In the introduction, the author claims that "he does not assume from the reader really technical prerequisites other than a basic training in (non linear) partial differential equations". At variance, one could say that the material presented in the book is not only essential in the mathematical treatment of fluid mechanics but also in many other fields where the theory of non linear partial differential equations plays an important role. Its reading will become a must for researchers in this area of mathematics.

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Scaling, Self-similarity, and Intermediate Asymptotics, Cambridge Texts in Applied Mathematics 14, by **G. I. Barenblatt** (Cambridge University Press, Cambridge 1996, 386 pp.) GB£ 65.00 hc ISBN 0 521 43516 1, GB£ 22.95 pb ISBN 0 521 43522 6

In his book on *Dimensional Analysis* (MacMillan, 1964) Palacios, as an example of the dangers of indiscriminate use of dimensional analysis, asks how much time t a golfer must practice in order to drive a ball a distance d, in earth gravity g, and deduces that $t = C(d/g)^{\frac{1}{2}}$. Batchelor (*Quart. J. Roy. Met. Soc.*, **80** (1954), 339) also notes that dimensional analysis is "...an exceedingly powerful weapon... (but) that it is also a blind, and undiscriminating weapon and that it is fatally easy to prove too much and to get more out of a problem than was put into it". Of course, there have been dramatic successes, and one of the most spectacular is Taylor's dimensional analysis of the blast-wave problem which led to the development of a self-similar solution. That this might be described as spectacular arises from the fact that when time series photographs of the first nuclear explosion were published in 1947, Taylor was not only able to confirm his similarity theory, but also make an accurate estimate of the energy released by the bomb. This caused consternation in official circles since that information, from measurements made at the time, was not in the public domain. An interesting historical account of this is given by Batchelor in *The Life and Legacy of G. I. Taylor* (Cambridge, 1996).

One of the aforementioned photographs adorns the front cover of the book under review and, unsurprisingly, the blast-wave problem features prominently in it. In the first chapter the basic ideas of dimensional analysis and similarity are introduced, including the Π theorem, and Taylor's blast-wave result is given as one example. In the next, on self-similar and intermediate-asymptotic solutions, it again features as one example. The idea of self-similarity, in this case a solution that is valid at times and distances large so that any influence of asymmetry of initial conditions and size of the domain of original energy release is unimportant, is familiar. Barenblatt defines an intermediate-asymptotic solution as one that is self-similar in the above sense, but does not yet represent the final state. As he notes "This situation is common, and greatly increases the significance of self-similar solutions". The blast-wave similarity solution again provides an example, since it is inappropriate at very large times as it decays to an acoustic wave. A not entirely convincing pictorial image of the *Mona Lisa* is included as an illustration of intermediate asymptotics.

The self-similar solutions that can be constructed using dimensional analysis alone are designated self-similar solutions of the first kind. Others that cannot, where an exponent in the solution must be determined from an eigenvalue problem, are of the second kind. Perhaps the earliest and most famous of the latter is Guderley's implosion problem. But the present author, as an initial illustration of this second kind, constructs the similarity solution for inviscid, irrotational flow past an infinite wedge as an intermediate-asymptotic solution for flow past a wedge of finite length. Several further examples of this second kind are discussed. Self-similar solutions contain basic constants which for the first kind are determined from integral conservation laws. Although these do not exist for solutions of the second kind there are analogous asymptotic conservation laws discussed for many examples of interest. Chapters on classification of similarity rules, and transformation groups, complete the framework. Within it the author applies the ideas he has developed to areas as diverse as gas-dynamic waves, deformation and fracture of solids, turbulence and geophysical fluid dynamics. Anyone wishing to explore the opportunities offered by dimensional analysis and self-similarity will do no better than make Barenblatt's book a starting point. And not least because of the window it opens on the vast Russian literature in this area.

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Structure and Dynamics of Nonlinear Waves in Fluids, Advanced Series in Nonlinear Dynamics, edited by **A. Mielke, K. Kirchgässner** (World Scientific Publishing Co., London, 1995, 418 pp.) GB£ 66.00 hc ISBN 981 02 2124 X

The book stems from a IUTAM-ISIMM Symposium which was held in Hannover, August 17-20, 1994. (IUTAM stands for International Union of Theoretical and Applied Mechanics, while ISIMM stands for International Society of Interactions of Mechanics and Mathematics). The book contains 41 articles, divided into two parts: Part One – Invited Papers and Part Two – Contributed Papers. Although the distinction between Mathematics and Mechanics is not always easy to define, one can say that there are roughly 16 articles with a mathematical flavor and 25 with a mechanical flavor. Therefore the balance between mathematics and mechanics is pretty good.

When one opens the book and looks at the table of contents, one is struck by the large variety of topics which are treated in this book.

The authors state in the preface that all the papers have been refereed. Obviously this refereeing process has been done with care and one must thank the scientific committee for their job. Of course one cannot be an expert in all fields but I can say that the majority of the papers which are close to my field are of excellent quality (and several of them would have been quite appropriate for the European Journal of Mechanics/B Fluids!). Moreover, most of the papers present results that one cannot find somewhere else. It is clear that the contributors made a special effort to present new results, and not just results to appear elsewhere.

Let us now consider in more detail some of the topics which are treated in the various articles.

As one can imagine, all kinds of waves are considered: periodic waves (travelling or standing), solitary waves, fronts, quasi-periodic waves. For all these kinds of waves, there are papers emphasizing the bifurcation aspect while some papers emphasize the stability aspect. These papers deal either with the full Euler (or Navier-Stokes) equations, or with model equations such as the Ginzburg-Landau equation, the Korteweg-de Wries equation, the Boussinesq equation. Several papers also deal with the interaction between solitary waves and with multi-pulse solitary waves.

Hamiltonian systems are also well represented. In particular, there is an interesting article on the use of the multi-symplectic structure framework to study wave instability.

The classical problem of water waves is considered in several articles, with new results on the existence of generalized solitary waves (*i.e.* solitary waves with oscillatory tails), on the spectral stability of solitary waves as well as on the existence of fronts at the interface between two fluids of differing densities. More physical results on resonant capillary-gravity waves, solitary waves with oscillatory tails, the dynamics of waves in the Faraday experiment are provided as well.