



The Large Hadron Collider, one of the few facilities that can recreate conditions of the early Universe.

PHYSICS

A cosmos in the lab

Andreas Albrecht ponders a study of the physicists who grapple with the origins of the Universe.

Cosmology has been radically transformed in the past few decades. The study of the origins of the Universe once entailed plenty of speculation and few data. Now, an impressive array of ground- and space-based telescopes produce vast amounts of data, and the 'standard' cosmological theory fits it exquisitely and in detail. The subject of Zeeya Merali's *A Big Bang in a Little Room* — the possibility of creating a universe in a laboratory — ties in very broadly with these exciting developments.

The astronomical data show that the Universe gets hotter as we go further back in time. These conditions can be recreated only with great effort at laboratories with particle accelerators, such as CERN in Europe and Fermilab in the United States. High-energy physics has introduced interesting possibilities and insights — such as the idea that the very early Universe underwent an accelerated expansion, or cosmic inflation, and the possibility that the observed Universe was produced by a quantum-tunnelling event (perhaps tunnelling out of a lab). Among these developments, Merali shows, there are great stories and colourful characters.

Merali, an accomplished science writer, weaves a picture of modern cosmology from



A Big Bang in a Little Room: The Quest to Create New Universes
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its results, its history and the motivations of individuals. Thoughts from Alan Guth, Andrei Linde and Alex Vilenkin about the development of cosmic inflation, and from Joe Polchinski about the evolution of string theory (to mention a few), wonderfully convey the sometimes thrilling and often circuitous nature of scientific progress, and its emotional ups and downs. Many of the scientists profiled are colleagues of whom I am fond, and it is gratifying to see their wisdom and quirks shine in Merali's excellent prose.

Each chapter focuses on one key subtopic, and features scientists who work in it. We learn about the foundations of quantum physics through the reflections of Antoine Suarez on his distinguished career creating ever more powerful laboratory tests of quantum theory. Greg Landsberg shares his expertise on the search for mini black holes at CERN, and Eduardo Guendelman describes his pioneering work on how they

could be the seeds of baby universes. Other chapters take on determinism and free will, and the ethics of creating artificial life.

The question of cosmic origins, and the possibility that humans might create new universes, can connect with religious concerns. These form a substantial thread through *A Big Bang in a Little Room* that significantly reduced the book's appeal to me. I am an atheist. I respect that many people are deeply religious (some are very close to me) and that religion can have a positive, even beautiful, role. And I know many religious people who do superb science. But I find most attempts to connect religious questions with the fundamental questions of physics and cosmology (or vice versa) deeply unsatisfying.

Does your favourite interpretation of quantum mechanics or apparent fine-tuning of the fundamental constants provide evidence for or against a divine creator? Deeply religious people know better than to leave something so important to them to fads in physics. And when people do engage in these debates, they seem to find a reason to believe what they want to believe, regardless of how the science unfolds.

For example, Suarez shares how his religious convictions (about determinism and divine omniscience) convinced him that his experiments would disprove quantum theory. But once his experiments had upheld the theory, he found a new way to fit a deity into the picture, by identifying the "many worlds" proposed by US physicist Hugh Everett with thoughts in the "mind of God".

The diversity of scientists' religious beliefs is an interesting topic, and there is some good writing on it throughout *A Big Bang in a Little Room*. Merali is not shy about airing her own religious views, and they clearly inform her enthusiasm for talking to scientists about theirs. Some of her interviewees share thoughtful contemplations; Guendelman ponders why an all-powerful god would allow horrifying evil. But weaker discussions let the book down, including a lengthy exploration (bringing in Polchinski and Christoph Schönborn, the archbishop of Vienna) of whether string theory supports or refutes the existence of god. And, given how central religion is to this book, it seems strange that neither the title nor the blurb mentions it.

Atheist readers more uncompromising than me may find this book unbearable. Even deeply religious readers may not welcome the sloppy interplay between science and religion. Still, there are those who enjoy debating perceived relationships between this or that physics concept and the existence of a god: it is probably they who will enjoy the book most fully. ■

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