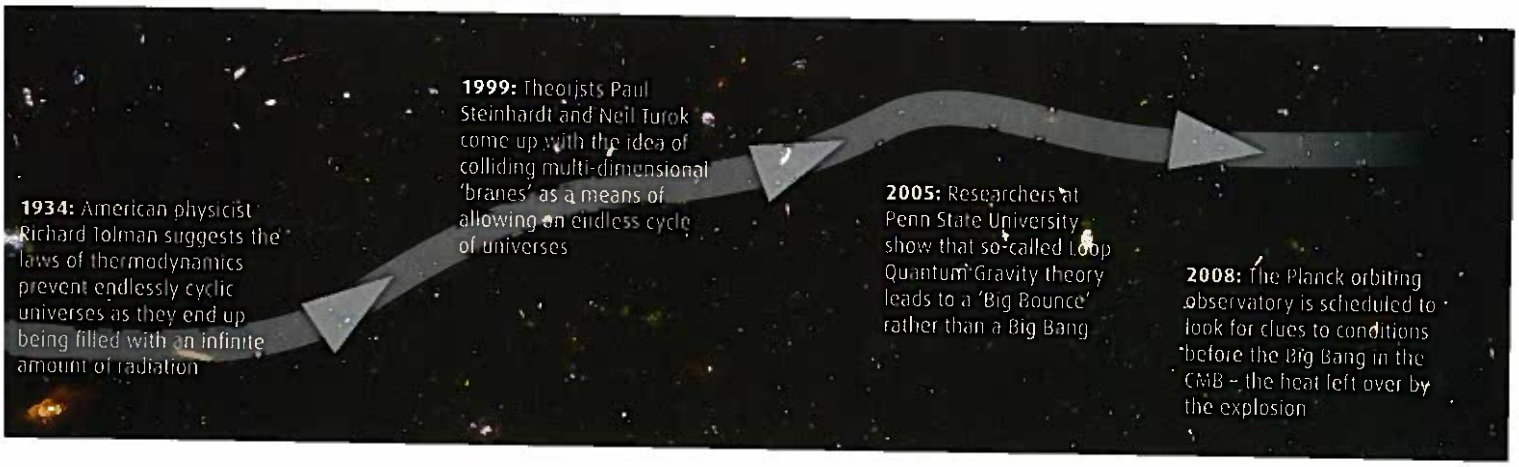
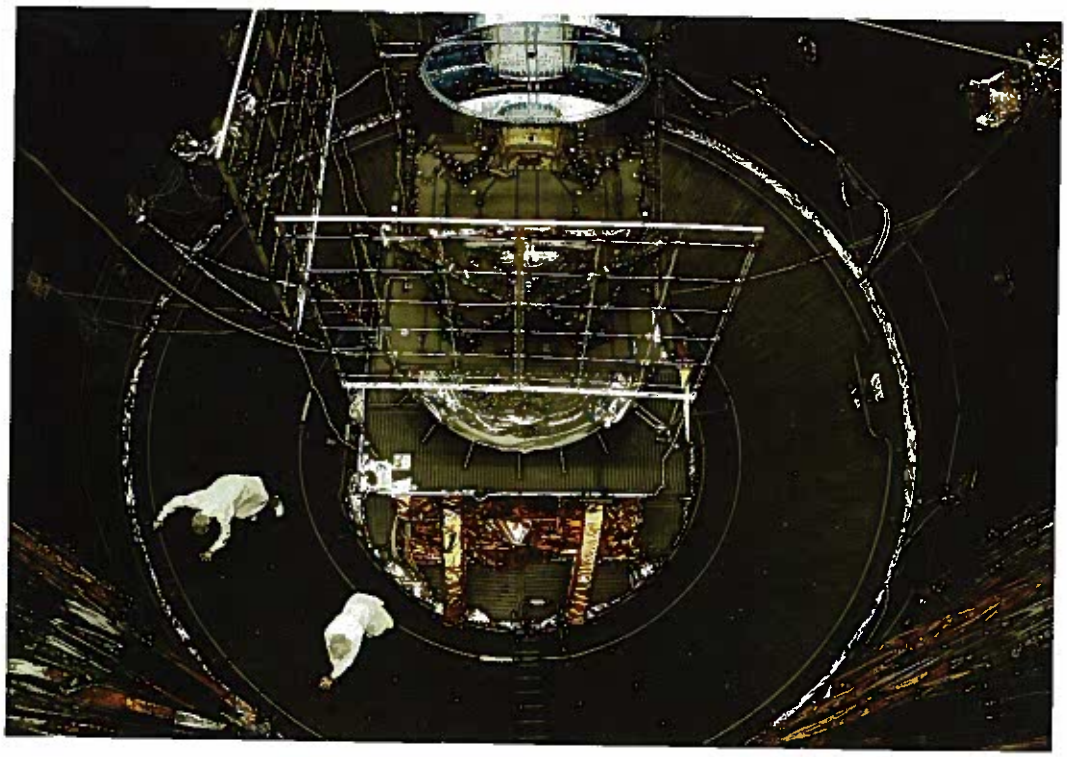


years, and give direct evidence of what happened during the Big Bang.

Inflation is expected to create gravitational waves quite unlike those triggered by the brane collisions of the ekpyrotic theory, making these ripples in space-time crucial in deciding which of the two theories holds the most water. The only slight drawback is that, to date, no evidence for *any* kind of cosmic gravitational waves has been found.

That could be about to change thanks to Planck, whose instruments can detect such waves through their effect on the CMB. It's a long shot – and many theorists agree that the definitive test of the rival theories needs direct detection of gravitational waves using future missions like the Big Bang Observer (see 'Testing the theories', p58). Even so, the fact that both of the two rival theories about the early Universe both point to a Big Bounce rather than a Big Bang suggests the concept of a cyclic universe must now be taken seriously, having previously been largely denied.



The Planck observatory is due to be launched later this year

And that demands a radical rethink of our cosmic past and future.

Until now, cosmology textbooks have claimed the cosmos somehow appeared out of nowhere 13.7 billion years ago, inflated, and then continued to expand forever. They also paint a picture where, trillions of years in the future, the expansion will leave our galaxy forever isolated from every other, and left to undergo a slow, lingering fade-out.

But if the cyclic universe theory is correct, the textbooks will have to be re-written. Today's Universe will then be just the latest in an endless series, ending in another Big Bounce trillions of years from now, and a fresh start. So perhaps the future isn't so dull after all. Who knows – perhaps next time we'll learn to harness the forces of the cosmos and mould a truly everlasting universe to suit ourselves.

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The Endless Universe
Paul Steinhardt and Neil Turok (Weidenfeld & Nicolson, 2007)

Three Roads to Quantum Gravity
Lee Smolin (Weidenfeld & Nicolson, 2000)

www.tinyurl.com/ykj9mp
Planck mission homepage

www.tinyurl.com/37we2k
3D simulation of two branes colliding in the 'Big Bounce'