

Review of *At the Edge of Time: Exploring the Mysteries of our Universe's First Seconds*. Dan Hooper. Princeton University Press. 233 pages. 2019.

Dan Hooper wrote *At the Edge of Time: Exploring the Mysteries of our Universe's First Seconds* for non-scientists, those who are interested and curious about the beginning of the universe and what went *bang* at the time of the Big Bang, 13.8 billion years in the past. Hooper, a skillful writer, tells the reader that “With this book, I offer you a glimpse of the Big Bang—our universe’s first seconds and fractions of a second” (p. 5). “A trillionth of a second after the Big Bang the entire universe was filled with an unimaginably hot and dense plasma of energy” (p. 73). During this period of “cosmic inflation,” quantum particles were being scattered and “Although this epoch of inflation lasted only a little longer than a millionth of a billionth of a billionth of a billionth of a second, it left our universe utterly transformed.” (p. 7) Cooling to about 3000 degrees made it possible for atoms to form and eventually find their way into the “soup” that formed life as we know it. The end of this violent period marked what Hooper calls “the true beginning of the universe that we live in” (p. 159). And that, is the essence of Dan Hooper’s analysis of the “mysteries of our universe’s first seconds.”

We are accustomed to hearing ninety-second spots on the evening news announcing discoveries about the universe but we are often left with terms that are unfamiliar and the news lacks clear significance of the discovery. Hooper provides a tool for hearing about these discoveries by reporting on current cosmological research. That is not to suggest that by reading this work the reader will fully understand the scope of what is being reported. It will be helpful, perhaps necessary for the non-scientist to have at hand a device to scan the internet for the meaning of the terms of physics.

Hooper uses simple examples to explain that which is not so simple. He uses the trajectory of a thrown baseball and a journey in a car to explain time and space according to Newton and Einstein. A “box of electrons” is used to understand the first moments of our universe’s history. The experience of measuring the local coffee while sipping coffee provides a way to understand the “expanding universe.” In other words, Hooper uses common illustrations to help the reader understand our home’s history.

Perhaps because of Hooper’s relatively young age (born in 1976) or in spite of it, he is at ease to admit that “A key feature of any healthy scientific community—its members, although often skeptical, are eventually willing to change their minds when the evidence calls for it. And the evidence in favor of the Big Bang has called loudly, howling from the rooftops” (p. 47).

However, the theory of the Big Bang was not so easily sold to the scientific community. “The Big Bang Theory was still a fairly controversial idea in the 1960s, and many scientists favored other cosmological models” (p. 58). Dark Matter and Dark Energy, part of the Big Bang event, are yet to be fully understood and Hooper concentrates on explaining and questioning their formation and identity.

Hooper is in step with his colleagues by admitting that uncovering the history of the universe is not complete. There are still mysteries to solve. He confesses that “When one talks about the

first 10^{-43} seconds after the Big Bang, one has little choice but to rely on a healthy dose of extrapolation and well-informed speculation” (p. 213).

For those who study and support the science of evolution, this book should be considered preliminary reading. Acknowledging a mysterious mechanism that took place in the first fraction of the second after the Big Bang, Hooper concludes that “If it weren’t for this unknown and mysterious mechanism, our universe would contain essentially no atoms. And without atoms, there would never have been any gas or dust—or galaxies, stars or planets. Our universe would contain no chemistry. No life. And no us” (p. 87). The Big Bang was our beginning.

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