CONTENTS

Foreword ......................................................... v
Preface .......................................................... vii

PART I: GENERAL SURVEY LECTURES

Open questions in the theory of one dimensional
hyperbolic conservation laws .............................. 1
  Alberto Bressan

Multidimensional conservation laws: Overview,
problems, and perspective ............................... 23
  Gui-Qiang G. Chen

Mathematical analysis of fluids in motion .......... 73
  Eduard Feireisl

Selected topics in approximate solutions
of nonlinear conservation laws. High-resolution
central schemes ............................................. 101
  Eitan Tadmor

Stability and dynamics of viscous shock waves ........ 123
  Kevin Zumbrun

PART II: SPECIALIZED RESEARCH LECTURES

Mathematical aspects of a model for granular flow .......... 169
  Debra Amadori and Wen Shen

The flow associated to weakly differentiable
vector fields: recent results and open problems ........ 181
  Luigi Ambrosio

Existence and uniqueness results for the continuity
equation and applications to the chromatography
system ..................................................... 195
  Luigi Ambrosio, Gianluca Crippa,
  Alessio Figalli, and Laura V. Spinolo
Finite energy weak solutions to the quantum hydrodynamics system ........................................... 205  
Paolo Antonelli and Pierangelo Marcati

The monge problem in geodesic spaces ......................... 217  
Stefano Bianchini and Fabio Cavalletti

Existence of a unique solution to a nonlinear moving-boundary problem of mixed type arising in modeling blood flow ............................. 235  
Sunčica Čanić, Andro Mikelić, Tae-Beom Kim, and Giovanna Guidoboni

Transonic flows and isometric embeddings ....................... 257  
Gui-Qiang G. Chen, Marshall Slemrod, and Dehua Wang

Well posedness and control in models based on conservation laws ................................................. 267  
Rinaldo M. Colombo

Homogenization of nonlinear partial differential equations in the context of ergodic algebras: Recent results and open problems ............................ 279  
Hermano Frid and Jean Silva

Conservation laws at a node ........................................... 293  
Mauro Garavello

Nonlinear hyperbolic surface waves ................................. 303  
John K. Hunter

Vacuum in gas and fluid dynamics ................................... 315  
Juhi Jang and Nader Masmoudi

On radially symmetric solutions to conservation laws .......................................................... 331  
Helge Kristian Jenssen

Charge transport in an incompressible fluid: New devices in computational electronics ..................... 353  
Joseph W. Jerome
Localization and shear bands in high strain-rate plasticity ......................................................... 365
  Theodoros Katsaounis and Athanasios Tzavaras

Hyperbolic conservation laws on spacetimes ......................... 379
  Philippe G. LeFloch

Reduced theories in nonlinear elasticity ......................... 393
  Marta Lewicka

Mathematical, physical and numerical principles
essential for models of turbulent mixing ......................... 405
  Hyunkyung Lim, Yan Yu, James Glimm,
  and David H. Sharp

On the Euler-Poisson equations of self-gravitating
compressible fluids .............................................. 415
  Tao Luo and Joel Smoller

Viscous system of conservation laws: Singular limits .......... 433
  Denis Serre

A two-dimensional Riemann problem for scalar
conservation laws .................................................... 447
  Hao Ying and Barbara Lee Keyfitz

Semi-hyperbolic waves in two-dimensional
compressible Euler systems ..................................... 457
  Yuxi Zheng

List of summer program participants .......................... 469