

biblical/theological content. *Savior or Destroyer?* is a fallacious dichotomy; the two may be mutually exclusive, but together they do not exhaust the possible roles of AI in society. And the book offers a history and a brief possible future of AI, not *The History and Future of AI*. This is not a definitive history and philosophy of mind, nor of AI science and technology, much less of related science fiction and theology.

Readers interested in a more skeptical treatment of the subject than can be found in Kurzweil's *The Age of Spiritual Machines: When Computers Exceed Human Intelligence* (1999); *The Singularity Is Near* (2005); and *How to Create a Mind* (2013) will appreciate Zarkadakis. I would also recommend Noreen Herzfeld's *In Our Image: Artificial Intelligence and the Human Spirit* (2002) and *Technology and Religion* (2009), chap. 3; James Barrat, *Our Final Invention: Artificial Intelligence and the End of the Human Era* (2013); Murray Shanahan, *The Technological Singularity* (2015); Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies* (2016); Yuval Noah Harari, *Homo Deus: A Brief History of Tomorrow* (2016); and Hector J. Levesque, *Common Sense, the Turing Test, and the Quest for Real AI* (2017).

Reviewed by Paul Fayter, a retired historian of science, theology, and science fiction, who taught at the University of Toronto, then at York University, Toronto, ON, for 30 years. He lives in Hamilton, ON.

TECHNOLOGY VS. HUMANITY: The Coming Clash between Man and Machine by Gerd Leonhard. Kent, UK: Fast Future Publishing, 2016. 172 pages, index. Paperback; \$15.95. ISBN: 9780993295829.

Technology vs. Humanity is a call to arms against the adversary of *dehumanizing* technology. An influence of tech futurists such as Ray Kurzweil, Alan Turing, Alvin Toffler, and sci-fi writers such as Ray Bradbury, is evident. Leonhard extrapolates present trends far into the future, but his call to arms is not readily dismissible. If he is correct, we surely must respond. By the time you read this review, it may already be too late, because in Leonhard's view, 2016—the year of the book's publication—is the critical year to take action.

There is a lot to ponder in this book—including but not limited to Leonhard's claim that we reached the pivot point in 2016 (*this* is the very moment when exponential increases are starting to really matter); his ability to envision future technology-generated scenarios and to support them with believable rationales ("What makes us think (these things) won't happen? We simply must consider these unpalatable what-ifs because this is the road we are on—fueled by exponential technologies," p. 83); his account of androrithms (a neologism, or word that Leonhard made up to describe those unique qualities that make

us human); his assertion that we will be held responsible for the decisions we make at this very moment (responsible to whom, he doesn't say); and his boldness in attempting to get the conversation started.

Leonhard explains that the pivot point is an inflection point of an exponential curve in many fields of science and technology; now we are moving at "warp speed" toward a blend of hell and heaven that he labels "HellVen." Even if Moore's law eventually ceases to apply as far as microchips are concerned, many fields of technology, from communications to artificial intelligence (AI) and deep learning, are still likely to grow at least exponentially and with combinatorial effects—the changes reinforcing one another. Engineers would call this "positive feedback."

Mathematically speaking, exponential curves do not have an inflection point. Perhaps Leonhard is thinking of the so-called "hockey stick" curve of global temperatures vs. time. Is energy use really rising exponentially? Are food production and consumption, and transportation? Perhaps he is using "exponential" metaphorically, not mathematically. But the concept is central to the argument, so I wish he were more rigorous on this point.

By 2020, Leonhard writes, almost everything will be perceived or defined as a service because everything will be digitized, automated, and "intelligized." This will have huge economic impact as it

progressively creates abundance in almost every sector of society—first music, movies, and books, followed by transportation, money, and financial services, and eventually, medical treatments, food, and energy. (p. 79)

By 2030

technology and pharma will have converged almost completely. Mankind's biggest diseases, including cancer, diabetes, heart disease, and AIDS are being tackled by advanced bioengineering. We will very rarely take pills to fight sickness or diseases; instead, we will increasingly use technology and genetic editing to observe, predict, and prevent the onset of diseases. (p. 157)

Leonhard cautions that we should not anthropomorphize our technologies too much or confuse our priorities when it comes to making important societal choices and decisions, and we should not forget our responsibility as we venture out to create technology that may end up surpassing us. Unfortunately, slow but systematic reduction or even discarding of androrithms is already underway. Distinctly human traits include the ability to ask questions, to imagine that something could be different, to be critical, to look at things from different angles, to read between the lines, and to see what may not yet be there. If

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we don't spend as much time and resources on andorithms as we do on algorithms, not only will technology end up running our lives, but we will also be forced, tricked, or otherwise cajoled into becoming technology ourselves. We shall become "the tools of our tools."

Technologies with potentially catastrophic consequences such as geo-engineering or artificial intelligence, Leonhard writes, should be guided and supervised by those who have been proven to possess practical wisdom, what the ancient Greeks called *phronesis*, and not by technology developers, corporations, or military bureaucrats. In particular, we should not attempt to mend, fix, upgrade, or eradicate what makes us human; we should design technology to know, respect, and protect andorithms (p. 113).

Profit-and-growth-driven open markets will only escalate the challenges. The prevailing Silicon Valley ideology of "Why don't we just invent our way out of this, have loads of fun, make lots of money while also improving the lives of billions of people with these amazing new technologies?" could prove to be just as lazy—and dangerous—as Luddism. If something can be done, does it mean it should be done? Should we consider *not* doing things because they might also have negative side effects on human flourishing?

Leonhard suggests that precaution and proaction—the two principles often deployed to date as possible mitigation tools—are both insufficient to deal with this combinatory, exponential scenario where waiting will be as dangerous as firing ahead. Too much precaution will stifle progress and innovation, and too much proactivity will free some powerful and likely uncontrollable forces. He does not mention technology assessment, intelligent trial-and-error, Hippocratic engineering, responsible and appropriate technology, professional codes of ethics, or Lanny Vincent's *innovation in the company of God*.

Environmental issues receive scant mention—except (in passing) for geo-engineering, and the prediction that food, transportation, and energy supply will be abundant by 2020. But global climate change, scarcity of clean water, strategic minerals, species extinction, farmland conversion, sanitation, power distribution, flood control and irrigation are not mentioned as threats. Certainly these issues also demand attention.

Civic and political leaders must develop a deep understanding and personal foresight about technology in the context of humanity, and become stewards of our collective future. Across all sectors of all industries, we will need a new kind of hyper-collaboration, not hyper-competition. (To this reviewer it seems

that political conservatives and many evangelicals miss this point.)

In sum, Leonhard believes we must: (1) put our collective human flourishing first and above all other concerns; (2) allow those uniquely human things such as imagination, chance, mistakes, and inefficiencies to continue to matter even if they are undesired by or incompatible with technology; (3) fight the spread of machine thinking, i.e., not change what we stand for and need as humans simply because it might make it easier for the technologies that surround us; (4) not be tempted into preferring technological magic (i.e., great simulations of reality over reality itself) and getting addicted to technology; and (5) not prefer relationships with screens and machines over those that we can have with fellow humans.

For Leonhard the meaning and the purpose of life, the aim of human existence—is *happiness*. The only way to create lasting benefits in business as well as in society is by putting human happiness and well-being at the heart of decision making and governance. Technology should be guided toward human well-being or *flourishing*—the state of being comfortable, healthy, or happy. The Greek word *Eudaimonia*—central to Aristotelian philosophy and commonly translated as happiness or welfare—captures the point.

Religious approaches are deliberately ruled out because "they are not universal and are often regressive." Biblical higher calling—such as *imago Dei*, creation care, or the kingdom of God—is ruled out a priori. Thus Leonhard misses a very large body of work by biblical scholars and theologians who have developed equally profound insights and urgent calls to action. At least twenty-five books on the topic, in addition to my own, reside on my bookshelf.

If we want to master those imminent clashes between humans and machines, Leonhard says,

We will need a new kind of global stewardship backed up by ever more prescient foresights. We will need the ground rules to be decisive yet flexible enough not to inhibit progress. Daunting? Yes. Impossible? No. Alternatives? None. (p. 160)

Drawing from Greek philosophy, the Buddhism of the Dali Lama, and humanism, Leonhard develops his "digital age philosophy" of *exponential* humanism. In my view, however, the questions he raises are beyond the reach of secular and humanistic reasoning.

Leonhard's grasp of the meaning and purpose of life is bigger than mere "happiness," but his approach is basically humanistic and anthropocentric. As a Presbyterian elder, I am compelled to suggest a

higher calling as set forth in the *Westminster Shorter Catechism*: “Man’s chief end is to glorify God, and enjoy Him forever.”

If the issue is as urgent as Leonhard believes, I think that publishing this book (or any book) is totally insufficient to draw attention to the threat. A massive marketing campaign is required. The church might undertake such a task, if so inclined. But the church is sleepwalking in this arena. Some are struggling with trusting science, let alone steering it.

Even with these limitations, however, I strongly recommend *Technology Vs. Humanity*. Why? First, because Leonhard alerts us to the dimensions and urgency of the problem. Second, he proposes semi-tangible approaches, which he says are only conversation starters. Third, he sets forth fifteen *shall-nots*, five *core human rights* that should be incorporated into digital ethics, five *elements* of what it means to be human, and eight *must-do* actions in order for us to become stewards of our collective future. Finally, he appeals for action, not just another forum!

Reviewed by Jack Swearingen, Professor (retired), Washington State University Vancouver, Vancouver, WA 98686.

ALGORITHMS TO LIVE BY: The Computer Science of Human Decisions by Brian Christian and Tom Griffiths. New York: Henry Holt and Company, 2016. 368 pages, bibliography, index. Hardcover; \$30.00. ISBN: 9781627790369.

In *Algorithms to Live By: The Computer Science of Human Decisions*, authors Brian Christian and Tom Griffiths offer an answer to “the oldest question of all: how to live” (p. 4). Their bold recommendation is to live “by the wisdom of computer science” (p. 6).

In the introduction, Christian and Griffiths announce that they will demonstrate that “applying the lens of computer science to everyday life” reveals “the algorithmic underpinnings of our daily lives” (p. 4). They define an algorithm as “a finite sequence of steps used to solve a problem” (p. 3), and they contend that computer science algorithms offer us “practical, concrete suggestions for how to solve specific problems” (p. 4) in life. The authors contend that many of life’s dilemmas actually correspond to “solved problems” in the field of computer science, which, “unlike most advice,” is “backed up by proofs” (p. 6). Indeed, the authors go so far as to suggest that many people “don’t need a therapist; they need an algorithm” (p. 3). Moreover, they claim that “as computers become better tuned to real-world problems,” they also provide “a better standard against which to compare human cognition itself” and, therefore,

can reveal the “meaning of rationality” and the very “nature of the human mind” (p. 4).

Algorithms to Live By is subtitled “The Computer Science of Human Decisions.” Indeed, a number of the algorithms considered in the book for application to human decision making are associated with the discipline of computer science. For example, chapter 3 considers how sorting algorithms might lead to recommendations for organizing a library of books or designing an athletic tournament. Chapter 4 looks at caching algorithms and how they might assist us not only in organizing the clothes in our closets but also in understanding our own human capacity for memory. Chapter 10 explores what the design principles underlying the technologies driving the Internet might imply for how we think about and conduct our communications with other humans. However, in the remainder of *Algorithms to Live By*, the authors employ algorithms from other disciplines so often that a reader might question how well the subtitle describes the contents of this book. In these other eight chapters, most of the algorithms under consideration are not so much computer science algorithms as they are formulae from other fields, particularly mathematics, that a computer scientist might draw upon in attempting to construct a computer model, simulation, or analysis of a given real-world human phenomenon or data set.

The authors acknowledge in the introduction that the design of algorithms for computers requires theories not only from computer science but also from mathematics, engineering, statistics, and operations research. Moreover, they suggest that the application of computer algorithms to human minds requires looking “to cognitive science, psychology, economics and beyond.” Christian and Griffiths also share how their own multidisciplinary academic backgrounds have assisted them in the fundamentally interdisciplinary task of writing this book.

Regardless of the disciplinary origins of the algorithms, the authors do cover an impressive range of topics in their text as they work to develop their central argument in favor of a computer-science-like, algorithm-oriented approach to human life. In the process, their recommendations for the employment of a particular algorithm are variously descriptive, predictive, and prescriptive.

The authors’ argument is perhaps most compelling when they recommend the *descriptive* use of algorithms. They demonstrate how algorithmic models can provide insight into complex real-world phenomena that might be difficult to describe otherwise. For example, in chapter 3, they provide a superb explanation of “Big-O notation” and its usefulness