

## COSMOLOGIST'S PERSONAL AND PROFESSIONAL CHRONICLE

Book review by Andy Hone, University of Kent

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### HOW THE UNIVERSE GOT ITS SPOTS

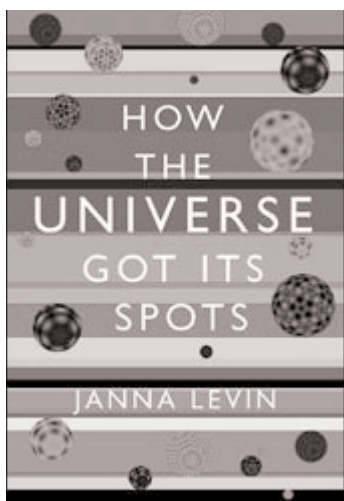
#### Diary of a Finite Space in Finite Time

By Janna Levin

Weidenfeld & Nicholson 2003

paperback 224 pages

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Popular science has become gradually more fashionable over the past fifteen years or so. This trend has partly been set by the bestsellers of Stephen Hawking, which have introduced modern cosmology into the public awareness. However, while there are now several good popular books on the subject, this new contribution from young cosmologist Janna Levin provides something unique: a rare insight into the personal and intellectual life of a scientist.

The book is a two-year diary of unsent letters to the author's mother, chronicling the peripatetic and insecure existence of a postdoctoral researcher. At the start she leaves behind her sun-drenched life in California, in order to strike out a new path in the chillier climes of England, with British boyfriend Warren in tow. Her unfortunate partner makes a great sacrifice, giving up his musical career to become a domestic drudge while she chases her scientific muse.

The main motivation behind the writing is the urge to explain what her work is about and what makes her tick. A history of the scientific view of the cosmos is presented, from Copernicus via Newton to Einstein and beyond. Being addressed to a non-scientist, everything is explained beautifully in an intuitive way, with many pictures. Even more unusual is the backdrop of her personal life, so that the most technical descriptions are interspersed with thoughts and reflections on where she is and who she's with.

The 'Finite Space' of the subtitle refers to Levin's original work concerning the possible extent of the universe. She has a gut feeling that nature abhors infinities, so the space we live in should be finite. However, just as we can travel on the curved surface of our planet without falling off, in a compact universe there is no edge of space. To explain this requires an appreciation of topology, in order to understand how space fits together, and the book gives a highly accessible introduction to these ideas. An important insight is that while Einstein's general theory of relativity describes the local geometry of the universe, in terms of the curvature of space-time, it does not address global topological questions.

The notion of a finite universe has received very recent media attention due to new measurements of the cosmic microwave background radiation by NASA's WMAP spacecraft, prompting the Guardian headline 'Universe is shaped like a football, says scientist'. The experts are still in disagreement about the correct interpretation of the WMAP results - apparently the football has already been ruled out! For a non-expert like me, Levin's book provides a fascinating introduction to the work of Thurston, Best and Weeks on compact three-manifolds with negative curvature. There is also a wonderful scientific analogy between patterns of radiation in the sky and Murray's work in mathematical biology on the leopard's spots, which gives the book its title.

Science is viewed here as a creative expression of our sense of wonder at the universe, and its human face is vividly evoked by the autobiographical passages. Levin is also brave enough to expose her raw nerves, not least the deterioration of her relationship with Warren. Yet she ends on a note of hope, suggesting that there may be a reconciliation of the differences between science and art, and between mind and heart.

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