

## Grounds for winning the 2013 Society Award of the Japan Society for Cryobiology and Cryotechnology

Basic Research on the Vitrification of Solutions and Biological Cells

By Dr. Hitoshi Kanno (Emeritus Professor of National Defense Academy)



Dr. Hitoshi Kanno is an emeritus professor of the National Defense Academy (NDA), Japan. He graduated from the University of Tokyo (UT) in 1963 and received his Dr. degree from UT in 1968. After that, he took his first faculty position as an assistant professor in UT and then became an associate professor and full professor in Meisei University. He also carried out research in Purdue University as a postdoctoral fellow. From 1986 to 2006, he served as a full professor in NDA and became an emeritus professor of NDA in 2011.

While working in these universities, Dr. Kanno made a great contribution to chemical science as a researcher and as a member of the teaching staff. He joined our society in 1991 and was actively involved in the society for more than fifteen years. In the society, he gave many presentations and had many papers published. He also acted as a director of the society for many years. The main theme of his research was an understanding of the glass states of water and solutions at low temperatures. He had many research achievements for this theme and was recognized as an authority in this research field of this society. The scientific influence of his research extended not only to our society but also to other societies both within and outside of Japan.

Dr. Kanno's research includes the following themes: (1) Study on glassy aqueous solutions by Raman spectroscopy and DTA methods, (2) Investigation of the main cause of the anomalous properties of liquid water, and (3) Basic study on the cryopreservation

of plant cells with glass formation. In his studies on the first theme, he exploited a new experimental technique using a combination of rapid freezing and Raman spectroscopic methods and showed the possibility for analyzing aqueous solutions containing various ions. Regarding the second theme, water has various functions in life systems, and the problem of ice nucleation always arises in the cryopreservation of biological cells. Resolution of this problem is the most important issue. He proposed a water model in which the formation of bulky clathrate-like local structures is interpreted as the main cause of the anomalous properties of supercooled water. In his studies on the third theme, based on the fact of easy vitrification of solutions under pressure, he investigated the supercooling and vitrification of aqueous solutions of various compounds under pressure, and he clarified the pressure dependency of vitrification of an aqueous sucrose solution. He also showed the viability of cultured plant cells under high pressures.

As mentioned above, Dr. Kanno had many original and remarkable achievements in his research on the glass states of water and solutions at low temperatures. New knowledge obtained in his research is important for an understanding of the survival mechanism of biological cells and the establishment of cryopreservation methods at ultra-low temperatures. His work has been a great contribution to our society. Therefore, Dr. Kanno deserves the 2013 Society Award of the Japan Society for Cryobiology and Cryotechnology.