

## PHYSICS

# Philosophy for physicists

A cosmologist explores the philosophical implications of the foundational laws of nature

By **Barry Loewer**

The 20th-century philosopher Wilfrid Sellars characterized the aim of philosophy as “to understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term.” This is also physicist Sean Carroll’s aim in his new book, *The Big Picture*. He sets out to show how various phenomena, including thought, choice, consciousness, and value, hang together with the scientific account of reality that has been developed in physics in the past 100 years. He attempts to do all this without relying on specialized jargon from philosophy and physics and succeeds spectacularly in achieving both aims.

Carroll calls his view “poetic naturalism,” the latter of which consists of two parts. First, he argues that observation and the scientific method are the only reliable ways of learning about the world. The second component is that the systematic application of the scientific method has taught us that there is one natural world that, at a fundamental level, consists of quantum fields distributed in space-time, the distribution of which is subject to physical laws. Currently, these laws are those of quantum field theory and general relativity. Any future physical theory is expected to subsume these two tenets as correct in their respective domains.

The “poetic” part of Carroll’s view refers to the idea that there are many true descriptions of the world, including those contained in the special sciences, the languages of psychology, economics, ethics, poetry, and so on. In any particular context, our purposes determine the best way of talking.

For Carroll, attempts to describe the natural world are legitimate as long as they serve the intended purpose and the claims made in them are consistent with the established theories of physics and with each other. He says

“consistent,” but I think he means something stronger, along the lines of “their claims are entailed by fundamental physical laws and facts.” Thus, although generalizations in economics may be the best way of talking about changes in the money supply, true economic generalizations about the money supply must be defined by the laws of physics that describe the motions of elementary particles and the fields that constitute the distribution of money and the rest of the economy.

Carroll observes that the laws of physics are complete within the domain of physics,



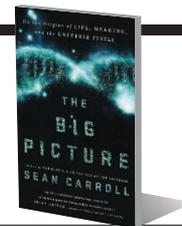
“What is the fundamental nature of reality?” asks Sean Carroll in *The Big Picture*.

meaning that any change in the configurations of fields and their particles can be accounted for in terms of earlier configurations and fundamental laws. He argues that it follows from the structure of quantum field theory and the results of particle experiments that all the fields and forces that are responsible for the behavior of macroscopic objects are known. Because any process must be implemented according to fundamental physical laws, it follows that this is sufficient to exclude certain kinds of putative phenomena (e.g., astrological and paranormal influences) from reality. Carroll does not mean that these are a priori impossible but rather that they are inconsistent with established physics and so are ruled out by poetic naturalism.

There are challenges to poetic naturalism that need more discussion than Carroll gives them. One is the origin of “time’s arrows,” especially causation. Carroll first addressed this issue in a previous book (*J*), and his efforts to

**The Big Picture**  
On the Origins of Life, Meaning, and the Universe Itself

Sean Carroll  
Dutton, 2016. 480 pp.



fill in the details in *The Big Picture* make for a lively research project in physics and philosophy (2).

Another challenge is understanding how thought, consciousness, and free will fit into physical theory. Thoughts are “about” things outside themselves, consciousness possesses a “what it is like” feel, and free choice seems to involve decisions that originate in an agent. It is difficult to see how these are entailed by the motions of fields and particles. Carroll discusses a number of well-known arguments that attempt to show that such phenomena are in-

consistent with a purely physical fundamental ontology and rightly concludes that these are not persuasive. But poetic naturalism should not be satisfied until it can include an account of how these elements emerge from fundamental physics or, if such an account is not forthcoming, why they do not involve nonphysical fundamental ontology.

A related challenge has to do with understanding the place of value in the big picture. Carroll follows Hume and noncognitivists in ethics, arguing that value claims are not descriptions of objective aspects of reality but rather that value is invented by human beings. But it is not clear

that this view does justice to the way we think about ethics and value.

A last challenge that poetic naturalism should seek to address is why the universe has the laws and parameter values it does and exactly how one is to understand what it is to be a law. Carroll does not answer these questions, but he does argue that theological explanations and metaphors are of no help.

Recently, a number of prominent physicists (Feynman, Weinberg, Hawking, and Krauss) have dissed philosophy, claiming either that it is of no use to physicists or that the problems it addresses have been solved already by physics. *The Big Picture* shows why these claims are misguided.

#### REFERENCES

1. S. Carroll, *From Eternity to Here: The Quest for the Ultimate Theory of Time* (Dutton, London, 2010).
2. See, for example, D. Albert, *Time and Chance* (Harvard Univ. Press, Boston, 2000).

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# Science

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