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Testing the Weyl proposal of gravitational entropy in gravitational collapse & other gravitational systems

We investigate the status of the gravitational arrow in the case of spherical collapse of a fluid which conducts heat and radiates energy. In particular, we examine the results obtained by W. B. Bonnor in his 1985 paper, where he found that the gravitational arrow was opposite to the thermodynamic arrow. The measure of gravitational epoch function used by Bonnor was given by the ratio of the Weyl square to the Ricci square. In this investigation, we have assumed the measure of gravitational entropy to be given by the ratio of the Weyl scalar to the Kretschmann scalar. Our analysis indicates that Bonnor's result seems to be validated, i.e., the gravitational arrow and the thermodynamic arrow of time point in opposite directions. This strengthens the opinion that the Weyl proposal of gravitational entropy is applicable only to the universe as a whole (provided that we exclude the white wholes). Following our previous works on gravitational entropy, we are also investigating different astrophysical and cosmological models and testing whether the gravitational entropy is giving us a correct sense of time or not.

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