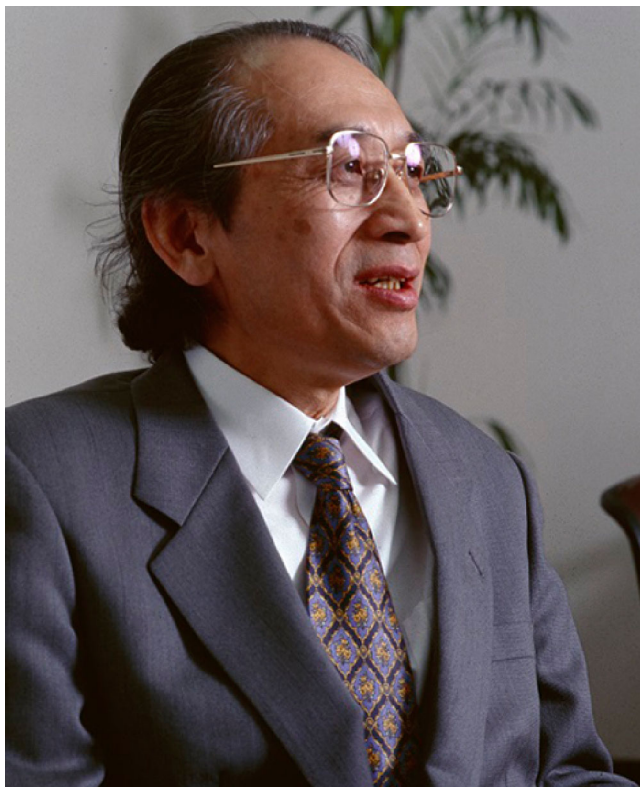


## Obituary: Dr. Yoshitaka Nagai (1931–2014)

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Dr. Yoshitaka Nagai, Professor Emeritus of the University of Tokyo, passed away on June 23, 2014. He was among the key contributors to the development of Glycobiology and was devoted to both the domestic and international scientific communities. Born in 1931, Dr. Nagai spent the years before university in Niigata, which is well known for its snowy

winters. He experienced the critical changes following the Japanese defeat in World War II in 1945 as he must negotiate the critical developmental stage of adolescence. The convergence of these two events, one environmental and one personal, left a lasting effect on his life and his scientific activities.

Dr. Nagai joined History and Philosophy of Science Department, University of Tokyo, where he encountered two mentors who deeply influenced his future, Dr. Goroh Maeda Professor of Christian Religion, and Dr. Yukichi Kimura, Professor of Natural Science, who also inspired Tamio Yamakawa, Kunihiro Suzuki, and Tamotsu Taketomi, leading scientists in the field of glycolipid biochemistry. It was at this point that issues related to life and evolution became the major focus of his life's work. The core of Prof. Kimura's philosophy of science involves the privileged role of one's own observations in understanding morphology, biochemical experiments, and the natural events occurring in living organisms. Dr. Nagai also taught his students and others to value their own experiences and original thinking in the process of doing science. He received his Ph.D. in 1963 from the University of Tokyo and started working on the glycolipid biochemistry of sea urchin gametes, finding complex gangliosides and sulfoquinovosyldiglyceride, with the aimed goal of a biochemical approach to embryogenesis or morphogenesis. In 1974, he was promoted to the position of Chairman of the Biochemical Division of the Tokyo Metropolitan Institute of Gerontology; in 1979, he became a Professor of Institute of Medical Science, the University of Tokyo; and, in 1982, he moved to Department of Biochemistry, Faculty of Medicine in the same university as Professor and the department Chairman. At that time, his research on neurochemistry made several important contributions to the field. His research group developed a ganglioside mapping method that is relied on a combination of ion-exchange column chromatography and thin-layer chromatography, revealing more than 70 brain

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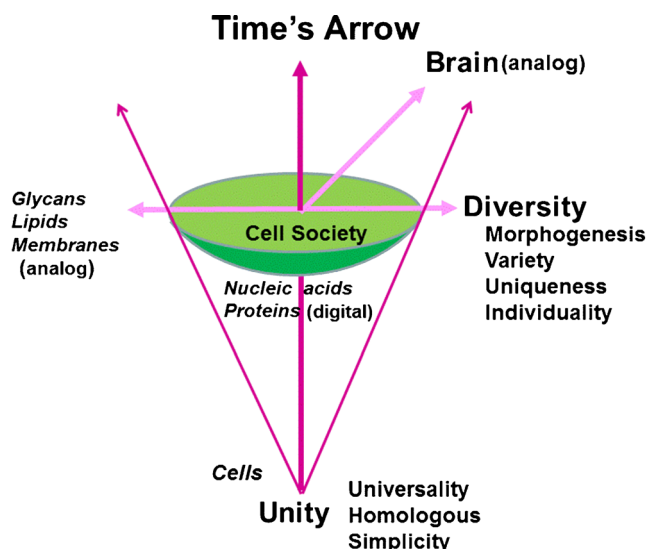
gangliosides, successfully produced an animal model of Guillain–Barré Syndrome by immunizing rabbits with gangliosides, and reported the robust neurotrophic activities of GQ1b ganglioside. These findings resulted in his being awarded a Doctor of Medical Science degree from the University of Tokyo in 1977.

In 1991, Dr. Nagai was asked to serve as the Director of the Tokyo Metropolitan Institute of Medical Science as well as the Director of the Glycobiology Research Group of the Frontier Research System at RIKEN, and then as Director of the Frontier Research System. In 1995, he became the Director of the Mitsubishi Kasei Institute of Life Sciences. Dr. Nagai remained at RIKEN for the remainder of his career, serving as the Chair of the Japan Consortium for Glycobiology and Glycoscience.

Dr. Nagai is survived by his wife, Kazuko, and two sons, Akira and Minoru, and by the many trainees, scientists, and others, including those involved in the arts. Indeed, Dr. Nagai was known for his talent for understanding art, especially paintings.

Dr. Nagai's scientific activity was grounded in his profound insights into life itself, and his favorite slide, the “Unity and Diversity of Living Nature,” shown in Figure 1 clearly reflects his basis for practicing science [1]. Let me end this obituary with phrases that Dr. Nagai himself often used in his lectures:

“Evolution does not produce novelties from scratch. It works on what already exists, either transforming a system to give it new functions or combining several systems to produce a more elaborate one.... (Yoshi's summary of “Evolution as Tinkering”) ....But specialization and diversification occurred by using differently the same structural information....It is always a matter of using the same elements, of adjusting them, of altering here or there, of arranging various combination to



**Fig. 1** Unity and diversity of living nature. Modified Fig. 1 of Ref [1]

produce new objects of increasing complexity. It is always a matter of tinkering..... (Yoshi's summary of “Molecular Tinkering”) [2].

These words, together with vivid images of Dr. Nagai, stay in my mind. Although I often found it difficult to grasp his precise meaning, it was always clear that Dr. Nagai's ideas were critically important. He remains in all of us and asks us to remember the essence of life.

July, 2014

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