

The Mechanics of the Soul

By Marcia Bartusiak

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The Mechanics of the Soul

A prominent neurophysiologist argues that consciousness is the result of evolution.

HOW BRAINS THINK

Evolving Intelligence, Then and Now.

By William H. Calvin.

Illustrated. 184 pp. New York:

Basic Books. \$20.

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WILLIAM H. CALVIN'S dander is up, albeit in a gentlemanly fashion. An authority in the field of neurophysiology for some 30 years, he's dismayed that inventive upstarts (most notably the physicist Roger Penrose, author of "The Emperor's New Mind" and "Shadows of the Mind") are encroaching on his territory. Why do physicists feel the need, he asks, to apply the tools of their trade to the study of the human intellect? These "consciousness physicists," as Mr. Calvin calls them, use "mathematical concepts to dazzle rather than enlighten. . . . Such theorists usually avoid the word 'spirit' and say something about quantum fields. . . . All that the consciousness physicists have accomplished is the replacement of one mystery by another."

Countering Mr. Penrose is not the express purpose of this captivating work (Mr. Calvin rarely even names names), yet this theme resonates throughout "How Brains Think" nonetheless. And it's a fine rebuttal. According to the author, physicists are digging far too deep into the microcosm for their answer to the brain-mind conundrum. "Consciousness, in any of its varied connotations, certainly isn't located down in the . . . subbasement of physics," he asserts. Instead, the mystery of intelligence and consciousness can be solved on far

higher floors, on the level of neurons, synapses and cortical layers.

Nothing is so vexing to cognitive scientists as dealing with the "C" word. In past centuries, researchers were banished for daring to ponder the mechanics of the soul. "Every time we contemplate the leftovers in the refrigerator, trying to figure out what else needs to be fetched from the grocery store before fixing dinner, we're exercising an aspect of intelligence not seen in even the smartest ape," Mr. Calvin notes. It's simply easier to say that something mystical ("spooky stuff") explains that wide chasm between primate and human. But in "How Brains Think," Mr. Calvin takes us on an exhilarating intellectual journey, building a strong case that our creative thoughts most likely arise and find form through the same Darwinian processes that have guided evolution for billions of years. "Ever since Darwin," he writes, "we've known that fancy things can . . . emerge (indeed, self-organize) from simpler beginnings."

Intelligence is not ascertained by a behavior's complexity. The fact that a bird can perform an intricate nesting ritual, for example, does not indicate it's particularly smart. Intelligence is more like a jazz improvisation, allowing us to perform when we don't necessarily know what to do ahead of time. It's guessing well. "Perhaps that's why, after a hard day awash in unpredictability, you tend to seek relief in ritual, music or sitcoms," Mr. Calvin writes with playful humor, "anything where you can again take pleasure in frequently guessing what comes next!"

The specialness of humans in this arena arose about two million years ago with the onset of the ice ages, when hominid brain size started to increase fourfold over the apes. The swelling was an evolutionary response as we acquired language, hunting skills and social abilities, all instrumental in surviving the erratic climate. Some animals change

an appendage to adjust to new conditions; we altered our mental life. And now, unlike any other animal, we can place utterances in new orders to create meaning, as well as plan ahead.

Mr. Calvin has written on these topics before, in such books as "The Ascent of Mind" and "The River That Flows Uphill." This slimmer volume, part of the Science Masters series, offers an exquisite distillation of his key ideas. He's a member of that rare breed of scientists who can translate the arcana of their fields into lay language, and he's one of the best. There are other, competing theories for explaining consciousness. But Mr. Calvin, so lyrical and imaginative in his presentation, draws you into his world of neural Darwinism and inspires you to read more.

SURVIVAL of the fittest is only a crude summary of the Darwinian principle. More to the point, it's a "copying competition," where quality emerges from random variations. To Mr. Calvin, that's true in our cognitive functions as well. Faced with a mental "climate change," our mind generates many competing copies of potential responses. Eventually (on fraction-of-a-second time scales), we drift toward the "guess" that best suits the challenge. According to Mr. Calvin, our sense of self — our consciousness — arises from the cerebral patterns permanently inscribed as a result of many life experiences.

In his closing chapter, Mr. Calvin warns us that science fiction will soon be science fact. If intelligence is so great, he asks, why didn't evolution allow more species to develop to our level of mental acuity? It's because competition is fierce in any closely related species (and probably why the Neanderthals are no longer with us). And that means we should be exceedingly careful in designing a superhuman artificial intelligence. But constructing such "work-alikes," he says, is inevitable. □

Marcia Bartusiak, a contributing editor at Discover magazine, teaches science writing at Boston University. Her latest book is "Through a Universe Darkly."

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