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Professor Shuichi TASAKI (1958-2010)

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Professor Shuichi Tasaki passed away unexpectedly on 6 June 2010 in Tokyo. He will be remembered for his theoretical achievements in condensed matter physics, in nonequilibrium statistical mechanics, and especially, in the mathematical theory of irreversibility.

Shuichi Tasaki was born on 26 April 1958 in Oita City, Japan. He obtained a BSc degree in physics from the Faculty of Science and Engineering of Waseda University in 1981 and a MSc degree in condensed matter physics from Kyoto University in 1983. In 1989, he received his PhD thesis from the same University for a theory of surface induced magnetism in absorbed ^{3}He film. The same year, Shuichi Tasaki arrived in Brussels as postdoctoral research associate of Professor Ilya Prigogine at the International Solvay Institutes for Physics and Chemistry. During his stay of four years at the Université Libre de Bruxelles, he opened up the way to new progress in nonequilibrium classical and quantum statistical mechanics. In 1993, Shuichi Tasaki returned to Japan as researcher at the Institute for Fundamental Chemistry founded in Kyoto by Professor Kenichi Fukui and, in 1997, he became associate Professor at Nara Women's University. In 2000, he took a position of associated Professor in the Department of Applied Physics at the Faculty of Science and Engineering of Waseda University, where he was promoted Professor in 2002.

Shuichi Tasaki was an outstanding theoretical physicist who contributed to condensed matter theory and nonequilibrium statistical physics. With his exceptional mastery of mathematical analysis and, especially, of functional analysis and the theory of C*-algebras, he obtained fundamental results in the complex spectral theory of time-evolution operators for classical and quantum systems, as well as in the theory of nonequilibrium steady states. He developed the theory of irreversibility on the basis of complex frequency resonances that allow the splitting of the unitary time evolution into distinct forward and backward semi-groups in consistency with microreversibility. For spatially extended piecewise-linear chaotic maps, he demonstrated that the spectral decomposition of their Frobenius-Perron operator can be expressed in terms of fractal deRham functions, and their nonequilibrium steady states in terms of Takagi nondifferentiable functions. For open quantum systems, he explicitly constructed the nonequilibrium steady states using the theory of C*-algebras and he deduced the transport properties as

well as the entropy production rate. In this way, he was among the first to obtain time-reversal symmetry relations for large-deviation dynamical properties (nowadays known as fluctuation theorems) in 1995 for classical maps and in 2003 for quantum systems. A further of his contributions was the proof published in 2009 of the steady-state fluctuation theorem for currents in open quantum systems, by considering transient time-reversal symmetry relations in some appropriate long-time limit. In 2000, he wrote a book in Japanese for a broad audience on the new advances -- he contributed to so much -- in our understanding of the arrow of time.

We also owe him inspiring theoretical results on the quantum Zeno effect and the control of decoherence in quantum systems, the theory of quantum billiards, the spectral statistics of classically integrable systems, the asymptotics beyond-all-orders approach, the optical properties of carbon nanotubes, as well as on equilibrium and nonequilibrium phase transitions. One of his last contributions is a theory of the nonequilibrium Peierls transition to interpret experimental observations of giant nonlinear conduction in charge-ordered organic materials. This theory was developed by combining condensed matter physics with nonequilibrium statistical mechanics and appears as a synthesis of Tasaki's deep insights into two of his favorite fields.

His sudden death the 6th of June 2010 came as a shock. The communities working in nonequilibrium statistical physics and the theory of irreversible processes have lost a leading figure who has greatly influenced the development of these fields by his seminal contributions during the last two decades. Professor Shuichi Tasaki will be fondly remembered as an exceptionally brilliant scientist and also as a deeply humane gentle person. He will be dearly missed by all who knew him.