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Combining potential theory with general relativity: a divergence theorem-based approach to proving geometric inequalities

Wednesday, 25 June 2025 10:30 (1 hour)

In 1977, Robinson gave a new proof of Israel's celebrated static vacuum black hole uniqueness theorem by applying the divergence theorem to a very clever divergence identity based on the Cotton tensor from conformal geometry. His approach has found applications in several branches of general relativity and has inspired the analysis of Ricci solitons and quasi-Einstein manifolds.

In this talk, we will demonstrate how one can combine his approach with linear and non-linear potential theory to give new proofs of classical as well as recent geometric inequalities such as the Willmore inequality in Euclidean space and its generalization to Riemannian manifolds with non-negative Ricci and Euclidean volume growth by Agostiniani—Fogagnolo—Mazzieri, the Minkowski inequality, and some geometric inequalities in general relativity. We will also show the relation to the corresponding classical potential theoretic approaches to these inequalities studied by Agostiniani, Fogagnolo, and Mazzieri.

The results we will present are based on joint works with Florian Babisch, Albachiara Cogo, Benedito Leandro, Ariadna León Quirós, Anabel Miehe, and João Paulo dos Santos.

Presenter: CEDERBAUM, Carla (Tübingen University)