where technologies are located in our homes and the roles they play in our lives. He then suggests some practical means we could use to limit those roles appropriately. Moreover, churches, schools, and community organizations—any association whose primary purpose is human formation—should not be surrendered to rationalization. He writes, "… personal ends cannot be achieved through exclusively impersonal means." On a broader scale, he points out that automated machine technology has developed a momentum of its own that seems immune to critique, driven by powerful economic forces (which Gay discusses with some care). Nevertheless, Gay points to the necessity of a more extensive cultural change, including the need to repent of hubris and the desire for autonomy and to turn from the mechanistic way of enframing the world that reflects that hubris.

Gay is not an alarmist, but he makes a compelling case that modern culture is heading in a dehumanizing direction. He analyzes how that course was set and shows how it needs to change. I heartily recommend this book for perspectival courses on technology in Christian colleges and universities and for anyone whose professional work is in a technological field. But it could be read with profit by anyone concerned with issues of technology and society.

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DEEP MEDICINE: How Artificial Intelligence Can Make Healthcare Human Again by Eric Topol. New York: Basic Books, 2019. 341 pages. Hardcover; $32.00. ISBN: 9781541644632.

Artificial intelligence (AI) will not be replacing human doctors anytime soon, but it will have profound impacts on the way medicine is practiced. This is according to Eric Topol, MD, the author of *Deep Medicine*. Topol vacillates between the voices of a historian and a prophet as he details the history of AI and its incorporation into the medical field, and then speculates about the future medical roles of AI. This is the author's third installment in a series of books describing the changing landscape of medicine in a society amid a technological revolution (see also *The Creative Destruction of Medicine* and *The Patient Will See You Now*). As a cardiologist, professor of genetics, and director of the Scripps Translational Science Institute, Topol is well qualified and uniquely positioned to take on the formidable task of translating the fields of AI, genetics, and medicine into prose understandable to the lay reader. He largely succeeds at creating a balance of a comprehensive description of each topic without overwhelming the reader with too much detail.

In the first two chapters, Topol whets readers' appetites with anecdotes describing potential ways that AI could improve medicine. He also chronicles some of the shortcomings of "shallow medicine," which is described as medicine practiced with "insufficient data, insufficient time, insufficient context, and insufficient presence" (p. 31), which he suggests is often the way medicine is currently practiced. Chapter 3 details some of the shortcomings of using AI for diagnoses in the past and describes some of the most promising fields of medicine in which AI is currently improving diagnostic power.

Chapters 4 and 5 take a step back to define what AI is, survey some of the history of its development, and explain how deep-learning algorithms work. Potential problems with AI are also discussed, from designing human bias into learning algorithms to sentient machines turning on humanity. The latter scenario is decidedly unlikely in the near future. Yet AI will undoubtedly change society profoundly, so, Topol cautions, it behooves us to be aware of this and direct its uses to ways that benefit humanity.

The remainder of the book focuses on specific facets of medicine and how AI is being used in each arena. Some of the topics include analyzing images (MRI and X-ray, for example), mental health, drug discovery, personalized diets, and the healthcare system itself. For each of these subjects, Topol offers a realistic description of the current state of AI incorporation and a distinctly optimistic look at how AI will transform that field in the future. However, a common refrain in these chapters is that the use of AI will always be limited by its inability to replace the human and relational aspect of the practice of medicine.

This leads to the last chapter, called "Deep Empathy," in which Topol offers an impassioned call for a paradigm shift in medicine away from an assembly-line mentality to a focus on developing uniquely human characteristics of medicine for which AI, in his view, will never be a satisfying substitute. He notes that in recent years it is these very characteristics that have been pushed aside as medical professionals are required to spend more time behind a computer screen, care for an increasing number of patients, and spend less time face to face with those in their care. As business interests have taken over medicine, profitability is favored over building relationships with patients. AI, he notes, "could be used in two very different, opposing ways: to make things much better or far worse" (p. 285). We still have the capability

to control the direction of the evolution of medicine, but it will take intentional effort by medical professionals, the government, and society to reclaim the humanity of medicine.

This is not the first time that society is faced with a technology that has the power to either greatly benefit or greatly harm, depending on its application. Impacts cannot always be reliably predicted. Therefore, Topol urges that these technologies must be closely monitored to mitigate negative impacts.

Christians should be integrally involved in this, both at the societal and policy level, to encourage equitable and ethical use of AI in the medical field. For example, this technology truly could, Topol suggests, increase the time that medical professionals have available to spend with each patient, allowing them to form human connections and develop true empathy. Humans are created as relational beings, so technology that frees time for deeper relationships should find widespread support.

However, equally possible is that business interests will dictate an increase in the number of patients seen, rather than the time spent with each patient. Similarly, AI may decrease costs associated with medicine, making medical care more accessible to marginalized groups in society who currently experience poor access to medicine. However, it may simply increase profit margins, enable discrimination based on risk factors, and "exaggerate the profound gap that already exists between those who have much and those who have less" (p. x). AI has the potential to narrow in on a diagnosis more rapidly than ever before, decreasing wasted spending on unnecessary tests and leading to better societal stewardship of monetary and medical resources. However, it could also increase spending and waste if individuals demand more tests and continuous medical screening because of their ready availability.

These issues must continue to be carefully considered while AI is being implemented, in order to guide our medical system to become something better, rather than worse, than its current state. In making these matters accessible to lay readers, Topol provides the information required for everyone to join in the discussion.

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