Foreword

This volume gathers articles resulting from research projects initiated during the *CEMRACS 2009*, dedicated to *Mathematical Modelling in Medicine*.

The CEMRACS (Centre d'été Mathématique de Recherche Avancée en Calcul Scientifique) is an annual summer research session, for PhD students and young researchers, whose goal is to strengthen interdisciplinary collaborations between applied mathematicians and scientists of other fields, both from academia and industry. It is promoted by the *SMAI* (French Society of Applied and Industrial Mathematics) and was initiated by Frédéric Coquel and Yvon Maday, in 1996.

In 2009, the fourteenth edition of the CEMRACS took place at the *CIRM* (Centre International de Rencontres Mathématique – Marseille, France) from July 20th to August 28th. During the first week (July 20 - 25) four courses were given by :

- Georges-Henri Cottet, "Level-Set methods and applications in image processing and fluid-structure interaction" ;
- Dirk Drasdo, "Towards the systems biology of multi-cellular tissues: Single-cell-based models and beyond" ;
- Marc Lavielle, "Mixed effects models in pharmacokinetics-pharmacodynamics" ;
- Nikos Paragios, "Biomedical Image Analysis: State of the Art, Challenges and Perspectives".

The following five weeks were dedicated to research projects sponsored by public and industry funds. Participants worked in teams of about two young researchers assisted by one or more senior researchers.

About 110 researchers, from 20 different citizenships, attend this edition, including medical practitioners, pharmacologists, biophysicists, computer scientists and mathematicians. The organizing committee was composed of D. Bresch (CNRS, Chambéry), V. Calvez (ENS de Lyon), M.-A. Dronne (Lyon 1), T. Dumont (Lyon 1), E. Grenier (ENS de Lyon), V. Louvet (Lyon 1) and P. Vigneaux (ENS de Lyon).
Topics covered by the 16 projects involve a broad range of mathematical tools (ODE, PDE, Stochastic and discrete approaches) applied to various bio-medical models : cardiac problems (fluids and electromagnetism), cancer treatment (bio, chemo, electro-therapy), stroke and migraine, cell dynamics, among others.

We would like to thank the French Ministry of Research, CNRS (and particularly GdR MABEM), INRIA and ANR for providing financial support. We also acknowledge the support of ENS de Lyon, Institut rhône-alpin des systèmes complexes (IXXI), SMAI, CEA, l'Oréal and Cardiatis.

We are very grateful to our colleagues who gave lectures and supervised stimulating research projects. We address our warmest thanks to the CIRM staff for their daily kind assistance during six weeks, as well as, to the UMPA and LJK secretariats for a significant *pre* and *post processing*. Last but not least, we would like to express our gratitude to all the participants for their involvements and kindness, making a friendly and productive ambiance throughout this session.

Didier Bresch, Vincent Calvez, Emmanuel Grenier and Paul Vigneaux,
Lyon, August 2010.

Article published online by EDP Sciences and available at http://www.esaim-proc.org or http://dx.doi.org/10.1051/proc/20103001