

## **In the Beginning**

### **Did the Universe Create Itself?**

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COULD the Universe have been its own mother? Two physicists in New Jersey say that this may be a more satisfying way of explaining the origin of the Universe than any alternatives dreamt up so far.

Physicists have huge problems trying to work out how the Universe got going ("The day time began", New Scientist, 29 April 1996, p 30). Some say the question of what happened before the beginning of time, space and matter is like asking what is south of the South Pole. Others argue that the Universe has existed forever, or somehow popped into existence out of nothing. "We suggest that the Universe emerged from something rather than nothing-and that that something was itself," says Richard Gott III of Princeton University in New Jersey.

This strange suggestion is a spin-off from the theory of inflation which purports to describe what happened immediately before the big bang. In inflation an unusual state of the vacuum grows rapidly and exponentially. One version is "chaotic inflation", suggested by Andrei Linde of Stanford University in California, in which inflating regions spawn others of their kind. "These are baby universes which bud off from the Universe like the branches of a tree," says Gott. Gott and his colleague Li-Xin Li say it's possible that a branch of spacetime could loop backwards to rejoin the tree trunk. "Such a thing is possible because Einstein's general theory of relativity permits closed time-like currents - loops of time", says Gott.

Gott and Li found that a time loop could have existed before the big bang without violating any laws of physics. Space would have been in a loop of time, perpetually recreating itself. If so, the Universe could be viewed as having given birth to itself.

Gott says that asking what the first event in the Universe was becomes meaningless. "Every event in the Universe could have an event preceding it," he says.

One consequence of the idea is a natural explanation for the so-called arrow of time. Theories of general relativity and electromagnetism do not rule out the idea that waves can affect events that occurred in the past. For instance, they do not forbid light from traveling back in time. Yet in our Universe light always travels with us into the future. The reason, say Gott and Li, has to do with what would happen to waves that regressed in time in the kind of universe they envisage. "They would travel back to the epoch of the time loop and circle forever, constantly reinforcing each other," says Gott. Such a universe could not exist, Gott concludes, because the time loop would quickly become unstable.

"This whole area of cosmology is incredibly speculative," comments Astronomer Royal Martin Rees at the University of Cambridge. "But I think this is a fascinating contribution." Gott and Li say that they have only begun to explore their idea and much more work needs to be done. Their results have been submitted to the J Phys Review- D. Marcus Chown