Non-variational existence problems in General Relativity and applications to positive energy theorems

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In this talk we study the Plateau problem for apparent horizons on general Cauchy data sets. In our construction we introduce a Perron method and ideas from geometric measure theory to study the blow-up behaviour of Jang’s equation. We will discuss new geometric insights about apparent horizons resulting from this approach, and will, time permitting, indicate an application of these methods to a conjecture of Bray’s related to the space-time Penrose inequality.