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Extended Passive/Active Duality

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A structural duality of passive and active is found to characterize consciousness (as subjective experience and volitional agency, respectively) and physics (as matter and energy, respectively). To rule out coincidence, this duality is sought and found to characterize a third metaphysical domain, computation (as data and algorithm, respectively). Also to argue against coincidence, a conceptual interrelatedness among the three passives is found to exist among the three actives, as follows. Matter contains data per subjective observer's interpretation; energy expenditures execute algorithms per volitional agent's intention.

Keywords: consciousness, physics, computation

Some theories of consciousness broadly relate mind with physics, without providing particulars about which aspects of mind correspond to which aspect of physics. An exception is panpsychism, which holds matter inherently to possess subjective experience; and a recently proposed variant, which adds a special provision for active consciousness, held to be an inherent attribute of energy expenditures (Lindell, 2019). Thus Whitehead's (1929) process philosophy, which holds there to be a traditional bias for substance over process in Western metaphysics, is incorporated into philosophy of mind, affording equal emphasis to passive and active.

So in the mind is a duality of passive and active; in physics, of matter and energy, which is similar to the mind's duality, construing matter as passive and energy as active. Whether this duality may be considered a structural framework for unifying consciousness and physics may hinge on whether their parallel structure can be dismissed as coincidence or shown to be of underlying significance.

Stephen Hawking (1998) provides an example of the risk incurred in gauging questions of coincidence by hunch. He noticed that a black hole's entropy and the surface area of its event horizon are both increasing in any interaction with the outside universe. He dismissed this as coincidence until Bekenstein showed that each is a precise measure of the other.

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Unaware of any off-the-shelf epistemic tests for coincidence, I have identified a possible methodology that tests for convergence, as follows. If two systems share a composite structure, then their common framework is less likely to be coincidence if corresponding attributes can be shown to converge. This test can be applied to panpsychism, premised on a passive/active duality common to mind and physics. Convergence of the two passives has been identified in that matter (passive physics) and subjective awareness (passive mind) converge in panpsychism, which holds one inherently to possess the other. Similarly, the two actives converge in that energy expenditures (active physics) are inherently volitional (active consciousness).

We can try to reinforce the foregoing argument by seeking a third domain, parallel to the first two, that also incorporates the passive/active duality. Information is a possible candidate, due to its intimate interplay with mind and physics in Chalmers' (1996) panpsychism, which holds both matter and consciousness to encode information. Hence the virtually inextricable correspondence between cognition and consciousness, which has led experimental neuroscientists on a quixotic search for a test for consciousness that is not subsumed into a test for cognitive activity.

Information's passive and active aspects are exemplified by a differential analyzer, which computes continuous state trajectories from dynamical equations (active aspect) and initial conditions (passive). Discrete information appears in Turing computation, in its passive form as data; in its active, as algorithm.

A functional description of passive and active can be inferred from their mutual interplay common to all three domains, where active is passive's agent of change. When an algorithm begins, executed as a formal Turing computation, its input data appear on its tape. The algorithm reads and writes to this tape; all changes to the data are effected by the algorithm, culminating in the output data when the Turing machine halts. Hence the algorithm's function is to effect these changes to the data.

In physics, we find the passive (matter) is changed by the active (energy) in that many of matter's attributes can be changed by an expenditure of energy, including velocity, spin, temperature, shape, size, density. The same relation applies in consciousness. Any time I want to change the contents of my own mind, I can do so by some volitional action. If I'm too cold, I can turn up the heat. I can alter the contents of my visual field by waving my hand in front of my face. In empirical psychology, where stimulus triggers response, the response produces a new or modified stimulus, as when pulling one's hand from a hot stove, changing stimulus and corresponding sensation to one of relative comfort. Again, active changes passive.

Having found that active is passive's agent of change in all three domains, we can re-apply the test of convergence, which was previously applied to only two domains, finding convergence between their respective passives and between their

actives. Information plays an important role in unifying subjective awareness with matter, which are both manifestations of information (Chalmers, 1996). Matter contains information by virtue of an informational interpretation by a conscious observer (Searle, 2002). We can find an analogous information-theoretic commonality for active consciousness and energy, replacing the comparatively vague notion of information with the precise formalism of Turing computation and its associated passive/active duality (data/algorithm).

We can now say matter contains data. We can also say energy expenditures implement algorithms, because whenever an algorithm is implemented physically, energy is expended, as in the kinetic energy of abacus beads or the electricity consumed by a desktop PC.

Moreover, both data and algorithm are observer-relative — and for the same reason. Let's say I place a dollar bill face-up on a table, oriented vertically. Due to data's observer-relativity, I adopt the convention that face-up represents *1*, while a second observer construes a vertical orientation as *1*. So at this point, both observers see a *1* in the current bill that is face-up and vertically oriented. (Conversely, my interpretation is unrelated to the bill's angular orientation, and the second observer's interpretation is unrelated to whether the bill is face up.)

Now, I flip the bill so it's face-down, maintaining its vertical orientation. I now see the bill as representing a *0*, but the second observer still sees it as a *1*. So for me, the bit has flipped from *1* to *0*, implementing the monadic Boolean *complement* algorithm. But for the second observer, the initial data of *1* remains unchanged, so no such algorithm has executed. Hence the observer-relativity of algorithm follows directly from the observer-relativity of data.

We have the result that information in general has passive and active aspects, as does its discrete form, computation, whose passive and active aspects are both subjective. Searle (2002) comes close without explicitly identifying this relationship, describing information as observer-relative. Then he adds *information and computation are in us*, subtly slipping in the word *computation*, but stopping short of identifying a passive/active duality in computation of metaphysical significance comparable to that in consciousness.

Moreover, his take on information's subjectivity is reminiscent of Bateson's (1972), who described information as a *difference that makes a difference*, where the difference it makes is in the observer's mind. Neither Searle nor Bateson uses the term *subjectivity* or makes the connection to subjective consciousness, described by Nagel (1974). It is salient that mind contains information and both are subjective; possible coincidence is explored below.

We now have a temporary result weaving discrete computation into the relationship between the other two domains. On the passive side, matter contains data *relative to a conscious observer's subjective interpretation*; on the active side, energy expenditures execute algorithms — again, *relative to a conscious observer's subjective interpretation.*

The problem is that the role of the conscious observer is the same for the passive and active side of the picture. For the sake of consistency, we would like to maintain this role for the conscious observer in interpreting matter as data. But on the active side, we need to say an energy expenditure implements an algorithm *relative to a volitional agent's subjective intention*. This result follows from the foregoing example of a dollar bill representing a binary digit, whereby the Boolean complement algorithm was executed solely by my intention as volitional agent, flipping the bill according to my interpretational conventions.

Now we can state the conclusion initially sought. Matter contains data subject to a conscious observer's interpretation. Energy expenditures execute algorithms subject to a volitional agent's conscious intention.[1]

This inter-relatedness of the passives demonstrates their threefold convergence in a single metaphysical relationship, passing an epistemic test that militates against coincidence. This result is strengthened by the interrelatedness (and convergence) of the three actives, and underscored further by the similarity of this relationship on both passive and active sides. These arguments may be further strengthened by considering structural parallels in other domains, with expanded metaphysical relationships among the passives that parallel those of the actives, as I hope to explore in a subsequent writing.

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[1] We can conclude an earlier paragraph that mentioned mind contains information, and both are subjective. Convergence militates against coincidence, since passive experience has informational content (convergence of passives) and active mind can execute an algorithm (convergence of actives).