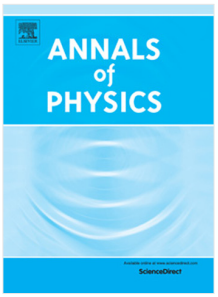


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PII: S0003-4916(17)30231-2
DOI: http://dx.doi.org/10.1016/j.aop.2017.08.011
Reference: YAPHY 67463

To appear in: *Annals of Physics*

Received date : 8 December 2016
Accepted date : 8 August 2017

Please cite this article as: P. Fonda, V. Jejjala, A. Veliz-Osorio, On the shape of things: From holography to elastica, *Annals of Physics* (2017), http://dx.doi.org/10.1016/j.aop.2017.08.011

# On the shape of things: from holography to elastica[☆]

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**Abstract**

We explore the question of which shape a manifold is compelled to take when immersed in another one, provided it must be the extremum of some functional. We consider a family of functionals which depend quadratically on the extrinsic curvatures and on projections of the ambient curvatures. These functionals capture a number of physical setups ranging from holography to the study of membranes and elastica. We present a detailed derivation of the equations of motion, known as the shape equations, placing particular emphasis on the issue of gauge freedom in the choice of normal frame. We apply these equations to the particular case of holographic entanglement entropy for higher curvature three dimensional gravity and find new classes of entangling curves. In particular, we discuss the case of New Massive Gravity where we show that non-geodesic entangling curves have always a smaller on-shell value of the entropy functional. Then we apply this formalism to the computation of the entanglement entropy for dual logarithmic CFTs. Nevertheless, the correct value for the entanglement entropy is provided by geodesics. Then, we discuss the importance of these equations in the context of classical elastica and comment on terms that break gauge invariance.

[☆] This document is a collaborative effort.

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