

## Unravelling Universe

Two science books, dealing with life, the universe and everything else, have gripped the public imagination this year. **Paul Murdin** looks at the two very different theories and their appeal

Stephen Hawking's **A Brief History Of Time: From The Big Bang To Black Holes** (Bantam Press, £14.95 hbk) has been in the *Sunday Times*' best-seller list for six months with over 200,000 copies in print by Christmas. This is success for any book, and is surely astonishing for a book on cosmology. Hawking himself appeared on the cover of *Newsweek* under the headline 'Master Of The Universe'.

As is well known, Hawking is confined to a wheelchair with motor neurone disease and he wrote the book from a computer through a voice synthesiser. He is renowned as Britain's new Isaac Newton, trying to create a single system of thought, combining gravity, relativity, quantum mechanics, and, later, the rest of physics, into a Unified Theory.

Einstein succeeded in unifying gravity and relativity (this is the so-called General Theory of Relativity). Hawking has gone a step further and unified Einstein's theory with quantum mechanics. He has successfully applied his ideas to black holes. It had seemed to physicists using Einstein's theory alone that black holes lasted forever and were always black - they never radiated light, for example. But Hawking showed that black holes do radiate and eventually evaporate. He went on to use these results to describe the Big Bang and to suggest why Time always runs forwards - why, for example, broken cups never leap off the floor and reassemble themselves on the edge of the kitchen table.

Reactions to Hawking's book have been mixed. Non-scientists find it mind-boggling; exciting, even to possess the book. Academics have been cautious. Perhaps the *Times Higher Education Supplement* was correct to criticise Haw-

king for his slipshod versions of medieval astronomy and catholic theology. Frankly, I can forgive Hawking for being an expert in only one thing, if that thing is the greatest intellectual challenge of the 20th century.

At least part of the reason for the success of his book is a human interest in Hawking himself and in his approach. What he says is objective but also personal and revealing. He describes his life's work in the context of his life and of history. Hawking's science is science with style, like music, engaging us both in the content and the presentation. In the same way we are entranced by Jacqueline du Pre's fine cello playing as well as her love affair with Daniel Barenboim, and the cruel revelation that she too had a wasting disease.

In searching for the Unified Theory like a Holy Grail of physics, Hawking assumes that it exists, although he, like everyone, recognises that the success stories of physics are based on very simple tests and models of how the world ideally operates: you don't hear about people being calculated from the Unified Theory.

Most situations, in the real world, are too complicated for Hawking's physics. As with the Holy Grail it is the search for and the idea of the Unified Theory which is the driving force, not so much the possible practical benefits. Most situations are actually Chaotic - in the sense which we all understand, as well as in a technical one.

But it has recently been discovered that Chaos itself has general properties. Who would have thought that the weather, populations of wild-life, cotton prices and dripping taps had anything in common? The new science which describes the order in the randomness in these things is the subject of



**Stephen Hawking: Universal bestseller**

James Gleick's book on **Chaos: Making A New Science** (Heinemann, £12.95 hbk).

Gleick's book presents a view of the world with an emphasis totally opposed to Hawking's. Far from a universe in which everything can be completely described, in principle, by one theory; everything in the Universe of Chaos contains an uncertain element, in which, for example, the settling of a butterfly in the Amazonian rainforest can create a disturbance in the weather which could cause a hurricane in Sussex.

I sometimes give a talk on astronomy in which I lay out a model of the solar system, with the Sun an orange and the Earth a pin head at eight metres; the nearest star is an apple in Cairo, and the rest is almost empty space. People react with awe. The talk is about an idea which originated in textbooks over the

last century and which has become a cliché; it's parodied in Monty Python's *The Meaning of Life*. We have learnt to assimilate the scale of the Universe and, whatever the audience feels during the talk, after it's over people are not frightened of the merely large. The new things which awe us, as judged by these two books' success this year, are Chaos and the inevitability of Time.

We are reassured by Stephen Hawking himself, physically vulnerable in an everyday world which we deal easily with. If he can overcome this frailty and then, in his own mind, seek what he calls 'the mind of God' and cope with his discovery that, apparently, there is nothing in the Universe for the Creator to do, so can we. Perhaps it is worse, as Einstein felt, to think of God rolling dice and making Chaos. •