

Preface

As the International Center for Mathematics (CIM) celebrated its 20th anniversary on the 3rd of December 2013, it is the perfect opportunity to look back on this past year, which has undoubtedly been one of the most ambitious and eventful ones in its history. With the support of our associates from 13 leading Portuguese universities, our partners at the University of Macau, and member institutions such as the Portuguese Mathematical Society, in 2013 the CIM showed yet again the importance of a forum such as this for bringing together leading Portuguese-speaking scientists and researchers from around the world.

The hallmark project of the year was the UNESCO-backed International Program Mathematics of Planet Earth (MPE) 2013, which the CIM participated in as a partner institution. This ambitious and global program was tasked with exploring the dynamic processes underpinning our planet's climate and man-made societies, and with laying the groundwork for the kind of mathematical and interdisciplinary collaborations that will be pivotal to addressing the myriad issues and challenges facing our planet now and in the future. The CIM heeded the MPE's call to action by organizing two headline conferences in March and September of 2013: the "Mathematics of Energy and Climate Change" conference in Lisbon in the spring, and the conference "Dynamics, Games, and Science II" in the fall. Both were held at the world-renowned Calouste Gulbenkian Foundation in Lisbon, one of more than 15 respected Portuguese foundations and organizations that enthusiastically supported the CIM conferences. As well as the conferences themselves, well attended "advanced schools" were held before and after each event: at the Universidade de Lisboa in the spring, and at the Universidade Técnica de Lisboa in the fall.

These conferences succeeded in bringing together some of the most accomplished mathematical and scientific minds from across the Portuguese-speaking world and beyond, while also serving as a launch pad for one of the CIM's most exciting endeavors in years: the new CIM Series in Mathematical Sciences, which will include lecture notes and research monographs and be published by Springer-Verlag. "The collaboration with Springer will bring mathematics developed in Portugal to a global audience," CIM President Alberto Adrego Pinto said at the time

of the announcement, “and will help strengthen our contacts with the international mathematics community.”

These first two volumes in the series, consisting of review articles selected from work presented at the “Mathematics of Energy and Climate Change” and “Dynamics, Games, and Science” conferences, reflect the CIM’s international reach and standing. Firstly, they are characterized by an impressive roster of mathematicians and researchers from across the United States, Brazil, Portugal, and several other countries whose work will be included in the volumes.

The authors are complemented by the editorial board responsible for this first installment, a world-renowned “quartet” consisting of: president of the European Research Council Jean-Pierre Bourguignon from the École Polytechnique; former Société Mathématiques Suisse and European Mathematical Society president Rolf Jeltsch from the ETH Zurich; current Sociedade Brasileira de Matemática president Marcelo Viana from Brazil’s Instituto Nacional de Matemática Pura e Aplicada; and CIM president Alberto Adrego Pinto from the Universidade do Porto.

While the MPE program was a major focus of the CIM’s activities in 2013, the center also organized a number of further events aimed at fostering closer ties and collaboration between mathematicians and other scientists, mainly in Portugal and other Portuguese-speaking countries. In this context the CIM held the 92nd European Study Group with Industry meeting, part of a vital series held throughout Europe to encourage and strengthen the connections between mathematics and industry. As the MPE program made clear, humanity faces all manner of challenges, both man-made and natural, and though industry is attempting to overcome them, in many cases mathematics and science are far better suited to the task. Yet it is often industry that delivers the kinds of innovative ideas that will launch the next great scientific and technological revolutions, and which academia must adapt to. The potential for dialogue and cooperation between academia and industry is in fact so great that I have now made it one of the core initiatives in my presidency of the US-based Society for Industrial and Applied Mathematics (SIAM).

As we look back at the successful year the CIM had in 2013, we should also bear in mind the dramatic changes currently taking place in the world, changes that above all the mathematical sciences—including statistics, operational research, and computer science—will be called upon to address. Foremost among them is the rise of Big Data, especially as it relates to national security, finance, medicine, and the Internet (among other fields), which has come to dominate research in many scientific sectors and requires new analytical tools, which mathematics can provide. This new landscape will require an unparalleled level of partnership between science and industry, and is what prompted the European Commission to recently announce its Europe 2020 Growth Strategy, which calls for investment in groundbreaking research, innovation in industry, and the cultivation of a new generation of scientists. It is no coincidence that these three pillars are at the core of the CIM’s own mission, and the CIM series in Mathematical Sciences will provide the ideal platform for

communicating and broadening the impact of the CIM's activities with regard to these global challenges.

President of CIM Scientific Council

Irene Fonseca

Dynamics, Games and Science

International Conference and Advanced School Planet

Earth, DGS II, Portugal, August 28–September 6, 2013

Bourguignon, J.-P.; Jeltsch, R.; Pinto, A.A.; Viana, M.

(Eds.)

2015, XVIII, 772 p. 141 illus., 94 illus. in color.,

Hardcover

ISBN: 978-3-319-16117-4