MSE-Colloquium@NTU

14 September 2017, 4.00 pm

Lecture Theatre 3, Nanyang Technological University

Structure Understanding of Materials by Discrete Geometric Analysis

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About the Talk

We are entering into the era of the data-driven society. The development of science and technology would then be very different from what we established previously. Materials – a form of complex media with high functions – have been developed based on the scientist's knowledge and experience from trial and error. In this manner, valuable know-how have been accumulated, but it usually takes a long time and much cost. It is therefore said that we need to develop smart design methods for materials by using information technology. The strategy of such smart material design is to understand the structure-function-process relation, and design material structures accordingly, and set controlled processes to achieve functions beyond conventional ideas. AIMR aims to contribute in materials research along this direction. Three target projects – (1) Non-equilibrium Materials based on Mathematical Dynamic Systems; (2) Topological Functional Materials; (3) Multi-Scale Hierarchical Materials based on Discrete Geometric Analysis – are set. In this talk, I will present some emerging results and discuss how mathematics influence materials design in the data society.

About the Speaker

Prof. Motoko Kotani is the Director, Professor and Principal Investigator of WPI Advanced Institute for Materials Research (WPI-AIMR), Tohoku University, Japan. She received her Doctor of Science from Tokyo Metropolitan University in 1990 and became Associate Professor in the Department of Mathematics, Faculty of Science, Tohu University in 1997. Thereafter, she joined the Mathematics Institute, Graduate School of Science, Tohoku University in 1999. In 2008, Prof. Kotani became the Distinguished Professor, and in 2010, she became the Chair. To date, Prof. Kotani holds multiple concurrent positions, such as, Director for WPI-AIMR at Tohoku University, Associate Executive Vice President (for Research) at Tohoku University, Executive Member in the Council for Science and Technology at the Policy Cabinet Office in Japan, Member in the Board of Governors at Okinawa Institute of Science and Technology, and President of the Mathematical Society of Japan.

Prof. Kotani was awarded the Saruhashi Prize in 2005 and The Presidential Prize for Educational Excellence of Tohoku University in 2010. Some of her main publications include "Large Deviation and The Tangent Cone at Infinity Of A Crystal Lattice, Mathematics Zeitschrift, 254(2006) 837-870, Motoko Kotani and Toshikazu Sunada", "Albanese Maps and Off Diagonal Long Time Asymptotics For The Heat Kernels. Communications In Mathematical Physics (1999), Kotani Motoko, et al ", and, "Discrete Analysis of Crystal Lattices. Sugaku Expositions, 19(2), (2006), 117-134, Motoko Kotani".

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