

CONSCIOUSNESS

Chasing an equation for awareness

A writer seeks connections between consciousness and fundamental physics



By **Chaz Firestone** and **Ian Phillips**

Science begins with mystery. What causes lightning? How did this mold stop bacterial growth? Why do we age? Arguably, the two greatest mysteries are the cosmos and consciousness—the vast world out there and the vibrant world within. Scientists captivated by one can be called to study the other, seduced by the thought that these mysteries are connected. Science writer George Musser's book *Putting Ourselves Back in the Equation* reviews their progress: Can physics unlock the mystery of consciousness? Does consciousness underlie fundamental physics?

The result is an ambitious but ultimately disappointing tour, peppered with breathless encounters with well-known scientists. Representative of the cast is MIT's Max Tegmark, who tells Musser: "If you look at the problems that we're still stumped on in foundational physics, pretty much all of them trace back to consciousness."

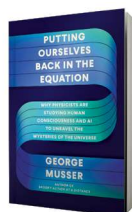
One puzzle is the quantum measurement problem. The basic formalism of quantum mechanics describes a world of superpositions: combinations of states represented by a wave function. Consider Schrödinger's celebrated cat. The relevant equations pronounce it both dead and alive; but when we open its box, it looks either dead or alive, never both. Multiplicity collapses into singularity—how? A radical solution is that consciousness is

the culprit. "The mind reaches out," writes Musser, "grabs particles that are poised between possibilities, and tells them, Choose!"

Other solutions avoid such mental magic. "Many-worlds" interpretations—favored by many contemporary physicists, including Tegmark himself—eschew collapse entirely, eliminating the mind's putative role. Musser charges these views with incoherence (even comparing them to conspiracy theories) but does too little to substantiate his case.

The book's primary theme is how physicists are contributing to understanding the mind, continuing "a long history of physicists colonizing other fields." The metaphor is apt. It recalls an episode from Barbara Kingsolver's *The Poisonwood Bible*, where an American colonial missionary ignores the local horticultural expertise of his Congolese housekeeper. The upshot? A nasty rash from poisonwood sap and a flooded garden.

Musser integrates physics with neuroscience, economics, botany, chemistry, philosophy, mathematics, ornithology, and more. Yet a key source of local expertise is notably absent—psychology, the science of the mind. An early example: Musser rightly applauds physicists' contributions to artificial neural networks but is overly credulous of their implications, declaring that "ChatGPT and DALL-E are already able to do things that seem to be coming from deeply felt experience" and "are starting to demonstrate a generalized intelligence like that of humans." Interviewing more psychologists—experts in both feelings and intelligence—could have exposed the considerable gulf remaining (1, 2).



Putting Ourselves Back in the Equation
George Musser
Farrar, Straus and Giroux,
2023. 336 pp.

What about consciousness itself? Why are some states associated with felt experience (the pain of a headache, the sight of a sunset) and others not? Musser's focus is integrated information theory, or IIT. IIT begins with five allegedly self-evident "axioms" of awareness: consciousness exists, and it is structured, specific, unified, and definite. It then derives "postulates" concerning the causal structure of conscious systems, identifying consciousness with integrated information—information that cannot be reduced to that in a system's parts. Finally, IIT offers a mathematical measure of this quantity, Φ : an equation for awareness.

However, despite its enthusiasts, IIT has profound problems. Its axiomatic basis is specious (those that are not trivial are not self-evident), and grave doubts surround its testability and Φ 's definability (3–5). Musser belatedly mentions Scott Aaronson's influential critique—that IIT implausibly assigns vast amounts of consciousness to DVD players and inactive logic gates—but seems unconcerned by this (devastating) result.

Of course, a theory of consciousness must do more than distinguish humans from DVD players; it must detail when, why, and to what degree we are conscious. Here, psychology's absence is most glaring. Over the last century, psychological research has revealed innumerable phenomena of consciousness, from paradigms that alter awareness (attentional blink, inattention blindness) to methods that render stimuli unconscious (masking, flash suppression); from extraordinary disorders of consciousness, such as blindsight or neglect, to rigorous studies of metacognition ("awareness of awareness").

Although controversial, such phenomena are the data that any scientific theory of consciousness must account for. That is why all serious theories say something about them, including global neuronal workspace theory, higher-order theories, and recurrent theories. Yet these phenomena and ideas are almost nowhere in the book. Of course, psychology has not solved consciousness; but one cannot hope to unravel awareness without confronting these data.

Consciousness is genuinely mysterious. So is fundamental physics. But hoping that physics can solve consciousness while excluding other approaches is only a recipe for more mystery, not less. ■

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ANTHROPOLOGY

Object lessons

An anthropologist confronts the history and ubiquity of human-made objects

By John Robb

There are lots of ways to tell any story, and the more important a story is, the more ways it can be told. How objects define humanity and what they reveal about big patterns in human history—the topics under discussion in anthropologist Chip Colwell's eminently readable book *So Much Stuff*—is one such story. These types of tales require an author to consider long-term trends in technology, skill, and art and are often naively framed as resulting from some inherent force of progress driven by human ingenuity. Authors like Colwell, who approach material culture from social science perspectives such as anthropology, archaeology, and the history of technology, deconstruct these frameworks and seek to show the roles played by social contexts and networks.

Such stories must also address long-term trends in the quantity of objects humankind has owned over time. Why, for example, does the amount of things humans have keep increasing?

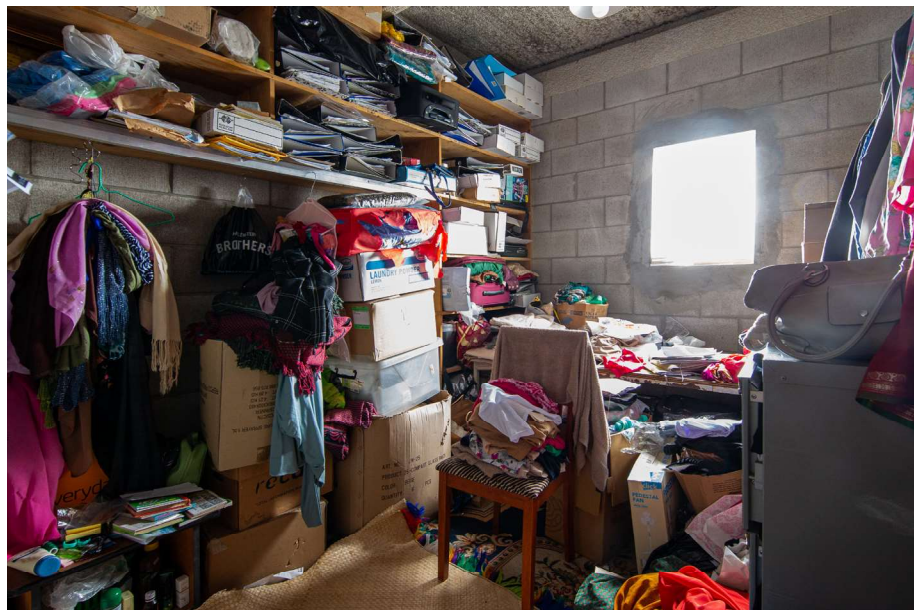
When you put both parts of this narrative together, there are two basic ways to spin it: as a utopian story of progress—of technology and capitalism's ever-expanding ability to furnish our every need and want—or as a pessimistic narrative in which the things we create and own suffocate us under their superabundance. In *So Much Stuff*, Colwell flirts with both angles.

The book frames the story of material culture as a series of leaps ahead, each of which builds on previous ones to move people from simple beginnings toward civilization, sophistication, and modernity. This is a familiar story of social evolution, drawing not only on cultural anthropology and archaeology but also on animal behavior, psychology, and cognitive research. Colwell tells it well in a chatty style. There is clearly a fair amount of academic thought underpinning the book, but it is worn lightly, with a greater emphasis on personal storytelling than on oppressing the reader with learned apparatus.

The book features many of the irresistible greatest hits of human material culture. These include Acheulean hand axes,

the Blombos Cave engraved ochre, Ice Age cave art, Göbekli Tepe, Ötzi the Iceman, the Northwest Coast potlatch, the Industrial Revolution, colonialism, and resistance. It is framed in terms of a handful of qualitative milestones: making tools, giving things meanings, and the accelerating accumulation of things.

One of Colwell's premises is that all our things are problematic in some way. A running theme is that objects enable humans to do things and to be human while also confining or imprisoning us. This does not happen



The items we acquire and accumulate reveal much about human civilization.

through any one object alone, Colwell argues, but through the cumulative mass of all of them. Together, our things strip the planet of resources, cost energy to use and maintain, generate enormous quantities of waste—and, potentially, reorient our senses and reactions in ways we might not like and that drive some people to seek out minimalist lifestyles.

Although present throughout the book, our dysfunctional relationship with things is never fully explored. Colwell can hardly be blamed for this; the overwhelming bulk of the anthropological literature on material culture is organized around case studies of particular objects, with almost none scrutinizing the effects of material culture as a total system.

So Much Stuff:
How Humans Discovered
Tools, Invented Meaning,
and Made More of
Everything

Chip Colwell
University of Chicago Press,
2023. 304 pp.



The book also skates over theoretical dilemmas relatively lightly, usually by invoking universalizing generalizations. For instance, anthropological theorists might quibble about whether humans have an innate desire to accumulate things, and economists might wonder about blaming overabundance on the advertising industry rather than on the underlying economic system generating the need to create consumers. But stories such as how advertising developed tactics for stimulating consumer desire are fascinating and succeed

in posing some thought-provoking questions. Why, for example, does religion have to have a material medium?

The book ends on one of its strongest points: the honest, personal account of Colwell's attempt to streamline his material life and get rid of things and how the system of things we live in defeated it. This account does not solve the dilemma the book poses, but it highlights it in ways that will resonate with most readers. Ultimately, *So Much Stuff* provides an engrossing introduction for nonexperts into the big questions of material culture studies. ■

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