is a change in which the sensible is actually sensed (*DA* II, 5, $416^{b}32$).[65] Sensible objects have the potential to activate sense organs, and sense organs have the potential to sense their correlative objects. In sensation, these two potentials are jointly actualized (the object is actually sensed, and the organ actually senses). The object being perceived by the sense organ is, identically, the sense organ perceiving the object – for these are alternate formulations of one event.[66] Thus, sensation is a form of *shared existence* – one act of two beings, as adumbrated by our discussion of environmental/body-state representation.

It is in terms of shared existence, and not of subsistent secondary qualities,[67] that we must understand passages such as 'when the object makes the organ in actuality like itself it does so because that organ is potentially like it,' (*DA* II, 11, $424^{a}2$) and 'that which is to perceive white and black must not be actually either, though potentially both' ($424^{a}8$). Aristotle means that they must be capable of being informed by both, not that they change color. As Aquinas explains, 'whatever is received is received according to the mode of the recipient.'[68] Thus, Aristotle's claim corresponds to our understanding that eyes only see, and ears only hear, frequencies they are capable of responding to – of being informed by.

Shared existence may be shocking, for we think of material objects as bound by a defining surface. Yet, this view cannot stand. Quantum physics teaches us that matter fields extend indefinitely, as do the electromagnetic and gravitational fields by which matter interacts – so the

core we think of is surrounded by a *radiance of action*. This is most obvious in the night sky, where stars' radiance of action fills the heavens.

Again, action and being may seem strange bedfellows. We think of being as passive, as sitting there, doing nothing, but what does nothing can neither be sensed nor known to be. Plato recognized the dynamic nature of being:

> I suggest that anything has real being that is so constituted as to possess any sort of power either to affect anything else or to be affected, in however small a degree, by the most insignificant agent, though it be only once. I am proposing as a mark to distinguish real things that they are nothing but power.[69]

Being, then, is convertible with the power to act. Thus, to be human is to act as humans do, and when we cease to do so, we are dead.

Aristotle views actions as *belonging* to their agent, first in the *Categories*, where action 'inheres in' a substance, then in the *Metaphysics*, where 'substance is rather that to which these [predicables including action] belong primarily.'[70] We have seen that the action of the environment on the sensory system *is* its neural representation. This is what shared being, the inexistence of 'intentional inexistence,' means. We have only to see how inexistence becomes intentional.

Knowing, by which inexistence becomes intentional, is analogous to sensing, but with a critical difference.[71] We still have shared existence,[72] for the object informing the intellect is, identically, the intellect being informed by the object; however, material structures cannot make themselves understood, for their theater of operations is described by physics, which lacks intentional effects. Still, we are informed by sensation and Aristotle insists that thought requires a physical representation.[73] Thus, neither Aristotle, nor Aquinas after him, divides the mental from the physical.[74]

Nominalists see universals as names assigned to arbitrary sets, a view inconsistent with experience. If a universal, such as 'apple,' named an arbitrary set, we could as easily assign a frog or a rock to the 'apple' set, as assign a Granny Smith. We cannot because universals reflect objective commonalities that make most classifications unproblematic. Universal terms express concepts elicited by specific properties or *notes of intelligibility*. One encounter with a six-legged segmented organism is enough to properly elicit <insect>.[75] We can predicate universals, not because they correspond to Platonic Ideas, but because each token has the objective capacity, the notes of intelligibility, to elicit the same concept.

Universal concepts are not Humean associations. While I may associate the setting sun with an orange or a beach ball, I would be unjustified in judging it to be either. Association merely activates contents for critical review. Connectionist theories of concept formation, judgement and reasoning[76] model symbol grounding and association, not awareness of contents, or logical processes such as distinguishing physically inseparable properties. Also, because they model concept formation as the tuning of activation weights through repeated encounters, they cannot explain concepts and judgements based on a single experience. This does not devalue

connectionist research, it only wards against its misinterpretation.

Since physics lacks intentional effects, physical objects cannot engender concepts absent a bridging dynamic. Phenomenologically, many sensations are subliminal, and even complex sensory processing need not engender conscious thought. Dennett's confutation of physical models of conscious experience, and Paul Churchland's observation that no neural structure corresponds to propositional attitudes, further support Aristotle's conclusion that sensory objects cannot make themselves known.

Aristotle's bridging dynamic is the *agent intellect* (*νοῦς ποιητικός*). Sensible objects engender a physical 'image' he calls a phantasm (*φάντασμα*). We would call it a neural representation. Since the phantasm's intelligibility cannot make itself known, something else, capable of intentional effects, must do so. This is the agent intellect.[77]

An agent intellect is necessary because we *actually understand* what is only represented in brain states. Since neural processing cannot effect awareness, an extra element is required, as Aristotle argued and Chalmers seconds. Dennett, lacking a physical mechanism, used a homunculus as a stand in. Further, this element works in the intentional theater of operations, for it is there, rather than in the physical theater, that understanding occurs. Further, the agent intellect need not change brain state because no physical operation produces intentional effects.

This brings us to the relation between concepts and physical representations. Aquinas sees the agent intellect creating a new, immaterial carrier of information, the *intelligible species* (*ST* I, 79, 3), the precursor to Lockean ideas. Similarly, Deborah Modrak believes that the phantasm and the first objects of knowledge (*πρῶτα νοήματα*) are different representations.[78] While logically distinct, they are not, and cannot be, separate. The agent intellect actualizing the phantasm's intelligibility is, identically, the phantasm's intelligibility actualized by the agent intellect. This makes understood contents *inseparable* from represented contents (the phantasm).

The essence of representation is the potential to be understood. A neural representation is not understood if what is understood is a different representation. Thus, the concept <apple> is not a thing, but an activity, *viz*. the actualization of an apple representation's intelligibility. Of course, apprehension may be followed by symbolization, and symbols are new physical representations. This explains Aristotle's insistence that phantasms are essential to thought – and allows the seamless integration of his psychology with studies of neural representation.[79]

Thus, mind-brain identity theory almost right: the brain is the organ of the mind. Still, it is wrong. Neural representations are essential to, but insufficient for, knowledge. Descartes drew the wrong line in the wrong place. It is the wrong line because discursive thought requires neural representations. It is in the wrong place because, if a line is to be drawn, it is between potency and act – between the intelligibility of neural representations and the actuality of understanding. Dualism is incompatible with the *identity* of physically encoded information informing the intellect and the intellect being informed by physically encoded information.

A final point needs clarification: if physical representations cannot have intentional effects, how can they inform the mind? Effects are determined not only by their efficient cause, but also by the potential it actualizes. While concepts' existence depends on the agent intellect, their content reflects the intelligibility actualized. So, their specification falls under the rubric of material causality, which limits possible products. Since the phantasm is *our* sensory system as informed by the *object*, both the object's and our own intelligibility are present in it – as anticipated above.

Subjective Function

This leaves the agent intellect a cryptic abstraction, with commentators arguing over whether it is a personal capacity or divine illumination. The phenomenological projection resolves this. How do we experience coming to know sensible objects? As attending to, and becoming aware of, sensory contents. Thus, the agent intellect is *our* power of awareness – and its operation is consciousness. Qualia are the contingent forms of actualized sensory intelligibility.

The Aristotelian and modern understandings of awareness differ fundamentally. While Aristotle sees it as our connection with reality – the way objects share existence with the mind – Locke, writing in a tradition that had disconnected the mental from the physical, defined consciousness as 'the perception of what passes in a man's own mind.'[80] This reflects his view that we only know our own ideas, failing to appreciate that ideas are not things, but acts of awareness. The Lockean and succeeding Kantian views leave us wondering what good consciousness is. Knowing what passes in our mind might be entertaining or depressing, but it cannot help us deal with reality or aid in species survival. Aristotle's analysis, on the other hand, makes consciousness biologically relevant and its contents a sound basis for rational behavior.

Abstraction is the selective actualization of intelligibility. In it, we attend to some notes of intelligibility while ignoring others. For example, we fix on environmental state while neglecting body state, or on two-ness while prescinding what embodies it. The resulting concepts are the building blocks of discursive thought – joined in judgements linked in chains of reasoning. Thus, consciousness functions as the *sine qua non* of rational thought, for without it, we could conceptualize nothing.

Consider forming a judgement, one of Churchland's propositional attitudes. If we are aware of feeling a stone, we can abstract the concept <hard>. Then, being aware that the identical object elicits both <the stone> and <hard>, we link these concepts to judge <the stone is hard>, giving propositional knowledge. The copula, <is>, betokens identity – not between subject and predicate, but of their common source. Indeed, '*a* is *b*' is unjustified if *a* is not identically an object which elicits <*b*>. This judgement requires the power to actualize intelligibility – first in becoming aware of the stone in an inchoate way (*tode ti* = this something), and then in abstracting a physically inseparable property. Thus, abandoning the Fundamental Abstraction allows us to explain phenomena beyond the scope of the SM.

Consequently, consciousness, the operation of the agent intellect, is not a niggling anomaly that can be ignored until explained as a neurophysical side effect, but an *experiential primitive* essential to understanding human rationality. Certain concepts, such as <electric charge>, are

accepted, not because they are theoretically reducible, but because they are epistemologically primitive – reflecting contingent realities that cannot be, or at least are not, further explained.

6. Conclusion

The Hard Problem of consciousness signals the need for a paradigm shift. The Standard Model of neuroscience, portraying behavior as purely neurophysical, is inadequate not only to consciousness, but also to overt behavior such as reports of subjectivity and the execution of rational plans. This limitation is primarily due to the Fundamental Abstraction of natural science, which attends to the objective, while prescinding from the inseparable subjective, elements of experience. Its secondary cause is a Cartesian conceptual space, into which naturalists typically project psychophysical phenomena, and which induces problematic representational artifacts.

The Aristotelian framework avoids these problems by focusing on potency and act rather than structure and mechanism. By seeing awareness as actualizing the intelligibility of neural representations, it provides a framework integrating introspection and neuroscience. This leaves neuroscience unimpeded in studying neural representation without denigrating phenomenological research.

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