ANDREW J. MAJDA

Foreword

<http://www.numdam.org/item?id=AIHPC_1991__8_3-4_229_0>

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   Ron DiPerna was a uniquely talented mathematician. After receiving
his Ph. D. in 1972 at the Courant Institute under James Glimm, he spent
the next 8 years as the leading young researcher in systems of conservation
laws in a single space variable. Following Glimm and Lax, he made
many important new contributions to this difficult subject including the
systematic use of geometric measure theory for regularity theory, sharp
decay estimates, and uniqueness of solutions. Beginning in 1980, his work
on hyperbolic conservation laws was strongly influenced by the ideas of
Tartar and Murat involving compensated compactness, Young measures,
and the weak topology. DiPerna developed novel applications of these
ideas culminating in 1983 with the first global existence theorems for
isentropic flow with large data. For the remainder of his scientific career
DiPerna focused on problems involving the special role of the weak
topology for nonlinear partial differential equations from fluid mechanics
and kinetic theory. From 1985 to 1987, DiPerna and I collaborated on
theories of oscillations and concentrations for incompressible fluid flow
including the special mathematical structure that occurs for important
physical problems such as vortex sheets. Our joint work was strongly
influenced by ideas of P. L. Lions and Brezis among others involving
concentration in variational problems with critical Sobolev exponents.
From 1987 until 1989 DiPerna collaborated with P. L. Lions and together
they developed the first global existence theorems for suitable weak solu-
tions of the Boltzmann equation among many other important applications
to transport theory. One important component of this work was the novel
velocity averaging method first introduced by Golse, Perthame and Sentis.
   This volume consists of several current research papers which both
emphasize the vital role which many of DiPerna's ideas have on contempo-
rary research in nonlinear partial differential equations and also stress his
special relationship with the French community in nonlinear P.D.E. Ron
DiPerna died tragically in January 1989 after a courageous struggle with
cancer. He was a warm and loyal friend for many of us with a sharp wit
and keen sense of humor. He left us too soon and at the height of his
creative scientific power. This volume indicates that many of his ideas and
contributions will influence our scientific community into the distant
future.

<div align="right">Andrew J. MAJDA</div>