Systems of Conservation Laws in Continuum Physics

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Most of the partial differential equations arising in elasticity, plasticity, fluid mechanics, particle physics, semiconductors, combustion and other applied areas can be formulated as conservation laws. Solutions to hyperbolic conservation laws may be visualized as propagating waves. When the system is nonlinear, the profiles of compression waves get progressively steeper and eventually break, generating jump discontinuities which propagate as shocks. Hence, inevitably the theory must deal with weak solutions. In this talk we consider various models of hyperbolic and viscous conservation laws and we present results on the global existence, uniqueness and asymptotic behavior of solutions even in the case of large discontinuous initial data.