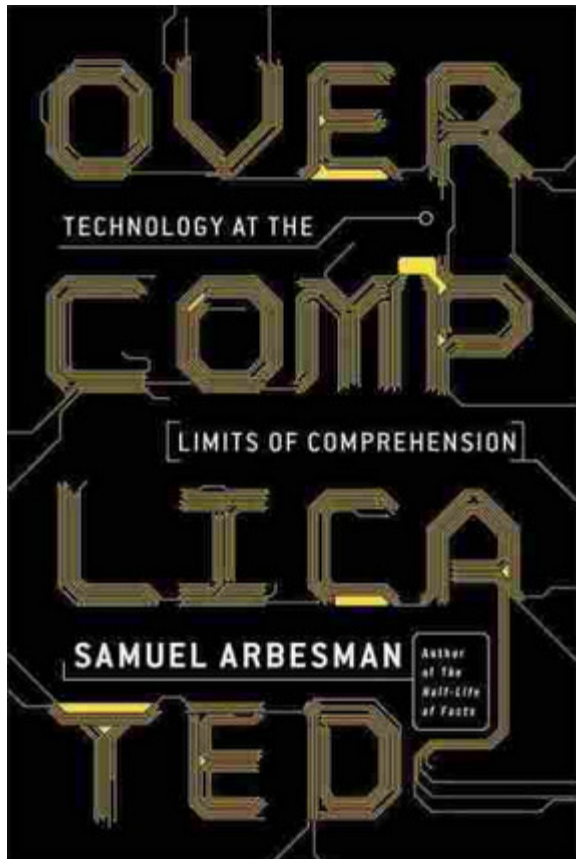


# Arbesman insightful, cautionary

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*“Overcomplicated: Technology at the Limits of Comprehension” by Samuel Arbesman. New York: Current (an imprint of Penguin Random House), 2016, 249 pages, \$23.*



“Technological complexity has been growing for a long time,” Samuel Arbesman explains near the beginning of “Overcomplicated: Technology at the Limits of Comprehension,” his treatise on the brave new world we are entering at an accelerating pace. “But today’s technological complexity has reached a tipping point. The arrival of the computer has introduced a certain amount of ‘radical novelty’ to our situation. Computer hardware and software is much more complex than anything that came before it, with millions of lines of computer code in a single program and microchips that are engineered down to a microscopic scale.”

“As computing has become embedded in everything from our automobiles and our telephones to our financial markets, technological complexity has eclipsed our ability to comprehend it,” he continues. “We are of two minds about all this complexity. On the one hand, we built these incredibly complicated systems, and that’s something to be proud of. They might not work as expected all the time, but they are phenomenally intricate edifices. On the other hand, almost everything we do in the technological realm

seems to lead us away from elegance and understandability, and toward impenetrable complexity and unexpectedness.”

“Overcomplicated” is a relatively brief but exceptionally well-researched volume, with 47 pages of source notes at the conclusion of the introduction and six chapters comprising the main narrative. One of the features of Arbesman’s prose that really struck me was the way he was able to shift between the abstract and the practical in such a seamless manner. One moment, he is discussing a concept or process that seems so hopelessly embedded in philosophical rhetoric that it could only be understood by someone with an advanced degree in logic or linguistics. In the very next paragraph, however, he clarifies what he is trying to convey in such a straightforward and clear-cut manner that I am left wondering why I questioned my ability to grasp such a fundamental truth.

Let me illustrate what I mean by offering an example he presents in “Walking Humbly with Technology,” the final chapter and one of my personal favorites. The context for this case in point is the inevitable failures and random events we are increasingly experiencing as the complexity of our technologically-based world continues to evolve at an extraordinary and frightening pace.

Arbesman argues quite convincingly that these kinds of episodes will continue to become the rule rather than the exception: “When vehicles manufactured by Toyota began accelerating unexpectedly, even resulting in deaths, experts could not figure out exactly what had caused the error. One suggestion was to inform Toyota drivers that if their cars ever began to accelerate uncontrollably, a simple solution involved shifting the car into neutral. Of course, when you are a consumer entrusting your life and your family’s lives to a powerful machine that might behave in an unpredictable and frightening manner, that’s not what you want to hear. It sounds like a callous Band-Aid slapped onto a deeper problem.”

In Arbesman’s world, perfect reliability is never realistic or attainable; complexity, by its very nature, precipitates unforeseeable and unintended consequences. The higher the level of sophistication and integration, the less likely we will be able to fully appreciate or control our creation. Toward this end, the author spends a fair amount of time discussing the anxiety this heightened state of affairs inevitably causes for most human beings. We like to see ourselves as the definitive regulator of all we have produced; as such, we hold steadfast to the illusion that all glitches can eventually be removed and all bugs can ultimately be neutralized. But if you follow Arbesman’s argument closely, it becomes clear we will never achieve this level of confidence.

When it comes to complex systems, the human body probably ranks near the top of the scale in terms of integration and interdependence. Yet how the body functions remains a mystery even to those who have devoted their entire lives to studying it. Interactions occur that have unpredictable results as a consequence of this complexity, which is precisely why finding the cure for cancer is proving to be so elusive. Its origins and stubborn persistence are due, at least in part, to the complexity of the system in which it flourishes. As our technology approaches this level of complexity, Arbesman asserts we should not be surprised or shocked when seemingly random failures occur; in fact, we should probably expect them at an ever-increasing rate.

A Senior Fellow of the Silicon Flatirons Center of Law, Technology, and Entrepreneurship at the University of Colorado and a Research Fellow at the Long Now Foundation, Arbesman’s résumé includes stints as a Senior Scholar at the Ewing Marion Kauffman Foundation and as a Research Fellow at Harvard Medical School. He has a B.A. in computer science and biology from Brandeis University as well as a Ph.D. in computational biology from Cornell. His articles have appeared in *The New York Times*, *The Wall Street Journal*, *The Atlantic* and *Wired*. His one previous book, “*The Half-life of Facts: Why Everything We Know Has an Expiration Date*,” was published in 1994.

In the final analysis, I was happy to see that Arbesman offers a decidedly optimistic prognosis for our future. The way to deal with the rather depressing realities he describes in some detail is to view them through the lens of a biologist rather than a mathematician or a physicist. As opposed to their model-building counterparts, biologists are typically not concerned with creating an overarching system – a set of fundamental principles that define the architecture on which a system operates. Rather, biologists are fully aware they can never completely understand how systems work so they seek to further their knowledge by more empirical means: observation, experimentation and trial-and-error.

I found “Overcomplicated” to be insightful and cautionary. As complexity increases, so does uncertainty. If you want to know precisely how and why, pick up a copy.

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