



## At the Edge of Time: Exploring the Mysteries of Our Universe's First Seconds

**Dan Hooper**

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Dan Hooper's *At the Edge of Time* charts what is understood, and what remains a mystery, about the Big Bang—that moment 13.7 billion years ago of inconceivably high temperatures, fast expansion, and particles and forces like gravity coming into existence, but not yet following the laws of physics as they are now known.

The Big Bang's "cosmic inflation" equated to the universe expanding in volume by a factor of 1075 in just 10–32 seconds. Such numbers are hard to grasp. Moreover, the very concept of the universe expanding is a challenging one to accept—after all, where is there for it to expand *into*? Hooper suggests a thought experiment: If you can't picture space expanding, instead imagine that you're in a coffee shop and everything in it, including you and the yardstick you use, is shrinking while the room stays the same.

The book reminds its audience of the fundamental paradigm shift from Newtonian physics, which reigned for 200 years, to today's quantum mechanics. Hooper specializes in dark matter, which accounts for 84% of what exists and is mysterious still. All of these evolving understandings and loose ends mean that concrete understanding is an ongoing struggle.

Just as the Big Bang is framed as having happened "at the edge of time," the concepts introduced in the text are at the outer edge of what most laypeople can grasp. There are many abstractions involved. Hooper assists by setting up analogies using everyday objects, as well as by introducing "let's imagine that..." exercises.

The book's enthusiasm for its subject is contagious. From Einstein's theories and Edwin Hubble's discoveries to the Large Hadron Collider, the text presents scientific advancement as an exciting odyssey—if one that is, for the time being, often characterized by questions, to be answered at a future date to the satisfaction of all.

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