MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

T a g u n g s b e r i c h t 29/1992

Hyperbolic Systems of Conservation Laws
28.06. - 04.07.1992

Nonlinear hyperbolic systems of conservation laws arise in modeling conservative physical systems, such as fluid dynamics and elasticity. The nonlinear structure gives rise to interesting features such as shock waves and oscillations, and has been the subject of intense mathematical study for over 40 years. Questions of existence, uniqueness and regularity are still being actively investigated using vanishing viscosity and entropy condition techniques as well as newer approaches such as compensated compactness. There is currently much interest in the kinetic theory of gases, the relation of Boltzmann equations and Broadwell models to conservation laws and the development of new mathematical techniques based on these connections.

New applications are being studied where the structure is more complicated than in the classical genuinely nonlinear homogeneous case. Source terms are of particular importance in combustion problems. Applications to general relativity, magnetohydrodynamics, elastic-plastic solids and traffic flow were also discussed.

The study of numerical methods for conservation laws is also an active area of research, with emphasis on methods that capture shocks sharply while respecting entropy conditions and giving highly accurate smooth solutions. Several talks concerned the development of genuinely multi-dimensional methods for gas dynamics on structured or unstructured grids. Applications to combustion and enhanced oil recovery also received attention, as did new techniques for estimation errors and proving convergence.