

Dedicated to the Memory of Professor Jindřich Nečas
December 14, 1929 - December 5, 2002

In June 2003, the Eighth International School on *Mathematical Theory in Fluid Mechanics* was traditionally held at the small village Paseky in the north part of the Czech Republic. The central part of the program consists of the series of lectures delivered by Rinaldo Colombo (Brescia, Italy), Benoit Perthame (Paris, France), Michael Růžička (Freiburg, Germany) and Misha Vishik (Austin, USA). This issue brings the articles based on the lecture notes of the speakers.

During this school, *Rinaldo Colombo* presented results on a set of techniques, called Wave Front Tracking, introduced to construct approximate solutions to systems of hyperbolic conservation laws. His article *Wave Front Tracking in Systems of Conservation Laws* provides several examples (ideal gas dynamics, liquid-vapor phase transition, combustion problem, traffic flow) proving remarkable utility of the method.

In his lecture course, *Benoit Perthame* talked on mathematical properties of various systems of PDEs proposed to model chemotaxis. For this purpose, the classical Patlak/Keller-Segel model, some special continuum and kinetic models of hydrodynamics, and a degenerate parabolic system proposed to model the formation of capillarity blood vessels have been covered and discussed. This all forms the content of the second article entitled *PDE models for chemotactic movements: parabolic, hyperbolic and kinetic*.

The last paper of this issue *Modeling, Mathematical and Numerical Analysis for Electrorheological Fluids*, written by Michael Růžička, describes an approach to continuum modeling of electrorheological fluids; these are suspensions consisting of solid particles and a carrier oil. Once a simplified model is settled, its mathematical properties are studied. Here, the author focuses on proving local in time existence of strong solutions for large data, which can be then applied to obtain error estimates for a fully implicit time-discretization.

Finally, *Misha Vishik* concentrated in his Paseky course on questions of stability and instability of flows of the Euler and Navier-Stokes fluid. His contribution should appear in one of the subsequent issues.

The program of the school was completed by short communications of participants, preprints, reprints and book exhibitions and hours and hours of discussions of all participants. We thank all of them for attending the school and their contributions. Those who are interested in more details about this, former as well as future schools can visit the school web-page

www.karlin.mff.cuni.cz/paseky-fluid/

The Paseky school No. 8 was the first one that took part after Professor Jindřich Nečas passed away.

Jindřich Nečas was one of the co-founders of the school since the first dreams and ideas to start doing something like this occur. We only later realized that he himself organized similar type of schools in sixties, being of our age at that time; the schools were focused on modern methods in the theory of partial differential equations.

During the Paseky schools, Jindřich Nečas was frequently saying that he is the “disorganizer” rather than an organizer, meaning that he always initiates chaos in time schedules etc. Of course, just the opposite has been true. He was the key person, attracting people from abroad to attend the school again and again (it concerns both young and well-established experts), relaxing the atmosphere with jokes, interrupting the speakers with questions and comments during their lectures, contributing significantly to discussions after the lectures and short communications, introducing the young people to the main lecturers.

This role of Jindřich Nečas cannot be overestimated. He was always interested in all what young people are working on, always expressing his opinion about the problems, encouraging them in their effort. For many Czech and even foreign students, the Paseky schools were the first international meetings and we know that thanks to Jindřich Nečas their interest in research got another strong support.

The schools supervised by Jindřich Nečas had a very high scientific level. The list of main speakers that presented the series usually of five lectures includes experts as Claude Bardos, Marco Cannone, Constantine Dafermos, Jens Frehse, Giovanni Paolo Galdi, Vivette Girault, Michael Griebel, John Heywood, Alexandre Kazhikov, Dietmar Kröner, Wiliam G. Litvinov, Nader Masmoudi, Akitaka Matsumura, Serguei Nazarov, Mariarosaria Padula, K.R. Rajagopal, Martin Rumpf, Gregory Seregin, Vsevolod A. Solonnikov, Vladimír Šverák, Lutz Tobiska, Athanasios E. Tzavaras, Wolf von Wahl. The lecture notes were carefully edited and published first in Pitman Research Notes in Mathematics Series, later on by Springer and finally as special issues of the *Application of Mathematics*. The important feature of the school consisted in the fact that people stay together after the official program has been over, and they have thus the opportunity to take up with each other in such a way that many friendship relations and long lasting collaboration resulting in plenty of joint publications come out as the side output from these schools.

The meeting point for Paseky evenings is the bar in the cellar. It has been amazing that Jindřich Nečas was frequently available there (drinking just one small glass of beer his daughter permitted him) to discuss any topic including mathematical, historical, political and social themes. He was also initiator and unforgettable singer of several music sessions with Czech, Moravian, Slovak and international songs.

In the above lines, we wanted to address the ir retrievable role Professor Nečas had for the meetings on analysis in fluid models at Paseky ¹ and as it is obvious we miss him. Let us hope that all of his followers can fill the gap that remained after his leave.

September 2004

Eduard Feireisl
Josef Málek
Antonín Novotný
Mirko Rokyta
Michael Růžička

¹Further references can be found on the commemorative web-page
www.karlin.mff.cuni.cz/memories/necas