

# Initial data and the Cauchy problem for Einstein's equations

## Energy inequalities, spherical foliations and normal coordinates near infinity

Gerhard Huisken  
*MPI Gravitational Physics, Golm*  
*Am Muehlenberg 1*  
*Golm 14476*  
*GERMANY*

### **Abstract**

The first lecture of the minicourse reviews the geometry of space-like slices in a Lorentzian manifold and describes the (3+1) formulation of the Cauchy problem in General Relativity. Particular topics include gauge conditions, physical assumptions and their relation to curvature conditions, as well as specific examples. The second lecture concentrates on the geometry of 3-dimensional asymptotically flat slices: We investigate positive mass theorems, Penrose inequalities and concepts of quasilocal mass with the help of suitably chosen 2-dimensional spheres inside the 3-dimensional slice. If time permits some of the partial differential equations governing these 2-surfaces are also discussed.