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Celebrando el centenario de la Relatividad General

Einstein's brane

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Abstract

In 1905 Einstein abolished the 'aether' of 19th century electromagnetic theory; in his new theory (known as Special Relativity, SR) it was an unnecessary hypothesis. However, that doesn't mean that it doesn't exist! To be consistent with SR, an 'aethereal' medium must have a tension (negative pressure) that is equal to its energy density. In 1917, two years after presenting his theory of General Relativity (GR) in its final form, Einstein proposed that the vacuum is precisely such a medium; its tension is his 'cosmological constant' and its energy density, now called 'dark energy', constitutes (according to current consensus) about 70% of the energy density of the universe. GR is contained in string theory, and string theories are unified by M-theory. The constituents of M-theory are extended objects of various dimensions known as 'branes' (from 'membrane'); their characteristic feature is that their tension equals their energy density. The cosmological constant has an interpretation as the tension of a 3-brane: we may be living on Einstein's brane! His brain remains in a jar of formaldehyde.

This talk will survey some of the basic physics of strings and branes, with an attempt to put them into a historical, and Einsteinian, context.