RETROSPECTIVE

Daniel C. Dennett (1942–2024)

Philosopher and science advocate

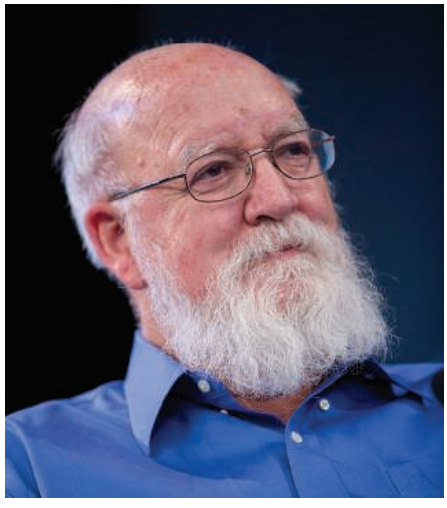
By **Rafael Yuste**[1] *and* **Michael Levin**[2]

Daniel Clement Dennett, who merged philosophical thinking with scientific evidence from many fields, died on 19 April at age 82. In the central question of the nature of the mind, Dennett took a neuroscience-anchored position, arguing that consciousness and all higher cognitive abilities could be understood as a direct consequence of the physiology of the brain. He expanded his ideas in best-selling books about religion and evolution and became one of the strongest voices publicly defending atheism and Darwinism.

Born in Boston on 28 March 1942 to a diplomat and a professor, Dennett spent his childhood years in Beirut. He graduated with a BA in philosophy in 1963 from Harvard University, where he studied with Willard Quine. In 1965, Dennett received a DPhil in philosophy at the University of Oxford, under Gilbert Ryle, with a groundbreaking thesis, "Content and conscience," which has since been translated into many languages. He taught at the University of California, Irvine, for 6 years and then moved to Tufts University in 1971, where he remained for the rest of his career. At the time of his death, Dennett was Fletcher Professor of Philosophy and co-director of the Center for Cognitive Studies at Tufts. He was also a prestigious University Professor, which allowed him to teach in any department, an appropriate honor for an interdisciplinary scholar like Dennett.

Starting with his doctoral thesis, Dennett's main body of work focused on the philosophical examination of both basal and higher mental abilities, which he grounded in scientific research. In his book *Kinds of Minds*, he laid out ways of thinking about the different types of cognition, starting from its humble evolutionary origins. In *Consciousness Explained*, he proposed a unified theory of consciousness, whereby sensory systems work in parallel to generate perceptions, which are then "edited" and integrated into a unified "Cartesian theater" with a common "narrative." He argued for strict materialism, without room for subjective elements of consciousness, which he thought were confusing and unscientific. His position was prescient, as recent brain recording and imaging research has demonstrated how the parallel processing of sensory information is then integrated into a unified framework in brain-wide functional signals.

Dennett was also deeply interested in evolution as the major force for the creation of the mind, and he argued for a central role for natural selection, which inevitably leads to more sophisticated and complex organisms. His strong Darwinian stand led him to publicly defend atheism and oppose religion. He also argued that morality was the natural outcome of a selection process.



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In his later work, Dennett explored the origins of intelligence and argued for a more general definition of intelligent systems, beyond biological ones. As long as there are Darwinian-style selection rules for emergent properties (properties of a complex system that arise from interactions among its parts), he envisioned that systems could acquire more complex phenotypes with more sophisticated functions and inevitably progress, like the steps in a ratchet, toward a more intelligent behavior. He was comfortable extending intelligent and goal-directed behavior to systems as simple as viruses and molecular networks and those as complex as artificial intelligence (AI) and the internet. His position anticipated many of the current arguments and discussions about consciousness in AI long before the technology existed. His views meshed seamlessly across disciplines, merging ideas from computer science, evolutionary biology, and cognitive neuroscience to form a rich understanding of embodied minds.

Dan was a generous thinker, sharing inspiration and wisdom with his colleagues and students. M.L. was a student in Dan's philosophy of mind course when they met in 1993. He had the good fortune to later work with Dan as a fellow faculty member. Dan was equally generous and inspiring in both capacities, offering the best of critical analysis but also freedom to explore wild hypotheses.

Dan loved coming to M.L.'s lab to personally look through microscopes and directly see the new biology that could inspire his thinking. He had an infectious excitement about new ideas and new ways to experimentally test his and others' theories. His cunningly designed thought experiments, which he referred to as "intuition pumps," could be used to powerfully transmit counterintuitive concepts, clearly and often with great humor.

R.Y. met Dan in his later years and explored with him a "modern synthesis" of philosophy and neuroscience, aiming to help explain how cognitive properties can be mechanistically implemented by the dynamics and emergent properties of neural circuits. Echoing the mid-20th-century synthesis of evolutionary biology and genetics, this goal remains one of the most formidable intellectual challenges of our generation.

Immensely curious from a very young age, Dennett was a sketch artist, sculptor, jazz pianist, skilled navigator, computer engineer, and inspiring lecturer. He managed a farm in Maine with his wife, Susan, for many years. He and Susan adopted two children and later enjoyed their roles as grandparents.

Dennett held honorary doctorates from McGill University and the universities of Connecticut, Edinburgh, Bucharest, and Amsterdam. He became a AAAS fellow in 2009, and his many awards included the American Humanist Association's Humanist of the Year in 2004. In 2012, Dennett was awarded the Erasmus Prize, one of Europe's most distinguished recognitions for exceptional contributions to culture, society, or social science.

Dennett's combination of intellectual humility and brilliance is an uncommon one. A prolific writer and engaging speaker, he was scrupulously honest and always more interested in clarity and insight than in cheap rhetorical wins. His frequently used strategy of presenting an opponent's strongest-possible argument and directly engaging the reader or audience in the debate, an approach he called "steel-manning," is a typical example of the profound legacy he leaves us. The fields of consciousness studies, philosophy, and neuroscience will deeply miss his timelessly classic yet always youthful intellectual curiosity. ■

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