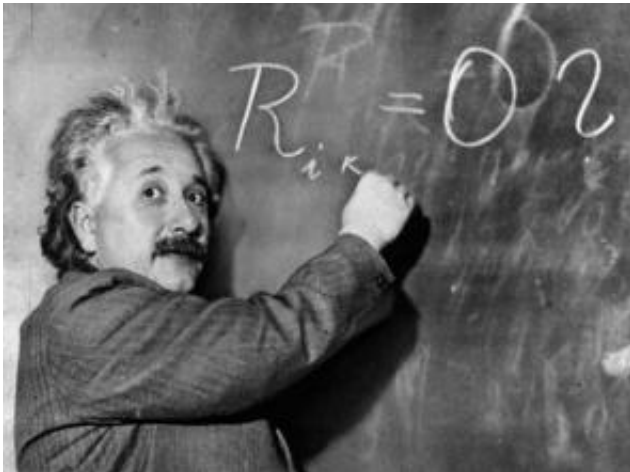


An analysis of Einstein's 1931 paper featuring a dynamic model of the universe

19 February 2014



A paper published in the *European Physical Journal H* provides the first English translation and an analysis of one of Albert Einstein's little-known papers, "On the cosmological problem of the general theory of relativity." Published in 1931, it features a forgotten model of the universe, while refuting Einstein's own earlier static model of 1917. In this paper, Einstein introduces a cosmic model in which the universe undergoes an expansion followed by a contraction. This interpretation contrasts with the monotonically expanding universe of the widely known Einstein-de Sitter model of 1932.

The authors, Cormac O'Raifeartaigh and Brendan McCann from the Waterford Institute of Technology, Ireland, provide insights into Einstein's view of cosmology. At that time, the first pieces of evidence for an expanding universe emerged, among others, stemming from Hubble's observations of the expanding universe.

Einstein was keen to investigate whether a relativistic [model](#) could account for the new observations, by removing the so-called

cosmological constant introduced in his 1917 [cosmological model](#). Einstein sets the constant to zero. He then arrives at a model of a universe that first expands and then contracts. This model is also characterised by singularity-like behaviour at either end.

In this paper, the authors also discuss Einstein's view of issues such as the curvature of space and the timespan of the expansion, while also uncovering some anomalies in Einstein's calculations. For example, they highlight a numerical error in the calculation of the present radius and matter density of the universe. They also believe that Einstein's estimate of the age of the universe is based on a questionable calculation of Friedmann's analysis of a relativistic universe of spherical curvature and time-varying radius. Finally, they argue that Einstein's model is not periodic, contrary to what is often claimed.

More information: C. O'Raifeartaigh and B. McCann (2014), "Einstein's cosmic model of 1931 revisited," *European Physical Journal H*, [DOI: 10.1140/epjh/e2013-40038-x](https://doi.org/10.1140/epjh/e2013-40038-x)

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