

## The Forum "Maths for Industry" 2019

The Forum "Maths for Industry" 2019 was held at our campus last month. An international meeting, this annual event is held under the umbrella of the Asia-Pacific Consortium of Mathematics for Industry (APCMfI). See: <u>https://apcmfi.org/fmfi2019/index.html</u>

The theme this year was: "Mathematics for the Primary Industries and the Environment". Our PVC, Ray Geor, delivered the opening address.

Several important figures at the Forum were:

\* Masato Wakayama, Distinguished Professor and Executive President of Kyushu University, Japan; the driving force in establishing the Institute of Mathematics for Industry (IMI), and currently the President of the APCMfI.

\* Osamu Saeki, Distinguished Professor, Kyushu University, currently the Director (Head) of IMI. (He kept the local Organising Committee for this Forum on its toes!)

\* Phil Broadbridge, Emeritus Professor, sometime Head of the School of Mathematics and Engineering at La Trobe University; he has been awarded a distinguished service award from Kyushu University, recognizing his contributions to the international activities of that university through his effort in establishing and operating the Australian Branch of IMI at La Trobe University, and his service as a member of IMI's International Advisory Board.

\* Professor Mark McGuinness (VUW) who is currently Chair of the Australia and New Zealand Industrial and Applied Mathematics (ANZIAM).

\* Professor Graeme Wake, from this university, who has been a leading light in the drive to establish various Maths-in-Industry initiatives in New Zealand, and who was the Chair of the Invited Speakers Committee for this Forum.

The Organising and Invited Speakers Committees included, from SCNS, Winston Sweatman, Graeme Wake, Alona Ben-Tal, Gaven Martin and Robert McKibbin. Altogether, there were 65 attendees, including 11 from Massey, 15 from other NZ universities, CRIs and industries, 25 from Japan, and several from other Asian countries (Thailand, Korea, Malaysia and Vietnam) and Australia.



Massey University has long been an advocate of the importance of how mathematics and statistics can be useful in industry, and this continues with strong support for, and participation in Mathematics-in-Industry study groups held in New Zealand and Australia, and elsewhere around the world. Applications in the primary industries and the environment are important to our country and, indeed, everywhere.

The Asia-Pacific region has many commonalities of interest, and this was reflected in the presentations at this meeting. We were grateful to those in the region who came to share their own quantitatively-based efforts to address important problems. Several New Zealand industries presented a local perspective on industrial and environmental matters of importance (NZ Ministry for Primary Industries' NZ Food Safety, Transpower NZ, Fonterra NZ's Co-operative Group Ltd, and Massey University's Al Rae Centre for Breeding and Genetics).

With this meeting, the Forums now have a decade-long history, initiated by the Institute of Mathematics for Industry at Kyushu University in Japan in 2010.

The Forums have provided a meeting place for mathematical minds, and to provide insights that enable the endeavours of industry-focussed researchers to be shared within the region. The Forums "Math-for-Industry" were held mainly in Fukuoka, during the first 5 years from 2010 to 2014. In 2014, the Asia-Pacific Consortium of Mathematics for Industry (APCMfI) was formed and since then the annual meetings began to move around the member countries. This year it was New Zealand's turn.

Though its significance has often been overlooked, Industrial Mathematics has always been an essential aspect of the history, culture, traditions and development of mathematics, including much of modern theoretical mathematics. Directly and indirectly, developments in mathematics can be traced to the initial attempts to answer quite practical questions. Early examples include the development of Galileo's telescope and the design of clocks.

The conservation and minimisation of energy engendered in the study of thermodynamics and fluid motion underlie much of the foundations of modern theoretical mathematics as well as applied and industrial mathematics. The increasing sophistication of modern industry is reflected in, for example, medical measurements, game theory applications in economics, psychology, biology, computer-controlled instrumentation, the efficient development of geothermal energy, the microbial treatment of waste water, finance, and many more.

It has generated a need and demand for mathematical expertise to stimulate, foster and implement the associated innovations. Even more theoretical areas of algebraic geometry, abstract algebra, topology, differential geometry and group theory are playing an increasingly-important role in industrial endeavours connected with entertainment (such as games and movies), architecture, analysis of protein structure and error-correcting codes.

The Asia-Pacific Consortium of Mathematics for Industry was first proposed with strong support and encouragement from colleagues from the countries represented at last week's Forum. Consequently, a small group, with the encouragement of various colleagues throughout the Asia-Pacific region, met in Canberra in 2014 to do the initial planning for the formation and launch of APCMfI with the emphasis being, fundamentally, "Mathematics-for-Industry", with annual Forums and other activities.

The abilities of mathematicians to address these affirms the importance of such specialists in the increasingly-complex ways in which society operates. The value that quantitative scientists and engineers provide to all communities cannot be under-estimated. While most people appreciate effective and efficient systems, and are willing to depend on mathematical models of how the world works, they often do not realise how these come about, and who is providing the sophisticated processes that underlie their efficiency.

The speakers heard at this year's Forum are experienced in their fields. However, the students who presented posters and gave talks about their work are the future leaders in APCMfI. They are valuable members of the "Math-for-Industry" community, and were particularly welcome at the Forum. Each student gave a brief oral presentation of their work and provided extra comments about their work afterwards. Prizes, provided by IMI, were awarded at the closing ceremony on Thursday. Three students from SNCS presented posters: Neelum Bashir, Shumaila Noreen and Seyed Mohsen Hashemi. Mohsen was awarded one of the "Excellent Poster Awards"; his prize is a two-week trip to IMI in Fukuoka, all costs included, to participate in research activities there.

Congratulations, Mohsen!

Written papers by speakers will be collected for the Proceedings of FMfI2019, a volume to be published by Springer.

The excursion (on the Wednesday evening) was a dinner cruise with The Red Boats on the Waitemata Harbour: good weather, and it was enjoyed by all.

We are grateful to IMI (at Kyushu University), and to APCMfI for their support. Thank you to the members of the Organising and Invited Speakers Committees, and to the administrative staff at Massey and Kyushu universities. In particular, our SNCS crew of Annette Warbrooke, Sue Di Leo, Liz Thaisen Fitzmaurice, Mehrnaz Tavasoli and Hengchen Qiu (Jack) were pivotal in ensuring the meeting was a success.

Next year's Forum will be held in Vietnam.

Robert McKibbin



(FMfI 2019 Group photo)



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