Preface

This book contains the proceedings of the Forum "Math-for-Industry" 2015 held at the Institute of Mathematics for Industry, Kyushu University, October 26–30, 2015, for which the unifying theme was "The Role and Importance of Mathematics in Innovation". Selected papers presented at the forum are collected here.

Innovation is in fact the cornerstone of creativity in all human endeavors. It involves "seeing" things from an entirely new, sometimes quite elementary, perspective. Innovation in mathematics is the bread and butter of mathematical creativity. Historical examples of mathematical innovation that have had profound and lasting impacts on the subsequent development of mathematics include the logarithm, complex numbers, non-Euclidean geometry, and calculus. Equally important is innovation in the performance of mathematics which can be disarmingly simple but have profound consequences. Examples include adding zero, multiplication by one, and seeing a new interpretation that simplifies matters. This book illustrates two different types of key roles that mathematics plays in supporting innovation in science, technology, and daily life:

(1) Needs-based. Once a need or an opportunity for innovation has been identified, the subsequent experimentation and/or lateral thinking utilizes mathematics to assist with sorting through the possibilities and putting matters on a more rigorous foundation. An example is the development of Wi-Fi.
(2) Idea-based. After an idea for an innovation has materialized, mathematical models of the possible implementations play a key role. An example is the design of the next model of an automobile that exploits recent developments in materials and technology. Being able to innovate comes from experiencing and understanding how innovation occurs in mathematics, science, and technology.

The contents of this volume report on productive and successful interaction between industry and mathematicians, as well as on the cross-fertilization and collaboration that occurred. The book contains excellent examples of the roles of

mathematics in innovation and, thereby, the importance and relevance of the concept Mathematics_FOR_Industry.

We would like to thank the participants of the forum, especially the members of the Scientific Board of the Forum. Without their cooperation and support, we would never have experienced the great excitement and success of the forum. Moreover, we would like to express our deep appreciation for the great help of the conference secretaries during the preparation and organization of the forum, and to Chiemi Furutani for the proceedings.

Fukuoka, Japan   Yasuhide Fukumoto
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            The Organizing Committee of the Forum "Math-for-Industry" 2015
                                                                                                          and
                                              The Editorial Committee of the Proceedings

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