Books

New astronomy and space titles reviewed

RATINGS
★★★★★ Outstanding
★★★★☆ Good
★★★☆☆ Average
★★☆☆☆ Poor
★☆☆☆☆ Avoid

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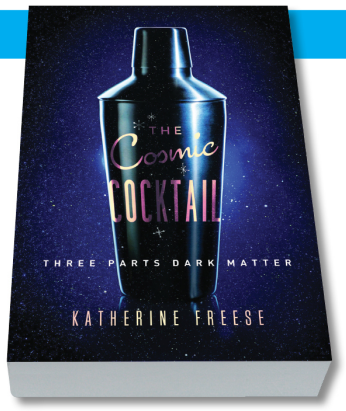
The Cosmic Cocktail

Three Parts Dark Matter

Katherine Freese
Princeton Press
£19.95 ● PB



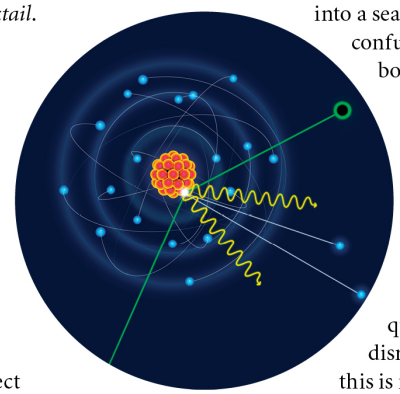
"Without having learned the language of mathematics, it can look like a string of meaningless symbols and its beauty is hard to access."

Here Katherine Freese, one of the pioneers and key players in the field of dark matter and particle astrophysics, hits on one of the main problems in popular science writing – one that she quite successfully overcomes in her new book, *The Cosmic Cocktail*.

Freese traverses the astrophysics timeline, from the composition, history and geometry of the Universe to dark matter, antimatter, neutrinos, quarks, the Higgs boson and the various candidates we have in the dark matter line up.

Considering the complexity of the subject matter, Freese successfully treads the line between assuming too much of her readers and missing out key aspects of the story to simplify it. However, some of the particle physics chapters become too complicated, with excessive detail, equations and diagrams popping into the text.

After explaining why dark matter must exist, Freese unpicks all the possible candidates for this elusive stuff, settling on the one astronomers think to be the most likely: weakly interacting massive particles (WIMPs). Freese is involved in attempts to detect these ghostly particles which, as their name suggests, interact too weakly to be seen directly.



WIMPs are the best-accepted candidates for dark matter

The book explains what they are and why they're our best hope, before describing the current and future experiments hunting for this missing piece of the cosmic puzzle.

Unfortunately, here the book deteriorates into a sea of acronyms, which is confusing and also quite boring to read.

There are other things that are off-putting – for example, Freese weaves her own personal narrative into the physics story quite well, but some sections are quite irrelevant and disrupt the flow. However, this is minor as the personal anecdotes become less frequent and the complexity of the content rises. Despite these weaknesses, the author gets an awful lot right – perhaps the most valuable aspect is how Freese gives context and insight into a complex and fast-moving field.

★★★★☆

NICKY GUTTRIDGE *is a science journalist and Hubble public information officer*

Reader price £13.99, subscriber price £12.99
P&P £1.99 Code: S0814/1

TWO MINUTES WITH KATHERINE FREESE

What inspired you to write the book?
The dark matter problem is a great unsolved mystery and here we are on the verge of solving it. Twenty-five years ago I proposed ideas and made calculations that persuaded experimentalists to build detectors to hunt for dark matter particles, and now it seems that these global efforts are coming to fruition. It's a great story and I thought people should know about it.

Why is it so important to find dark matter?
Because it's there! If we are right, there are billions of dark matter particles going through us every second. They don't harm us, but still we want to know what they are.

How far are we from solving the mystery?
We think we are on the verge of it. A multitude of experiments, both in underground labs and via satellites in space, have found unexplained signals that could have their origin in dark matter particles. Many believe that discovery is around the corner.

How have technical advancements in observations helped the search?
When I made my calculations of the interactions of dark matter particles in laboratory detectors, we found expected count rates of less than one per kilogram of detector per day. Experimentalists were willing to try to build the detectors. No one thought that the sensitivity would be a thousand times better than we originally calculated by now, and it is. These are tremendous achievements!

KATHERINE FREESE *is the George E. Uhlenbeck Professor of Physics at the University of Michigan*