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Graphene elastic degrees of freedom, a multi-loop approach.

In this talk, we shall discuss recent results for the elastic degrees of freedom of fluctuating surfaces obtained by multi-loop approaches. These surfaces are ubiquitous in physics, and are used to describe objects in various fields; from brane theory to membranes in biophysics and more recently, applied to graphene and graphene-like materials. We derive the three-loop order renormalization group equations that describe the flat phase of polymerized membranes within the modified minimal subtraction scheme, following the pioneering one-loop computation of Aronovitz and Lubensky [1988] and the recent two-loop order one of Coquand, Mouhanna and Teber [2020]. We analyze the fixed points of these equations and compute the associated field anomalous dimensions η at three-loop order. Our results display a striking proximity with those obtained using nonperturbative techniques and re-expanded in powers of $\epsilon = 4 - D$. Moreover, the three-loop value that we get for η at the stable fixed point, $\eta_4 = 0.8872$, in $D = 2$, is in quantitative agreement with known theoretical and numerical values.

Significance

References

https://arxiv.org/abs/2109.03796

Speaker time zone

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