Views on Atomism and Simulation

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Ordinary experience has become increasingly permeated by windows, 'views', or exportations of the human mind, that manipulate electrons to recreate experiences from and for our senses without needing direct access to the systems being represented, in a somewhat similar manner to how the mind can use electron movements to recreate imagery or sound without needing external sensory stimuli (e.g. internal visualization with the eyes closed). The systems represented by electron movements in both the mind and in digital media may or may not be representative of 'real world', material systems with an atomic basis. For example, a digital photograph of an apple is an electronic, electron-based representation of a real-world system with a real-world arrangement of atoms. The digital photograph itself, however, does not include an arrangement of atoms that resemble the system of an 'apple' — only electron movements through transistors and pixels that reconstruct electromagnetic signals in a pattern that matches the reflectance values of what would be expected when experiencing a real-world apple. From this, both digital and mental reconstructions of systems and experiences using electrons will be considered 'simulations', while the direct sensory experience of systems that we may conclude to consist of or be derived from atoms will be treated and distinguished as 'material reality', even though such a conclusion may only arise through technological or mental intermediaries and thus may only arise through simulating atomic principles and arrangements. Even the most detailed understanding of the atomic constituents of our own senses lies outside the boundaries of our senses. It would thus seem that attempting to truly differentiate reality from simulation is ripe with paradox, derived from and emphasizing our lack of understanding of self, environment and universe.

Still, current understanding of atoms is typically theoretical (requiring mental simulation) and/or experimental (requiring a technological/digital intermediary simulation), because individual atoms lie outside of our sensory thresholds. Therefore, representations of any system outside of our sensory thresholds are also considered simulations by default, because we must create intermediary, artificial 'views' with technology and theory to experience them. Likewise, the sensory thresholds and their relationship to atoms will be based upon a well-written definition by Buckminster Fuller (1), in order to help isolate the initial interfaces of our senses as unique systems with high-low thresholds. By conceptually defining the boundaries of our senses, we can then better conceptually isolate all systems that lie outside of these thresholds, and automatically designate them as simulation when their representation is experienced. Afterwards, material/atomic reality will be differentiated from electromagnetic reality, and electromagnetic reality will be differentiated from electromagnetic simulation.

"Human Sense Awareness

- INFRARED THRESHOLD (Only micro-instrument-apprehensible)
- Tactile: Preponderantly sensing the crystalline and triple-bonded atom-and- molecule state, including all the exclusively infraoptical frequency ranges of the electromagnetic wave spectrum's human receptivity from cold "solids" through to the limit degrees of heat that are safely (nonburningly) touchable by human flesh.

- Olfactoral: Preponderantly sensing the liquid and double-bonded atom-and- molecule state, including all of the humanly tunable ranges of the harmonic resonances of complex chemical liquid substances.
- Aural: Preponderantly sensing the gaseous and single-bonded atom-and- molecule state, including all ranges of humanly tunable simple and complex resonance harmonics in gasses.
- Visual: Preponderantly sensing the radiantly deflecting-reflecting, unbonding- rebonding, atom-and-molecule energy export states, including all ultratactile, humanly-tune-in-able, frequency ranges of electromagnetic wave phenomena.
- ULTRAVIOLET THRESHOLD (Only macro-instrument-apprehensible)" — Buckminster Fuller (1).

The writing above correlating sensory interfaces to the atomic world will be modified slightly to better emphasize the boundaries of our senses, as follows:

—Below touch receptor threshold; too faint—

- Tactile: Preponderantly sensing the crystalline and triple-bonded atom-and- molecule state, including all the exclusively infraoptical frequency ranges of the electromagnetic wave spectrum's human receptivity from cold "solids" through to the limit degrees of heat that are safely (nonburningly) touchable by human flesh.

—Above touch receptor threshold; saturation and numbness—

—Below smell receptor threshold, too faint, or, lack of proper smell receptors—

- Olfactoral: Preponderantly sensing the liquid and double-bonded atom-and- molecule state, including all of the humanly tunable ranges of the harmonic resonances of complex chemical liquid substances.

—Above smell receptor threshold; saturation and numbness—

—Sound wave oscillation frequency too slow; pitch too low— Or, —Sound wave amplitude too low; energy too low to collect—

- Aural: Preponderantly sensing the gaseous and single-bonded atom-and- molecule state, including all ranges of humanly tunable simple and complex resonance harmonics in gasses.

—Sound wave oscillation frequency too fast; pitch too high— Or, —Sound wave amplitude too high; too much energy to collect and damage ensues—

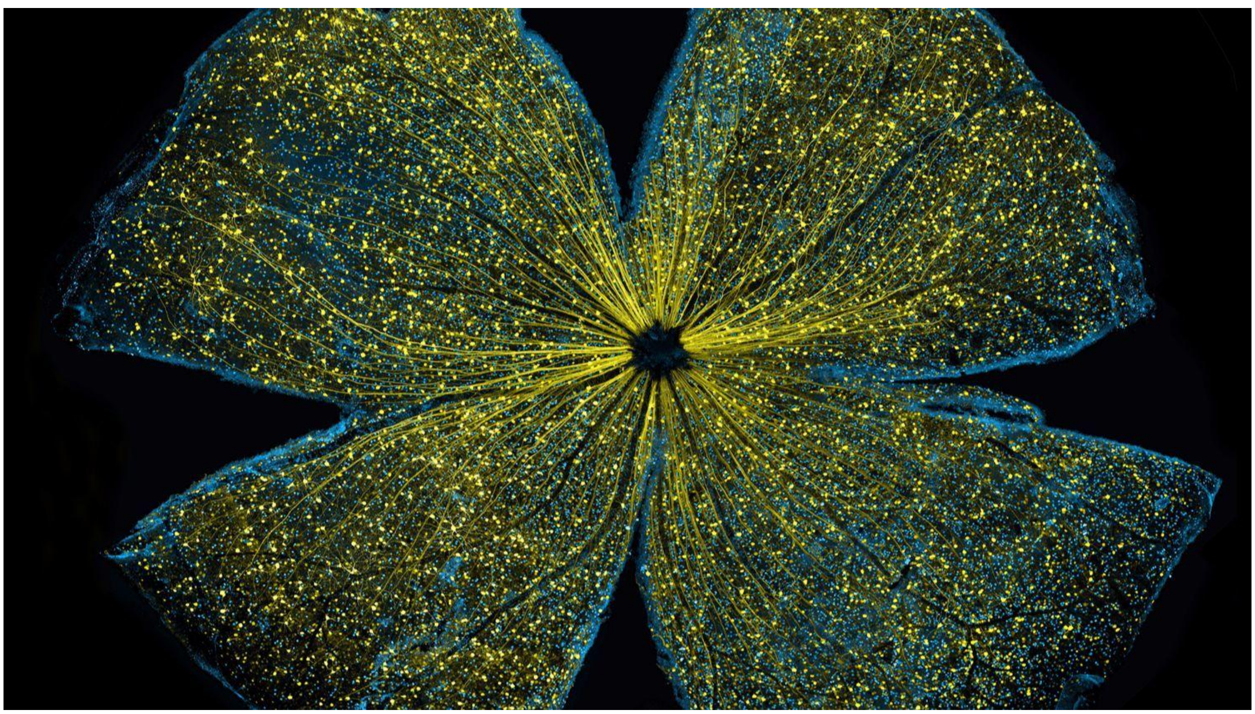
—INFRARED THRESHOLD (too large, slow and low energy to capture)—

- Visual: Preponderantly sensing the radiantly deflecting-reflecting, unbonding- rebonding, atom-and-molecule energy export states, including all ultratactile, humanly-tune-in-able, frequency ranges of electromagnetic wave phenomena.

—ULTRAVIOLET THRESHOLD (too small, fast and high energy to capture)—

The minor changes above now abstractly define more detailed thresholds for each of the senses. Each of our senses is a specific quantity of neural receptors arranged in a specific spatial pattern, and each comes with a corresponding brain region. From this, we may see that each of our senses is an interface, or 'map' or 'patch' of receptors that detect some form of energy within a range, and each range has thresholds for which a property or properties of the collected energy is too low or too high. Therefore, any information outside of the low-high energy receptive sensory ‘patches’ or ‘maps’ is beyond our ability to experience directly, and so when it is experienced, per definition of this essay, can automatically be considered a simulation. Figure 1 below is one example of a sensory interface, ‘patch’, or ‘map’: stained and highlighted retinal ganglion cells from a mouse retina/eye (2).

Figure 1: Mouse retinal ganglion cells. Cells and their axons or ‘cords’ are differentially stained and the retina itself is cut in four places to flatten the sample (2).



These cells directly transmit information from light sensitive rods and cones to the brain. This gives us a solid foundation for imagining the human interface of vision, which would look like the image above, except ten or so times larger, and of course in a pair to account for both eyes.

And as previously mentioned, the external energy this interface or sensory patch can collect is constrained within the threshold of electromagnetic waves corresponding to the visual spectrum, and excludes wavelengths that are too fast and high energy, as well as those that are too slow and low energy for light-sensitive neural cells to collect. Likewise, if we were to 'experience' anything corresponding to ultraviolet or higher energy waves, or infrared or lower energy waves, this automatically requires us to either place a technological 'view' (eg microscopy) between us and the waves, or directly simulate the waves also with a technological 'view' (eg computers), and in either case may be considered a simulation. Similarly, these thresholds impose both temporal and spatial constraints on vision, and so anything we 'perceive' that is too small and/or fast to experience directly, or too large and/or slow to experience directly, may also be considered a simulation. Microscopy, for instance, is an intermediary 'view' between our senses and something beyond them, and in turn is 'forcing' something outside of our senses into them, which intrinsically distorts at least some of the information of the system under consideration.

If the electromagnetic waves collected by the retina are reflected from a form considered to be composed of atoms, then this might be thought of as a window or 'view' into 'material reality'. When directly observing the northern lights in person, one may consider this an act of peering into and at material reality, or 'electromagnetic reality'. Even though the northern lights are predominantly experienced as a phenomena of light, they do have an atomic basis (electromagnetic waves/particles ejected from atoms in the sun interacting with atoms/molecules in our atmosphere). On the other hand, if observing an image of the northern lights on a classroom projector, the digital image itself is created by the projector manipulating electricity to make electromagnetic waves, but there are no atoms in the projector that take the form of or directly generate the phenomena of the northern lights, so this may be thought of as a simulation, as it is instead an intentional electromagnetic reconstruction of the northern lights. The 'materially real' northern lights are instead directly representative of energy exchanges between the sun and our atmosphere, and are not a reconstruction of these exchanges.

Still, we find that any attempt to separate simulation from reality often requires conceptual simulation, creating a paradox. Perhaps the closest way without paradox to differentiate simulation from reality is to separately experience them both, by plunging into the natural unknown for enough time to let thought cycles dissipate into raw sensory experience, and then returning to civilization with increased mindfulness of the reorganization of thought cycles into the hybridization of a simulated reality. By temporarily dampening thought cycles with raw experience of the natural world, we decrease the quantity of electrons/neurons in the mind that are allocated to simulating concepts/thoughts, and increase the population of electrons/neurons that are spent on imprinting the world around us; on directly taking in material reality. Experiencing the difference between the two may be as close as we can reach towards understanding our simulated reality.

Additionally, the combination of scientific, artistic, philosophical and experiential understandings have led us to logically assume that there is *a lot* going on at, between and beyond the peripheries of our senses, and so cycling the attention given to our senses between thought, and raw, externally imprinted sensory information may in turn help us experience them both so as to 'feel' the difference and better appreciate what lies beyond. Since consciousness may cycle between our definitions of simulation and reality, or at least get closer to reality or get closer to simulation, it is perhaps a hybrid between the two. Interestingly, not only does imprinted sensory information from the external word have a direct electron/electrical correlate the in the mind, but also an atomic one. When gazing at an apple, or at a friend, electrons in the retina and downstream in the cortex temporarily take direct or parsed forms of the system under consideration, as in Figure 2 below (3). From this, it is also likely that the recreation of these 'parsed forms' is to some degree what occurs when recreating images in the mind without the initial sensory stimuli, e.g. visualization and simulation with the eyes closed.

Figure 2: Illustration of cortical magnification. Regions in the brain such as the visual cortex magnify signals from the center of the retina (the fovea), which corresponds to the center of our visual attention (3).

Yet for this to happen, biochemical cascades and cellular contractions (involving increasingly large aggregations of atoms) must occur in a pattern also resembling the system under consideration, at least at the initial sensory interface, in order to properly propagate electrons with spatial origins correlating directly to the system being imprinted. Otherwise, there would be no room to transform the data into the varied forms used by the brain if the collected data itself does not at least initially resemble the system from which it is derived. This is precisely what is seen in the retina, as one example, where light sensitive rods and cones, as well as the retinal ganglion cells they pass information to, physically contract/expand as their photoreceptor molecules trigger electron movements, directly in the pattern of the imprinted system. In the example below, Figure 3, (4), red, green and blue light-sensitive cone cells in the retina (the small grey spheres) temporarily alter their physical form when they receive and react to light, which changes the characteristics of light they absorb/reflect, and this change can be detected and highlighted with techniques such as optical coherence tomography (often thought of as ‘sonar’ with light). In figure 4 (5), the retinal neurons that light-sensitive cone cells pass electrochemical information to also temporarily alter their physical form as a brief contraction/expansion when firing, and the neurons that alter their physical form will collectively do so in the same ‘shape’ as the imprinted external image.

Figure 3: Cone cells in the retina activate in a pattern directly representative of the imprinted lightwaves (of the image one is looking at). The red image is an data reconstruction highlighting the pattern of activated cone cells from looking at the black and white image (4).

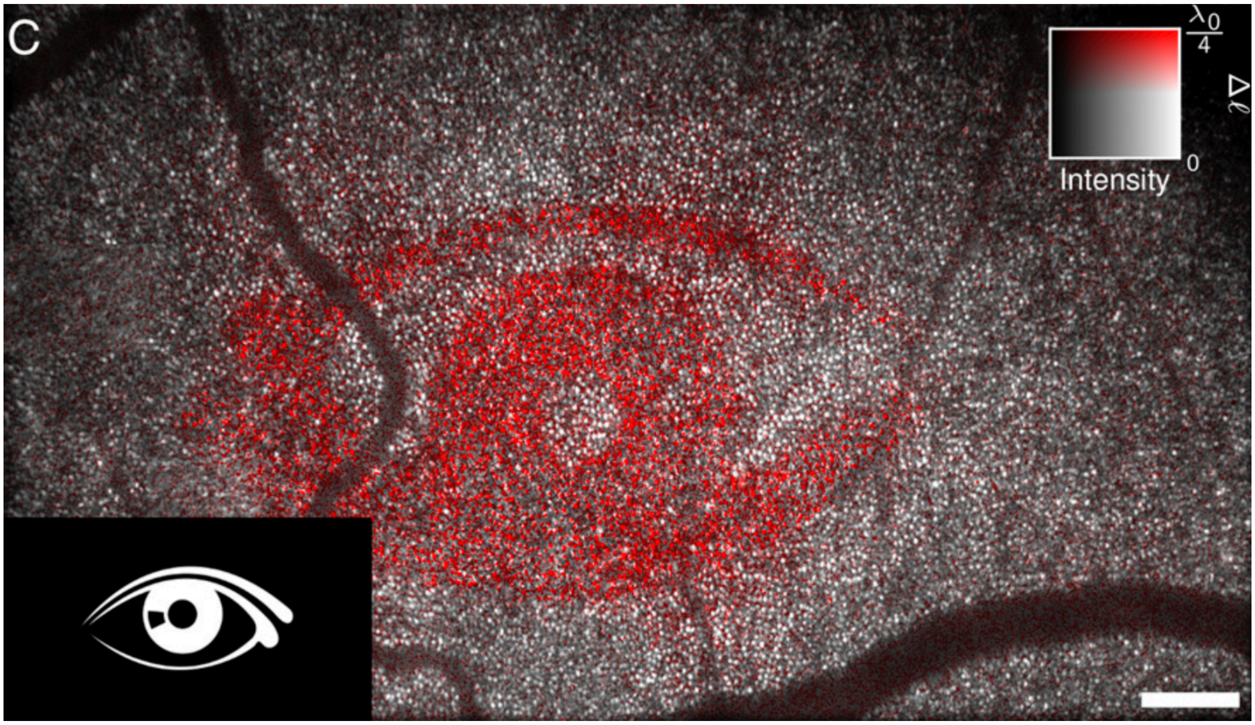
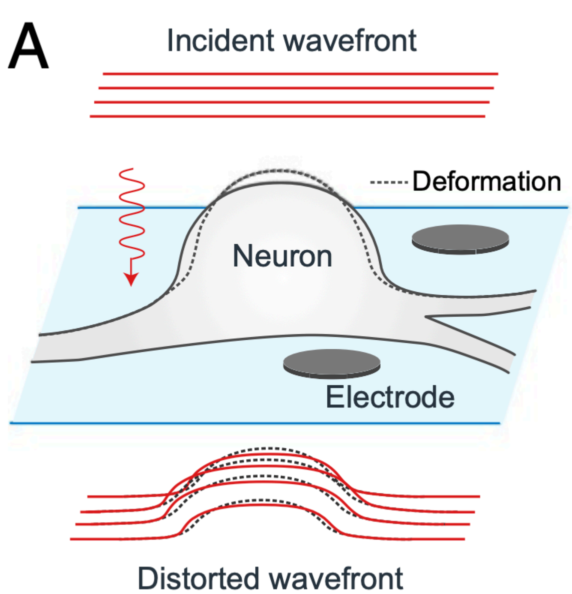


Figure 4: Neural cells undergo rapid contractions and expansions when firing (5).



Likewise, since neurons in regions such as the visual cortex can also have direct, parsed correlates of form to the initially imprinted image, as per Figure 3, this indicates that both atoms (molecules, cells, etc) and electrons can dynamically sculpt and re-sculpt themselves into representations of the external world. In some ways, our sense of sight truly ‘beats to the rhythm’ of the forms we sense, as for all other senses.

From this, we come to see that senses such as vision can dynamically and simultaneously sculpt both electrons and atoms into a representation of the form under attention — the form being sensed — which invokes both of our previous definitions of material reality and simulation. Likewise, from these definitions, the ability of our mind to manipulate electrons and atoms to simulate reality with or without an atomic basis while requiring and arising from an atomic basis itself (the body), implies that we are a hybrid between material reality and simulation. Because we consist of truly dynamic matter, of atoms and electrons moving in harmony and often reforming themselves with their environment, this perhaps alludes to the possibility that the only way to attempt to experience and differentiate simulation from material reality is to be a product of both of them.

References:

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