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THE 2018
NUKIYAMA MEMORIAL AWARD

Presented to

Ruzhu WANG

at the 16th International Heat Transfer Conference
August 14, 2016

by the Heat Transfer Society of Japan

Professor Ruzhu WANG

Dr. Ruzhu WANG was born on Dec. 22, 1964. He is now a professor of School of Mechanical Engineering at Shanghai Jiao Tong University (SJTU). He obtained his B.E. degree in 1984, M.E. degree in 1987 and Dr. Eng. degree in 1990 all from SJTU. He served as lecturer during 1990.08-1992.12, associate professor during 1992.12-1994.12 all in SJTU. He was appointed as full professor at SJTU in Dec. 1994. Currently, he is director of Institute of Refrigeration and Cryogenics, director of Engineering Research Center of Solar Energy, MOE China.

Dr. Wang's research interests include thermal driven sorption cycles, heat pumps, heat transfer to superfluid helium, solar energy and green building energy systems. He has discovered mass recovery cycle, and heat & mass recovery cycle for efficient adsorption refrigeration, variable effect absorption cycle for LiBr-water absorption cooling, pinch analyses for constructing high efficient ammonia-water absorption refrigeration. He pioneered composite adsorbent researches for adsorption refrigeration, thermal storage, and also desiccant dehumidification. He introduced capillary assisted evaporation for the design of adsorber heat exchangers and also evaporators. All the above shows his significant contributions to low grade thermal driven sorption cooling. Dr. Wang has invented solar source and air source heat pump water heaters and commercialized his patents in 2003. He demonstrated the use of air source heat pump water heating/cooling system together with small temperature difference fan coil units could yield efficient and comfortable heating in winter for residential apartments, this new patent system is now commercialized and widely accepted. His weakly coupled temperature and humidity control principle for direct expansion air conditioning system by using desiccant coated evaporator/condenser has doubled air conditioning energy efficiency. Dr. Wang had conducted deep researches on heat transfer to superfluid helium, he had established the heat transfer models both for steady state and transient, he revealed the pressure effects, temperature effects on heat transfer and also revealed the noisy film boiling boundary in HeII bath. He had found two step-wise heat transfer in subcooled HeII. Dr. Wang has invented various solar sorption cooling systems (adsorption, absorption and desiccant), he has shown a design and application guideline of various chillers matched with different grade solar thermal collectors. By using his expertise on thermal driven chillers, heat pumps, and solar thermal technology, Dr. Wang and his group has demonstrated sufficient green energy based projects for various buildings, he had even built a Sino-Italian a Green Energy Laboratory (GEL) in his University, this GEL was LEED Gold Medal certified.

Dr. Wang has published 471 refereed journal papers, 130 international conference papers, 32 review papers and 8 books. He has presented more than 30 plenary/keynote lectures. He was selected as **Clarivate 2017 Highly Cited Researcher**. His research achievements have won National Natural Science Research Award (2014) and National Invention award (2010). **Due**

to his most noteworthy contribution to Refrigeration globally, he was honored to receive the J & E Hall International Gold Medal from the Institute of Refrigeration (UK) in 2013. Dr. Wang is not only a well-known scientist worldwide, he is also a successful educator, he was awarded the best top 100 national distinguished teacher in 2007, national model teacher in 2009, National Labor Model in 2015. His education achievement "Innovative, Globalization and Research learning for talents education in Refrigeration" has won National Education Award in 2009.

Dr. Wang is vice president of Chinese Association of Refrigeration, vice chairman of Chinese Society of Heat and Mass Transfer. He has served as editors in various Elsevier journals, such as deputy editor-in-chief of Energy, Regional editor of International Journal of Refrigeration, Associate editor of Solar Energy, Editorial board member of Energy Conversion and Management, Applied Thermal Engineering and etc.

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

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Shiro Nukiyama 抜山 四郎 (1896 – 1983)

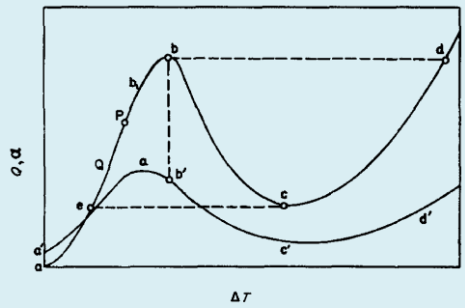
Shiro Nukiyama was born in 1896 in Tokyo, Japan. He graduated from Tokyo Imperial University, and immediately started his professional career as a Lecturer of Tohoku Imperial University (currently Tohoku University). He was appointed Associate Professor in 1921. He visited England, Germany, Switzerland 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 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.