

*Cosmic Jackpot: Why Our Universe Is Just Right for Life.* By Paul Davies. London: Penguin, 2006, and Boston: Houghton Mifflin, 2007. xv + 315 pages. \$26.00.

Paul Davies is a celebrated cosmologist with a sustained interest in its philosophical dimensions. Years ago he wrote *God and the New Physics* (New York: Simon and Schuster, 1983), and in the quarter century since he has repeatedly returned to themes surrounding the anthropic principle. *Cosmic Jackpot* is the sequel, maybe even a finale. If he can answer the question in his subtitle, that will really hit the jackpot.

Cosmology is changing (dark energy, dark matter, the thermal birth map of the universe, made with the Wilkinson Microwave Anisotropy Probe), so the issue needs revisiting. Davies is unsurpassed in summarizing highly technical results and their significance for a reasonably literate audience, such as *Zygon* readers. He can couple this with a conversational style, often with reminiscences about the cosmological celebrities involved.

He can be refreshingly blunt separating science from speculation and worrying about the transition zones: "As we consider earlier and earlier moments, we have to rely on increasingly speculative theories. Inflation, for example, makes use

of grand unified theories (GUTs) of particle physics that so far have no direct experimental confirmation" (p. 72). In one of the typically British understatement of the book, such "theories of everything" involve "considerable exaggeration" (p. 86). They seek to unify the different elementary particles and their characteristics but have nothing to say about historical particularity—trilobites, elephants, or persons, for example. This is a little like trying to explain everything in the United States by using gravity. So we just smile at the exaggeration. But then we begin to wonder whether, even if we know the "just right" cosmology, we will know why there is the unique history that has occurred on Earth.

If we play with the jackpot metaphor, Who won what jackpot when? The *who* answer seems to be humans ("arguably *the* most significant fact about the universe," p. 2), or at least life ("the universe is bio-friendly," p. 2), but the *when* answer seems to be the start-up event some 13.7 billion years ago. So there is quite a lag time between hitting the jackpot and winning. The jackpot is, to mix metaphors, a cooking pot, and the lag time is cooking time for heavy elements and for life on Earth. Davies is much more confident dealing with the primordial jackpot and the elemental cooking than he is with how life cooks up in the pot.

The book is nine chapters physics, then one chapter biology. But in that chapter we are told that "life . . . is 1 percent physics and 99 percent history" (p. 233). There is a kind of 9:1/1:99 tension throughout the book, continuing into the "how come" of concluding Chapter 10. The beauty of the book is the same as its problem. Davies is a physicist and remains challenged by the radical differences between physics and biology. "The Great Rule Book of Nature (at least as it is currently understood) would fit comfortably onto a single page" (p. 11). Has Davies looked at a recent biology text (typically 1,200 pages) and tried to shrink it to a single page?

Davies knows the laws of physics like the back of his hand; he does not seem to know that most biologists doubt that in biology there are any laws at all, in the sense in which physicists use that term—fundamental laws true of everything all over the universe. Biologists use generalizations (meiosis, independent assortment, haploids/diploids); they may find some laws in their biochemistry (valence bonds in glycolysis). But glycolysis in another galaxy? Who knows? Biologists study an idiographic Earth. Cosmologists must be universally nomothetic. "Four fundamental forces explain everything" (p. 93). Why there are marsupials in Australia, while placentals dominate other continents? More hyperbole, but the point is that gravity, electromagnetism, and weak and strong nuclear forces are in the 1 percent physics, not in the 99 percent history.

Davies has read biology, of course. "Taking life seriously" in his concluding Chapter 10 (p. 223), he realizes that biology is Darwinian and physics is not. Organisms are autonomous and contain biological information not found in physics. The emergence of mind is challenging. "Somehow the universe has engineered its own self-awareness" (p. 231). Some "just right" "engineering"? When we look for "just right" explanations of Earth's natural history, resulting in mind, biologists are divided.

Consider whether this 99 percent history is contingent, inevitable, probable, or possible. Stephen Jay Gould, outspoken Harvard paleontologist, spent his career insisting that life is "the fragile result of an enormous concatenation of improbabilities, not the predictable product of any definite process" (1983, 101–2).

Michael Ruse, equally outspoken philosopher of biology, claims that scientists who read progress into the evolutionary record have slipped into “pseudo-science” (1996, 526). John Maynard Smith, theoretical biologist, together with his colleague Eörs Szathmáry, concludes that the major transitions in evolution have depended on “small number of major transitions” in the way information is transmitted (genetic code, cell nucleus, sexuality, acquired learning, language), but finds “no reason to regard the unique transitions as the inevitable result of some general law” (1995, 3).

There are biologists who think the Earth life history inevitable, of course. Lately, Simon Conway Morris, prominent Cambridge paleontologist, has been quite outspoken about how “life . . . is full of inherencies.” “Life shows a kind of homing instinct . . . given enough time, the inevitable must happen” (2003, 8, 20). He is impressed by convergences and parallel evolutions on Earth (doglike, catlike, rodentlike marsupials). Conway Morris is more inclined to find a jackpot Earth in an otherwise lonely universe.

Christian de Duve, Belgian microbiologist, is closer to Davies: “I view this universe [as] . . . made in such a way as to generate life and mind, bound to give birth to thinking beings” (1995, xviii). Theoretical biologist Stuart Kauffman agrees: “I believe that the origin of life was not an enormously improbable event, but law-like and governed by new principles of self-organization in complex webs of catalysts” (1993, xvi).

Davies knows who these people are, though he deals with them mostly by way of mention, en route to a discussion of teleology in physics (“the dreaded t-word,” p. 233). There he ends wondering whether mathematics and physics are one and the same and whether quantum mechanics permits teleology. Rather than evaluating whether de Duve, Conway Morris, or Kauffman might be finding laws of biology, or statistical probabilities, or convergent trends against the sheer-contingency claims (or whether they have fallen into pseudoscience), we end with the “key point” that backward causation might be a “quasi-respectable route to teleology” (p. 259). Maybe so, but backward causation is not going to illuminate whether or why life persists and elaborates in the midst of its perpetual perishing—mammals speciating rapidly after dinosaur extinctions.

The subtitle, *Why Our Universe Is Just Right for Life*, promises an answer the book never gives. Rather, we discover that when it comes to the big questions, bright physicists wander around like everybody else. We do get from Davies an intriguing account of *how* our universe is promising for life, which for him does keep open (keep promising, if you like) the *why* question, with God as one of the possible answers. Yes, there was an original cosmic jackpot; but, after that, there is also on Earth an escalating serendipity generating a wondrous richness of biodiversity and biocomplexity that physics cannot touch. Perhaps the best way to say this is that Davies’s cosmology is necessary for life (1 percent absolutely required) but not sufficient for Earth’s 99 percent storied natural history. We should welcome that much.

Davies takes stock: “In our search for an explanation of cosmic bio-friendliness we have encountered a heady mix of speculation, ranging from the intriguing to the seriously flaky” (p. 202). He inclines toward an “overarching law,” a “life principle,” or “self-explaining universe” (p. 266). A major reason for the spectrum is “the intractable nature of the problems being confronted” (p. 203). A

skeptical reader will conclude that Davies, for all his brilliance in cosmology, never gets much further than banging into intractable metaphysical problems. He concedes: "Confused, I certainly am" (p. 204). So much for the subtitle with its promised answer to the *why* question.

## REFERENCES

- Conway Morris, Simon. 2003. *Life's Solution: Inevitable Humans in a Lonely Universe*. Cambridge: Cambridge Univ. Press.
- de Duve, Christian. 1995. *Vital Dust: Life as a Cosmic Imperative*. New York: Basic Books.
- Gould, Stephen Jay. 1983. "Extemporaneous Comments on Evolutionary Hope and Realities." In *Darwin's Legacy, Nobel Conference XVIII*, ed. Charles L. Hamrum, 101–2. San Francisco: Harper and Row.
- Kauffman, Stuart. 1993. *The Origins of Order: Self-Organization and Selection in Evolution*. New York: Oxford Univ. Press.
- Maynard Smith, John, and Eörs Szathmáry. 1995. *The Major Transitions in Evolution*. New York: W. H. Freeman.
- Ruse, Michael. 1996. *Monad to Man: The Concept of Progress in Evolutionary Biology*. Cambridge: Harvard Univ. Press.

HOLMES ROLSTON, III  
Dept. of Philosophy  
Colorado State University  
Fort Collins, CO 80523