Shigenao Maruyama ／ Professor ／ Institute of Fluid Science

Profile

After graduating from the School of Engineering, Tohoku University, in 1977, Professor Shigenao Maruyama received his MSc degree from Imperial College, London University in 1989 and his Master of Engineering from Tohoku University in 1990. He obtained the degree of Doctor of Engineering from Tohoku University in 1983. Since then, he has been a faculty member of Tohoku University. He was promoted to the position of full professor in Institute of Fluid Science, Tohoku University, in 1997.

Throughout his academic career, Professor Maruyama has been engaged in promoting research and development in the area of Thermal Engineering. For his contributions, he received the JSME Medal for Outstanding Paper (1999), the Award for Academic Achievements of Thermal Engineering Division (2001) from the Japan Society of Mechanical Engineers, and the Award for Scientific Contribution (1998), and the Award for Technical Contribution (2002) from the Heat Transfer Society of Japan. He is the recipient of many other prestigious awards of Japanese and overseas academic societies.

Professor Maruyama has published many textbooks, handbooks and research papers. He has co-authored and edited the JSME Text Series "Thermodynamics", which is one of the best selling books on thermodynamics for mechanical engineering students in Japan.

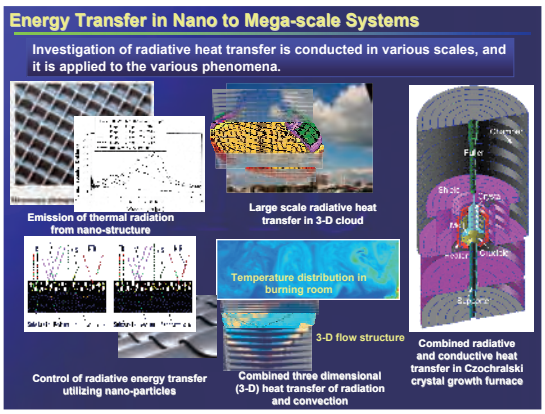
Professor Maruyama was a project leader of the 21st Century COE (Center of Excellence) Program (2003-2008), and is currently the leader of the Global COE Program (2008-2013). He has contributed to Tohoku University as a Councilor, a Special Advisor to the President, and as one of the Special Advisors for Centenary Events and the Alumni Association of Tohoku University.

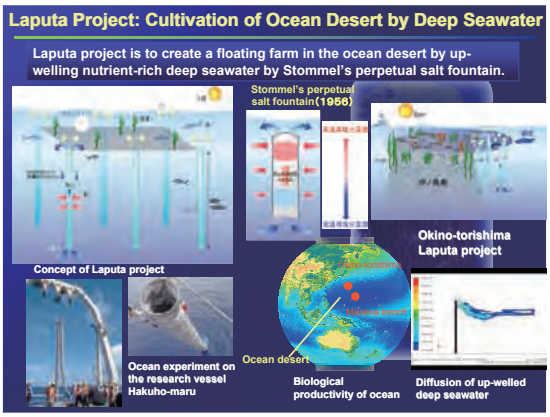
Research Activities

Professor Shigenao Maruyama specializes in thermal engineering. He has made detailed investigations of various aspects of fluid flow and energy exchange. Conventional heat transfer and thermal control focus on the enhancement of heat transfer and temperature control of equipments. Prof. Maruyama has proposed a novel concept of heat-transfer control, in which the heat transfer of the matter is enhanced or reduced actively. The proposed active thermal insulation system and a heat-transfer control device utilizes Peltier effects.

Prof. Maruyama's work utilizes knowledge from various academic disciplines, and his research is interdisciplinary. Some aspects of his research activities are as follows:

1. **Radiative Heat Transfer**: Radiative heat transfer, which is energy transfer by infrared or electro magnetic waves, has been investigated. A generalized analysis method to calculate radiative heat transfer was proposed, and the method was applied to analyze heat transfer in semi-conductor processes and industrial furnaces. This method was applied to large-scale environmental energy transfer, such as heat transfer in fogs and clouds. Thermal emission from nano-scale structure has been investigated. These results were published in a monograph, *Light Energy Engineering*, (Yokendo, 2004), written by Prof. Maruyama, which is the first general textbook of radiative heat transfer in Japan.
2. **Natural Convection**: Natural convection, which is induced by temperature difference in fluid and gravity force, has been investigated, and generalization and optimization formulae were presented. These results were applied to the cooling fins of electronic devices. This research has been extended to a large-scale natural convection in oceanography. Up-welling velocity of deep seawater in the ocean which was proposed by Stommel as a perpetual salt fountain was successfully measured for the first time in the world.
3. **Active Heat-Transfer Control by Peltier elements:** The peltier element, which has been used as cooling equipment, has been applied to a heat-transfer control device. This device has been applied to heat-transfer control of equipment in the microgravity environment, an active catheter and artificial heart muscles. Furthermore, heat-transfer control has been applied to the oriental medicine and cryosurgery, and it has been expanded to fusion of thermal engineering and medical engineering.





Message

Curiosity and imagination are essential for the development of science. The first step of the science is to observe carefully natural and social phenomena or the movement of machinery, and to have an interest in why the phenomenon happens or how the machine works.

Do not blindly trust the principles and rules just because "the teacher says it" or "everyone believes it". The thing that is thought to be common sense is not necessarily true when one considers it deeply. It is important to ask the question, "Why does it happen?" until you think you have understood the phenomenon. Keep in mind what Bernard Baruch said: "Millions saw the apple fall, but Newton was the one who asked why."

When you have understood the phenomenon within your ability, the next step is to derive or to create a new discipline or new equipment, and then to imagine its extension. I like the moment of creation and imagination. This process of creation is similar to the joy and agony of the process of creating a novel or art.

Why don't you enjoy the fun of the intellectual creation process?