

BOOK REVIEWS

Trends in Partial Differential Equations of Mathematical Physics. Jose F. Rodrigues *et al.* (eds). Birkhauser Verlag, P.O. Box 133, CH-4010, Basel, Switzerland. 2005. 282 pp. Price: EUR 115.56.

This book is a collection of twenty papers presented at the international conference on 'Trends in Partial Differential Equations of Mathematical Physics', held at Portugal in 2003 on the occasion of the 70th birthday of V. A. Solonnikov. Solonnikov is one of the outstanding mathematicians from St. Petersburg Mathematical School, Russia, with many fundamental contributions to the partial differential equations (PDEs) of mathematical physics. Naturally several papers deal with various aspects of these PDEs, using the results and techniques of Solonnikov.

Pioneering work in this field has been done by many Russian mathematicians like Petrovski, Kolmogorov, Ladyzhenskaya and Sobolev, to name a few. In addition to well-known PDEs like the Navier–Stokes and Euler's equations, various other equations have also been used to model fluid-flow problems and other physical phenomena. Solvability of these PDEs in suitable function spaces, uniqueness of solutions, regularity, stability, asymptotic behaviour of the solutions as time tends to infinity and control of the PDE by suitable parameters, are some of the major research directions.

In this book, there are papers which focus on building a model for a physical phenomenon and then prove the existence, uniqueness of a solution, or identify limiting models. Consiglieri *et al.* study a mathematical model for a non-isothermal, incompressible non-Newtonian fluid flow in a tube. They prove that when thermal conductivity σ tends to infinity and latent heat δ tends to 0, the limiting model is p -Laplacian flow with nonlocal diffusivity. Denisova studies a free boundary problem for a model of two incompressible heat-conducting fluids and proves the existence of a classical solution in a Holder class, local in time. Andreucci *et al.* present a mathematical model for the phototransduction cascade, taking into account the spatial localization of the different reaction processes, simplified by a process of homogenization and concentration of capacity. Fasano and Primicerio present a model for heat and mass transport in non-isothermal

saturated solutions and prove the existence and uniqueness of solutions.

Some papers deal with fluid flows modelled by the Navier–Stokes and Euler's equations. Frolova proves the existence of a solution in Sobolev spaces, local in time for a time-dependent problem for viscous incompressible non-homogeneous fluid bounded by a free surface on which surface tension forces act. Brandolese proves that the initial value problem for the Navier–Stokes equation in \mathbb{R}^3 with initial data in a subspace of a weighted L^2 space, is locally well posed.

Rautmann considers the vorticity transport equation of Helmholtz for incompressible flow modelled by the Euler's equations and proves the existence of a unique classical solution to Cauchy's problem with partial discretization in \mathbb{R}^3 for each bounded time interval. Mahalov *et al.* study the 3D incompressible Euler's equations with initial data characterized by uniformly large vorticity. They prove the existence of regular solutions on long time-intervals and obtain global regularity of 3D limit resonant Euler's equations.

Stability of the rest state for a layer of compressible fluid between two horizontal plates heated from above and below, is analysed in the paper by Guidoboni and Padula. For this Benard problem, the full compressible model has been used. Padula, in her paper on the equations governing general hyperelastic materials, a hyperbolic–parabolic system, introduces 'free work identity' and uses it to derive a series of stability and instability results for equilibrium configurations.

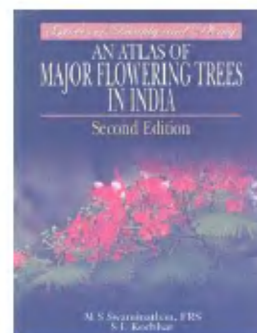
The paper by Antontsev *et al.* analyses how a coupling between velocity and temperature at suitably low temperature ranges can stop the fluid (velocity decays to 0), without a change of phase. Their model is the planar stationary Navier–Stokes equation for the velocity u , perturbed by a sublinear term $f(x, \theta, u)$ and coupled with a stationary advection–diffusion equation for temperature θ . After proving the existence and uniqueness of weak solutions, they show that the velocity u vanishes for large x . Exact boundary controllability for quasi-linear wave equation is studied by Li Tatsien. There are papers on fully nonlinear elliptic equations and also on nonlinear evolution equations governed by sub critical p -Laplacian.

This book gives an interesting collection of topics dealing with equations of

mathematical physics, regarding existence, uniqueness, regularity, stability and control. It is a good addition to any library.

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Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India – Second Edition. M. S. Swaminathan and S. L. Kochhar. Macmillan India Ltd, 2/10 Ansari Road, Daryaganj, New Delhi 110 002. 2007. 324 pp. Price: Rs 950.

The book under review is the second edition of the original publication that appeared in 2003. The very fact that a second edition of the book has appeared within a short span of 3 years indicates its importance and utility. The tree wealth of a country constitutes an important heritage for posterity and has both academic and applicational values. Indian flora is unique in having a rich diversity of 2560 tree species occurring naturally in almost all floristic regions. From the very early times, many Europeans have also introduced several ornamental and other exotic trees in India. Apart from recreation purpose, trees have played a crucial role in the very survival of human beings by providing food, timber, medicines and cleaning of the environment by maintaining carbon balance in the atmosphere. It is therefore essential for everyone to know, understand and study the tree flora in our own surroundings.

The book under review aptly focuses on this aspect. As the authors have pointed out, this atlas of Indian trees in-