

# INTRODUCTION

Some power there is that draws men's eyes and hearts up and outward, beyond the heavy clay that fastens them to earth.

Mary Stewart (1979)

The ... results have given physicists confidence that we understand the origin of the universe to within a fraction of a second after the Big Bang. However, we are still left with the embarrassing questions of what preceded the Big Bang and why it occurred.

Michio Kaku (1994)

Extrapolating all the way [back] to “the beginning,” the universe would appear to have begun as a point ... in which all matter and energy is squeezed together to unimaginable density and temperature.

Brian Greene (2003)

Cosmology is the scientific attempt to answer fundamental questions of mythical proportion: How did the universe come to be? How did it evolve? How will it end?

Charley Lineweaver (2003)

Tracking the history of the Universe from the instant after the Big Bang is a stellar achievement—but it leaves unanswered the fundamental question of how the Big Bang started in the first place.

Patricia Fara (2009)

Finding how the universe began turns out to need two new approaches. One is simply to begin at the beginning. The reader may think it odd that anything so obvious is new. These days it is. But trying it has fallen out of fashion. Experience suggests it's risky. And, too, the physics that should help turns out to stray amid a maze of problems. To the detective all these problems help to crack the case; they are the clues. So the other new approach is this embrace of many problems. A famous case may illustrate the way this works.

In 1687 Newton's apple shows him how to calculate the motions of the planets. Astronomers soon find his method works. Some two hundred years later a faint new planet, Uranus, is found. Its orbit doesn't fit the calculations. Le Verrier takes a big leap. He proposes yet another planet—one that nobody has ever seen—could, if *it* is in a certain orbit, make Uranus move the way it does. When telescopes are pointed where he calculates his planet needs to be, it's there! Uranus's problem is the clue that leads to Neptune.

Another case may show how extra clues can help. The year is 2009. The scene is tropical Pacific islands. The puzzle is their peoples: Where did they come from? There are many theories. Genetic studies lead to mixed results. Old pottery is inconclusive too. The origin of Austronesian peoples seems lost in the mists of time. Enter the detectives. They are scientists. The island languages, a thousand of them, yield more clues. Studies of the stomach-ulcer bugs in islanders add more. Taking all the clues together gives a clear and simple answer: They all—peoples, pots, tongues and bugs—came from Taiwan 5,000 years ago. Of course it isn't quite that simple. But the concept's simple and it's central to the art of the detective: Lots of clues say much more than a few.

By the 1980s, cosmology is an experimental science. It soon discovers many strange new clues. They make it possible for a detective—when a good one can be found to take the case—to ask and answer: What happened? It's a five-part story.

First, the detective will need a briefing on how cosmology's ideas—good and bad ones—came to be. Part I is *The Case History*, though no detective ever had one with a history like this.

Figuring out how the universe began is of course much messier than turning a math problem inside out to find a planet. But cosmology has lots of problems—well known among the in-crowd—that a detective could put to use. Focused more on problems than accomplishments, Part II is *The Cosmic Clues*. Part III is *The Apprehensions* in which any way to solve some problems could become a starting point to deduce—or more precisely, induce—the Beginning. The detective finds how space and time begin. Then, in Part IV, *The Way of It All*, the detective sets out to unravel how the universe emerges. But he isn't finished when this task is done: What can the Beginning say about the end? Part V is *From Here To Eternity*.

The book thus sets the scene; reviews the clues; discovers how the universe begins; sets out some of how it works; and follows up its future. Is it really this well organized? Well, it does get messy. After all, it's a detective story.