

## Book Reviews

Summa Technologiae. **Stanislaw Lem**. Minneapolis, MN: University of Minnesota Press, 2013. 448 pp. \$34.95 (hardcover) (ISBN 978-0816675760)

For purposes of argument, let's lay science fiction (SF) as a genre out on an axis that runs from SF about tools to SF about ideas (this is a facile split, but bear with me). On the tools side of the axis, we have science fiction that speculates about stuff: stories of airships, tricorders, and ice rays. At the far end of this side of the spectrum are documents that act as near-term, plausibly speculative engineering and design proposals—the Memex, and Vannevar Bush's "As We May Think," is this kind of proposal, complete with some extrapolations into the future following the Memex's introduction, with the new profession of "trailblazers" building associative links through the corpus of knowledge. The polar opposite to this mode, the ultraviolet to the infrared of video telephones and invisibility suits, is the science fiction of ideas and nothing else, and at the end of the line in that austere, high-altitude country lives Stanislaw Lem.

Lem is one of the world's most highly regarded science fiction writers. His work includes numerous short story collections (most notably *The Cyberiad*, written from the sardonic perspective of super-human machines) and several novels on subjects like artificial intelligence and human-alien communication, including *Solaris*, which has been repeatedly adapted for film by directors including Tarkovsky and Steven Soderbergh. He is science fiction's closest equivalent to Jorge Luis Borges, using his genre to push the limits of the thinkable.

If the SF of tools is always about to turn into an actual product proposal, patent application, or manufacturer's spec, the SF of ideas is always on the verge of tipping into pure philosophy. It asks questions of ethics and politics—what responsibility do we owe to beings with modes of cognition that do not resemble our own? For purposes of contact with aliens, who actually "represents" the human species? Of course, it asks questions of ontology (Philip K. Dick being exemplary here): how do we determine and engage with what is *really* real? In Lem's case, it asks epistemological questions: How do we know what we know? How are we certain? How do we assess salient information? And how, on this basis, do we make judgments?

This last is the sting in the tail of many of Lem's observations, both in his fiction and in the book discussed here.

Bush was concerned that vital discoveries were going unrecognized in the mass of material—"I suspect," he wrote to F.P. Keppel of the Carnegie Corporation in 1939, "we now have reincarnations of Mendel all about us, to be discovered a generation hence, if at all" (Nyce & Kahn, 1989, p. 215). Lem is indeed troubled by this as a practical matter, but his larger concern is the ways decisions are made based on what we know, or think we know. "If we ask for a boon from them," wrote Norbert Wiener of Cold War-era automated nuclear defense technologies, "we must ask for what we really want and not for what we think we want. If we program a machine for winning a war, we must think well what we mean by winning. . . . We cannot expect the machine to follow us in those prejudices and emotional compromises by which we enable ourselves to call destruction by the name of victory" (Wiener, 1961, p. 177). Lem—who cites and discusses Wiener a number of times over the course of the book—turns this question, and questions like it, over and over. As human capabilities begin to encounter the limits of our comprehension, Lem asks us to weigh our goals and our criteria of value. What is the victory of a nuclear stalemate? What is the freedom of a society of powerfully predictive big data analysis? What is the identity of the person whose humanity is artificially maintained? How do we evaluate conclusions presented by information systems too complex for humans to understand?

Hence this book. Its reception disappointed its author—it "sank without a trace" (p. xx)—and it has remained remarkably obscure and untranslated for decades, given that the bulk of Lem's work has been in press in dozens of languages since his career began flourishing in the late 1960s. Unfortunately, the reasons for this book's neglect are clear once we begin reading. Despite a lucid, brisk translation by Joanna Zylinka, who helps to untangle Lem's intricate sentences, the book as a whole can be slow going, full of table-setting as Lem describes the contemporary state of cybernetics, computing research, astronomy, and sundry other subjects to make the case for his thought experiments. Science fiction can provide a great liberty of thinking, permission to hand-wave the gritty intricacies so the author can get to the questions and implications. Lem was always particularly good at this; his works that seem most purely and idiosyncratically his are reviews and introductions he wrote for books that don't exist, freeing him completely from the tedium of dialog or explaining how such-and-such a device works. (He called these pieces "apocryphs," a neologism which deserves wider usage.) Here, there are some long walks, through sections sometimes repetitive and sometimes

poorly organized, for the sudden moments of Lemian illumination. But the moments are there and well worth finding.

What Lem offers the contemporary reader is not the dubious pleasure of ticking boxes on his predictive scorecard (“Nothing ages as fast as the future,” as he put it [p. xx]), but his analyses, which raise challenges and questions for us that are currently on the horizon of scientific and technical work. Here is where his lifelong interest in the problem of knowing, evaluating, and decision-making comes into its own. Chapter 4, for instance—“Intelelectronics”—is a wonderful course in thinking through both a speculative technology and how it could be adopted. We are facing a proliferation of information, he points out—avenues of research, sources of results, types of data and specializations, a “megabyte bomb” (p. 81) (this was written in the 1960s and updated in the 1970s). So far, so Memex. Along with proposing the development of “information farms,” about which more later, Lem looks to cybernetics for solutions. Let us say we can begin to develop brainlike systems, which don’t need to look or behave anything like human brains, with which we can augment our ability to evaluate some large swath of data and help us make decisions as to, for instance, which problems we should focus on, which areas of research to invest in—that sort of thing. Of course, we can’t specify these systems out in advance, not least because we’re relying on them to be able to handle an influx of novel information and provide some guidance. So they need to evolve, and he provides examples from cybernetic research of the day with the kinds of parabiological “computers” chronicled by Andrew Pickering’s history *The Cybernetic Brain: Sketches of Another Future* (Pickering, 2011), but the reader can fruitfully consider these ideas in terms of machine learning systems today. These devices may quickly reach black box status: we have inputs and outputs, and what happens in between is . . . complex. Possibly so complex that we need evaluative systems to check on the operation, and eventually evaluative systems to check on *those*, and. . . .

These systems will offer an enormous competitive advantage in industry. In fact, why not put the operation of the whole company under the guidance of one of these systems? Once they get good enough, you’ll owe it to your shareholders to collaborate with a black box rather than just a fallible CEO doing things by instinct. However, these systems, imitating nature, care above all for the “survival of the organism”—a quasi-biological industry, churning out disruptive innovations on an accelerated evolutionary clock, sounds very exciting until it does too well, bankrupts the industry and wipes out its competitors, crashes the economy, or innovates itself out of existence. Naturally, to account for this, we will install a super-black-box, the “Economic Regulator” (p. 104), which can take in the data being produced by the data-driven companies around the world, and make suggestions and alterations—sometimes quite radical alterations. In search of equilibrium it may be necessary to decrease global fertility for a time, or put a great many people out of work, or stop a nascent social movement that

could perturb one of the present parameters (some percentage of growth per annum plus the inalienability of private property, say). If this becomes a problem, we may want to apply some of this systemic intelligence to itself, and evolve the parameters of the decision-making process as well: the criteria by which choices are made can be refined by their own class of black boxes, “believing machines” (p. 125). Naturally, the final decisions in all these matters rest with us, but what if decisions made contrary to the recommendations of the analytic engines are noticeably lacking, ill-considered, and failure-prone? This is far more chilling than any straightforward tyrannical artificial intelligence. We always have options, but why take them? The Regulator of Regulators is producing much more reliably worthwhile proposals and the means to execute them. “Humanity could turn into a well-behaved child, always ready to listen to (No One’s) good advice” (p. 153). There is an underlying order to the whole of human activity which is fundamentally predictable, and we have built a system which can act on this order without ever being able to explain it to us. In other words, we have built a God, but we know that it’s empty all the way down the stack—just a complex process, working away.

Thus does Lem take us from the scientific journals piling up in the library carrel to a civilization that has built a perfectly effective yet completely vacant deity. That is his signature: The fairly reasonable step-by-step at the end of which we come to strange and often unnerving conclusions. Chapter 2, devoted to the possibilities of communication with other intelligent life (as a way to understand our own, by getting some contrasting examples), slowly comes around to contesting any sense we may have that our planetary civilization passes for “normal,” and that what we construe as our future is a model of what we should be looking for. (Look to the footnotes for a rather lacerating take on the Dyson Sphere, and the idea that all civilizations, no matter how alien, must inevitably start thinking as Dyson does [p. 375n2].) Chapter 8 is evolution as an archipelago of local maxima, foothills of fitness for survival on which species are stranded—evolution as a process in which we humans are duty-bound to intervene, without expecting significantly better results since we, too, are groping forward in the stochastic dark. Chapter 6 starts with simulating sensory experience and ends with proposing machines that would be at once practically useful and would undermine any remaining sense of individual subjectivity or bodily integrity we might enjoy.

Chapter 7, “The Creation of Worlds,” is particularly excellent in this regard. He returns to the problem of the production of scientific knowledge, this time going into more depth into how his decision machines would process data and produce theories. Indeed, in his model, the theories themselves become little self-adjusting machines, like living creatures, dying in relation to what they cannot explain and proliferating their variations in areas where they are tending towards accuracy: evolutionary algorithms, in an “information farm” (p. 237). With asides for Lem to discuss

embryology, the history of science, and a logical language of causality that functions genetically, he arrives at the prospective “gnostic machine” (p. 278), a human-machine collaboration which can both solve problems and also, in its production of evolutionarily refined theories, suggest new problems to be solved that would not have been found independently. (He also adds a spectacular four-page footnote in which he tosses out the idea of “ariadnology,” a guidance system for machine librarians that looks very modern indeed [p. 385n8].) This manifestation of “spontaneous, nonhuman, externalized thinking” may not reflect a “meaningful structure” (p. 279)—meaningful, that is, in preexisting human terms—but that’s a price we can choose to pay. This is the heart of Lem’s argument throughout the book: To relinquish any sentimental attachment we might have to the world making a comfortable, readily comprehensible kind of sense to us. As he puts it in the conclusion: “Though it causes everything, [nature] does not understand anything—yet its lack of intelligence is much more productive than our wisdom. . . . It does not pay attention to singular statements. What matters to it is the totality of expression over billions of years. It truly makes sense to learn such a language—because it constructs philosophers, while ours constructs only philosophies” (p. 361).

Causing everything, understanding nothing. Lem always struggled with how to have humans in his fiction, given that his interests were in the larger scales of time, space, and social order, and in the irreconcilably alien. As a young man in Poland, reading *The War of the Worlds* during the Second World War, he was deeply struck by the way H.G. Wells “climbed into a general’s position, from which it was possible to survey the whole human species in an extreme situation” (Lem, 1986). For Lem, this was the only position

worth taking for an honest writer in the modern era. In *Microworlds*, a collection of essays, he gives a harrowing statement of purpose which forms the core of his fictional project: “The unfathomable futility of human life under the sway of mass murder cannot be conveyed by literary techniques in which individuals or small groups of persons form the core of the narrative” (Lem, 1986). Your inner experience, and mine, really does not matter—what matters is the unfolding of large-scale phenomena in which we may play some minute role. What we think we know of ourselves and the world means much less than what a sufficiently large system, at scale, can know about us. In other words, Lem was writing and thinking about big data a full half-century ahead of everyone else. This book is his most direct attempt to discuss what it means for us, and it deserves to be read, taught, and discussed in that light.

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### **Finn Brunton**

*New York University*  
*New York, NY*  
*E-mail: fb42@nyu.edu*

Published online in Wiley Online Library  
(wileyonlinelibrary.com).  
DOI: 10.1002/asi.23235