Preface

This book is the proceedings of the conference “Forum Math-for-Industry 2014,” for which the unifying theme was “Applications + Practical Conceptualization + Mathematics = fruitful Innovation.” This epigram encapsulates the dynamics of the process that takes an application through to an innovation. Industrial mathematics can be viewed as the causal engine that implements the epigram by taking an Application such as input and convolving it with a mixture of Practical Conceptualization and Mathematics to generate a fruitful Innovation as output.

In industrial mathematics, the questions spawned by real-world applications are what drive the resulting two-way interaction between a particular application and the associated mathematics that is utilized and developed, and that sometimes involves, quite unexpectedly, deeper aspects and new areas of mathematics than initially anticipated.

The plan for the talks at the forum was to illustrate various aspects of this two-way interaction between applications and the associated highlighting of how the practical conceptualization assists with the linking of the question that encapsulates the current application to the relevant mathematics. The organizers believe the plan was quite successful. Readers will find in this proceedings that the forum can actually be viewed as a way for unifying the two-way interaction between applications and mathematics.

In a mathematics-for-industry situation, although the application context and the desired innovation are notionally relatively clear, it takes time to identify the questions to be resolved. It is at this stage that conceptualization plays a key role through the generation of a plethora of possibilities of how to link various questions to the mathematics that will generate reliable and useful answers. In a way, one is reminded of this quotation from Edward David: “The importance of mathematics is not self-evident.”

It acknowledges the fact that the role of mathematics plays in solving real-world problems is often taken for granted. Circumspectly, using mathematics to solve real-world problems is similar to a sculptor working with mechanical devices to
chisel out one of the possible forms hidden in the block of wood or stone being carved. The one chosen is the result of the current subconscious conceptualization of the artist. That sculpturing could be viewed from this perspective can be found in Soseki Natsume’s series of short stories “Ten Nights of Dreams” (Yume-Juya) in the Meiji Period (1868–1912). On the sixth night, the dreamer subconsciously visualizes Unkei, the famous Japanese twelfth-century sculptor (1150–1223), in the act of carving the two forbidding guardians of the Buddha Nio guarding the main gate of the Gokoku-ji Temple. Unkei is so absorbed in the carving, he is unaware of the noisy crowd gathered around him. The dreamer then visualizes that some onlookers theorize that the sculpture of the guardians is already hidden in the wood which Unkei is discovering rather than creating. The dreamer then concludes that he should also be able to find Nio in the wood and heads home to attempt it. Unfortunately, he is not able to find one. The dreamer thereby concludes that Nio is no longer in the wood of the Meiji Period.

The first Japanese Field Medallist Kunihiko Kodaira, in 1954, echoed this analogy in his remark that his theory of elliptic surfaces was not invented by him but was just sculptured, using paper and pencil, from the wood of mathematics where it was waiting to be discovered. The corresponding analogy for industrial mathematics, independent of the dynamics outside the context of the application being examined, is: “Answers to the questions that arise in an application are sculptured into reality using the tools of mathematics, which are thereby developed and sharpened by this process.”

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, especially Tsubura Imabayashi during the preparation and organization of the forum, and Chiemi Furutani for the proceedings.

Fukuoka, Japan
April 2015

Masato Wakayama
On behalf of the Organizing Committee of the Forum Math-for-Industry 2014 and the Editorial Committee of the Proceedings
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Forum “Math-for-Industry” 2014
Applications + Practical Conceptualization + Mathematics
= fruitful Innovation

October 27(Mon) - 31(Fri), 2014
Venue: Nishijin Plaza, Kyushu University
2-16-23 Nishijin, Fukuoka City

Invited Speakers
Gary Froyland University of New South Wales
Masahito Hasegawa RIMS, Kyoto University
Hans-Christian Hege Zuse-Institute Berlin (ZIB)
Theostratos Kochi TU Berlin / Zuse-Institute Berlin (ZIB)
Kerry Lundman The University of Melbourne
Vladimir Lorman CNRS & Université Montpellier 2
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**Forum “Math-for-Industry” 2014**

**Applications + Practical Conceptualization + Mathematics = fruitful experience**

October 27 to 31, 2014, Nishijin Plaza, Fukuoka, Japan

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