

Defects in Four-Dimensional Continua: A Paradigm for the Expansion of the Universe?

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Abstract: The elasticity theory and solid state physics have, since a long time, developed a theory of texture defects in solids analyzing their influence on the properties of materials. The presence of defects is known to produce internal permanent strained states without any exterior cause. The strain, in turn, is readable as a distortion of the metric properties of a solid. The theory can be, and has been, extended to more than three dimensions; in the case of four dimensions, allowing also for the appropriate signature, it is possible to apply these concepts to space-time. In this case a defect, similar to the ones known in three dimensions, would induce a non-trivial metric tensor, which can be interpreted as a peculiar gravitational field. The image of a defect in space-time can be applied to the description of the Big Bang, of a black hole, or of a source of torsion. A review of the four-dimensional generalization of defects and an application to the expansion of the universe will be presented.