How Many Light Bulbs Will it Take to Change Cognitive Neuroscience?

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ABSTRACT

The relationship between economically dominant technologies and fashionable scientific paradigms, including theories of mind-brain relations, is presented in historical context. Inferences are made about the possible future impact of quantum computing upon cognitive neuroscience.

Key Words: Black Body, Cognitive Neuroscience, Episteme, Hard Problem, Hegemony, Quantum Computer

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Introduction

The quantum revolution in physics was kick-started by the rise of a commercial technology: Edison's light bulb. Quests to scale up public and private use of incandescent filaments in the early 1900's motivated theoretical reconsideration of the black body problem (Von Baeyer, 2016). Classical approaches to black body radiation predicted a nonsensical "ultraviolet catastrophe." Max Planck's quantization of electromagnetism rendered the issue tractable and led to a wholesale overthrow of pre-quantum physics by Bohr, Einstein, Schrodinger, Heisenberg, Dirac, De Broglie, Pauli, and their successors. As it happens, much farther down the road, mature quantum field theory spawned previously unimagined technical innovations, including the light-emitting diodes now making Edison's most updated progeny obsolete.

Light bulbs played not only the abovementioned literal role in propelling physics into the quantum age. The metaphor of a "light bulb going off" in Planck's mind on the cusp of his great conceptual innovation seems apt as well. A longer historical view of scientific revolutions in general suggests that such inner light bulbs have switched on whenever dominant technological demands of a given time and place fueled pressure to reconceive some economically crucial aspect of reality (Mender, 2010). So, for example, expanding maritime trade during the Italian Renaissance created an incentive to improve telescopes, which allowed Galileo to observe the phases of Venus and thereby nail shut the post-Copernican coffin of Ptolemy's ancient geocentric cosmology. So, again, a nineteenth century industrial need for better steam engines inspired Rudolf Clausius to codify thermodynamics, which forever debunked fantasies of perpetual motion machines. And so, yet once more, a surge of interest in the "physics of life," stoked by recoil from the Second World War's assembly lines of death, helped to move biology from Schrodinger's abstract premonition of an aperiodic crystal through the new medium of X-ray crystallography toward Watson and Crick's concrete structural elucidation of the molecular gene (Watson, 2016).

On the other hand, it seems that governing technologies of commerce have too often kept a heavy thumb on the "off buttons" of metaphorical light bulbs pertinent to cognitive

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neuroscience and have exerted an essentially conservative rather than revolutionary influence on those theories of mind-brain relations favored during a variety of epistemes. At least one reason for this trend lies in politically freighted implications of perspectives on mind and brain. Ideological hegemonies, including mainstream ontologies of human nature justifying established social orders, tend to resonate with rather than against whatever technical means of production are most widespread in a given economy (Mender, 1994). Thus, Freud proposed a hydraulic model of libido while steam power was driving the industrial revolution, Sherrington described the sentient brain as an "enchanted loom" while factory-based capitalism was reaching its zenith, and classical digital computation as a putative basis for cognitive neuroscience captured academic citadels while Moore's Law was starting to transform economic transactions across the globe. As it turns out, none of these "advances" has solved Chalmers' "Hard Problem of Consciousness" (Chalmers, 1995). The light bulb of cognitive neuroscience, whose substantive illumination might signal some newfound ability of that discipline to explain qualitative subjective experience in physical terms, remains unlit to this day.

A few decades hence, quantum computers may replace digital machines as world-wide workhorses of finance, trade, and production of goods and services. It is tempting to nourish the hope that, at such a juncture, some commensurately quantized version of cognitive neuroscience will switch on the light bulbs of our self-understanding.

Yet perhaps not. A much more radical leap of intuition, untethered from conformity to transient technologies rebooting but also constraining our habits of inquiry, may be required for true enlightenment.

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