

have likely thought about the evolution of charismatic macrofauna, but the study of microbiomes is an exciting field of research that we would do well to inspire more budding scientists to consider.

A concern for microbiomes needs to be more widespread; many medical doctors still prescribe antibiotics too blithely. (In describing his son's birth, Solomon writes, "The doctors gave my wife intravenous antibiotics during labor and delivery, a preventative measure due to a positive test for a type of *Streptococcus* bacteria several weeks earlier. It was standard practice under the circumstances and may have prevented a serious infection, but I couldn't help but wonder if it would have any impact on the beneficial microbes my son would be exposed to during birth." [p. 178]) Similarly, standard medical practice for C-sections does not include vaginal swabbing, but researchers who study microbiomes already do this (Pollan, 2013). One surmises that Solomon would have as well.

We would have liked to see Solomon develop further the idea that the breadth of people from whom contemporary humans choose a mate makes future speciation or genetic polarity unlikely (except in the case of an isolated space colony). Solomon writes that "the current archaeological evidence suggests the physical separation that led to speciation in the case of the Hobbits lasted for hundreds of thousands of years. As we have seen, the current trend in humans is exactly the opposite—populations are more interconnected today than at any point in our history." (p. 170).

Though it is obviously misguided to equate current trends with events that lasted for hundreds of thousands of years, we wish Solomon had included a discussion of assortative mating. One consequence of the recent development of internet dating and first-world access to increasing numbers of potential mates has been a move toward increasing genetic polarity. Many humans choose to breed with life partners similar to themselves (Gibbons, 2017) (by way of anecdotal example we might offer ourselves, or Solomon and his wife), and increased mobility and mate pools make this more possible. Internet dating is too new for compelling data to exist, but there are tantalizing leads, such as the recent prevalence of autism among children born in Silicon Valley.

Though *Future Humans* seems to lack the depth needed for stand-alone course material, we would not hesitate to suggest it to someone interested in quickly learning the important concepts of this field. It seems impossible for someone to read this book without having one or two (more likely many) ideas worth pursuing further.

References

- Pollan, Michael (2013, May 19). Some of My Best Friends Are Germs. *The New York Times magazine*. Retrieved from <http://www.nytimes.com/2013/05/19/magazine/say-hello-to-the-100-trillion-bacteria-that-make-up-your-microbiome.html>
- Gibbons, Ann (2017, January 9). . *Science Magazine Online*. Retrieved from <http://www.sciencemag.org/news/2017/01/your-choice-life-partner-no-accident> doi: 10.1126/science.aal0589



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PHYSICS AND THE UNIVERSE

The Big Picture: On the Origins of Life, Meaning, and the Universe Itself. By Sean Carroll. 2016. Dutton. (ISBN 9780525954828). 470 pp. Hardback. \$28.00.

The Big Picture is exactly what its title proclaims, a book that tackles the big questions about human existence. Why does the universe exist? Is there evidence for the existence of God? How did life on Earth begin? Is humanity special somehow? Do we continue to exist after we die? Does our life have purpose? These are just some of the queries that Sean Carroll tackles in this impressive book. But this is no religious or purely philosophical treatise; rather it is a work examining the critical questions of existence through the lens of theoretical physics.

The book is divided into six parts: Cosmos, Understanding, Essence, Complexity, Thinking, and Caring. In each part, the author discusses a major facet of existence. In each, he argues that our current understanding of physics and biology is sufficient to explain how and why life is the way it is. Carroll makes a compelling case for the atheist stance, but does not intend or attempt to attack theists. Instead, he carefully and deliberately explains what physical evidence exists for the origin of the universe, the beginning of life, etc., and how the evidence does not require a supernatural explanation. And yet, Carroll argues, life still has meaning and value. Throughout the book, the author takes what he calls the "poetic naturalist" stance: the one true world that simply acts according to fundamental principles. These principles can be understood by scientific inquiry alone, but humans can produce goodness and beauty regardless.



Sean Carroll is a renowned expert in his field, and it shows. Throughout this book, he explains dozens of complex scientific theories: The Big Bang, string theory, field theory, gravity, chaos theory, quantum mechanics, evolution, and many more. However, the reader won't need a graduate degree to follow along. The author describes these complex concepts in language at a level that any undergraduate college student could follow. His case is compelling, and his ideas thought-provoking. Sean Carroll will have you reexamining your own world-view, and that is never a bad thing.



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