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THE 2022
NUKIYAMA MEMORIAL AWARD

Presented to

JUNICHIRO SHIOMI

at the 59th National Heat Transfer Symposium of Japan

May 19, 2022

by the Heat Transfer Society of Japan

Junichiro Shiomi

Dr. Junichiro Shiomi was born in Okayama, Japan in 1975. He obtained his BE degree in 1999 from Tohoku University, Japan, and Ph. D. degree in 2004 from Royal Institute of Technology (KTH), Sweden. After being a JSPS postdoctoral fellow, he has been a faculty at Department of Mechanical Engineering, the University of Tokyo, as Research Associate (2007-2008), Lecturer (2008-2010), Associate Professor (2010-2017), and Professor (2017-present). Since 2019, he has been Head/Chair of Department of Mechanical Engineering. Since 2010 he has founded and led Thermal Energy Engineering Lab, pursuing research to advance thermal management, waste heat recovery, and energy harvesting technologies based on nano-to-macro innovation in materials, structures, and systems.

Dr. Shiomi has served in several committees in Heat Transfer Society of Japan including Specific Promotion Research Committee, where he led Specific Promotion Research in Nanoscale Heat Transfer. He is a Fellow of Japan Society of Mechanical Engineers, Director in Thermoelectrics Society of Japan, and Member of the Science Council of Japan. He was also Associate Editors of Transactions of Japan Society of Mechanical Engineers, Applied Physics Express, and Japanese Journal of Applied Physics. He has been Organizing Member, Advisory, and Executive Committee of many international conferences.

He is a world-leading scholar in the field of nanoscale heat transfer, with the outstanding contribution to the field by developing unique methodologies and discovering new principles and controllability. He has been active in a wide range of sub-fields such as thermal energy management from fundamentals of heat conduction, phase change, and thermoelectric conversion to the system level, interfacial fluid dynamics and electro-kinetics, multiscale and multiphysics computation of transport phenomena, controlled synthesis and device integration of nanomaterials, thermal property measurements at the nanoscale, and materials informatics. He has published over 200 refereed journal papers with total citation and h-index of over 5,000 and 40 (by Scopus).

The great merit of integrating the broad subfields can be seen in Dr. Shiomi's achievement in establishing the phonon engineering platform, where he realized development of thermal functional solid materials based on material design guidelines obtained by coupling the four approaches: theoretical and numerical analysis, physical property measurement, structure fabrication, and machine learning. Having pioneered materials informatics for heat transfer, he has innovated the ways to design structures and materials that control heat transport by means of nanostructures and interfacial structures and has succeeded in developing materials with high-performance thermoelectric conversion, heat dissipation, thermal insulation, and thermal radiation.

Dr. Shiomi has delivered more than 30 invited or keynote lectures at international conferences and has won 12 awards from various organizations including Zeldovich Medal from the Committee on Space Research, the Young Scientists' Prize, The Commendation for Science and Technology by the Minister of Educational, Culture, Sports, Science and Technology, Academic award of Heat Transfer Society of Japan, Academic award of Thermoelectrics Society of Japan, and JSPS Prize.

The Nukiyama Memorial Award

The Nukiyama Memorial Award has been established in 2011 by the Heat Transfer Society of Japan to commemorate outstanding contributions by Shiro Nukiyama as an excellent heat transfer scientist. Nukiyama addressed the challenges of the boiling phenomena and published a pioneering paper which clarified these phenomena in the form of the Nukiyama curve (boiling curve). This epoch-making work was done in 1930s, when heat transfer research was in an early stage and Nukiyama himself was young, under forty years old. The Nukiyama Memorial Award shall be bestowed to a scientist under/ about fifty years of age, once every two years in the field of Thermal Science and Engineering.

Past Recipients

2012 Peter Stephan
2014 Gang Chen
2016 Mamoru Tanahashi
2018 Ruzhu Wang
2020 Ronggui Yang

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Shiro Nukiyama 抜山 四郎 (1896−1983)

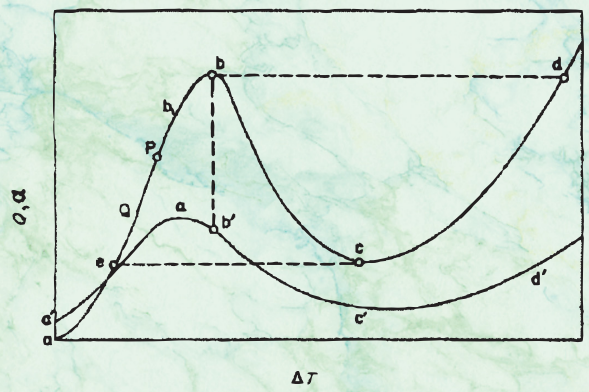
Shiro Nukiyama was born in 1896 in Tokyo, Japan. He graduated from Tokyo Imperial University, and immediately started his professional career as a Lecturer of Tohoku Imperial University (currently Tohoku University). He was appointed Associate Professor in 1921. He visited England, Germany, Switzerland and the United States in 1922~24. He was appointed Professor in 1926. In subsequent years he actively conducted boiling heat transfer research.

In 1934, Nukiyama published a pioneering paper*) which was entitled “The Maximum and Minimum Values of the Heat Q Transmitted from Metal to Boiling Water under Atmospheric Pressure.” This paper clarified and provided an overview of the boiling phenomena in the form of the Nukiyama Curve (boiling curve).

In this work, Nukiyama made an excellent experiment using a metallic wire or a metal wire), in which temperature and heat flux are evaluated accurately, and found that the relation between degree of superheating and heat flux is not monotonous, and that a maximum heat flux points appears in the nucleate boiling region and a minimum heat flux point appears in the film boiling region. He also found the hysteresis behavior that occurs in the transition region between the nucleate boiling and film boiling. Furthermore, he suggested that the boiling curve can be drawn even in the transition region if the state of the boiling water can be changed quasi-statically.

This was an epoch-making work which clarified the physics of boiling phenomena first. It has been highly appreciated in the international academic world of heat transfer. Also, it has become a guideline to heat transfer engineering for the design and control of combustion boilers and/or steam generators, and as such it has laid the foundation of modern energy technology. The Nukiyama Curve appears in every textbook of heat transfer today. Nukiyama is a great person in the international academic world of heat transfer.

In 1956 Nukiyama retired from Tohoku University, and was granted the title of Professor Emeritus. He served as the President of the Heat Transfer Society of Japan in 1963~64. He received the Max Jacob Memorial Award in 1968. In 1983, he passed away in Sendai, Japan.



*) : *Journal of the Japan Society of Mechanical Engineers*, vol. 37, no. 206, pp. 367-374, June 1934. The English translation was published twice in *International Journal of Heat and Mass Transfer*, in vol. 9, pp. 1419-1433, 1966 and in vol. 27, pp. 959-970, 1984.