The Journal of Physical Chemistry A

 VOLUME 101, NUMBER 4, JANUARY 23, 1997

Photograph by Seiichi Tanaka

# Saburo Nagakura

## Biography

Saburo Nagakura was born in Sizuoka, Japan, in 1920. He entered the Department of Chemistry of Tokyo Imperial University in 1941 in the midst of World War II and graduated with a B.Sc. in 1943. He was strongly influenced by having joined the research group of the leading Japanese structural chemist of the time, Professor San-ichiro Mizushima. He then became a technical officer in the navy and then carried out research on the dielectric properties of materials. By the end of the war in 1945, Saburo joined the Radiation Chemistry Research Institute of the University of Tokyo established by Mizushima. The facilities there had been destroyed by Allied bombing, but while others sank into depression, his determination to pursue fundamental science led him to rise above this. He built all his equipment, including an optical spectrometer and complex glass apparatus for sample preparation, and gathered snow to cool his samples. In 1949 he was promoted to Associate Professor and he received a D.Sc. from the University in 1953.

Saburo's interests centered on the electronic structure of molecules, and he formed a discussion group with a few colleagues in Tokyo which grew in time to form the nucleus for the largest meetings in physical chemistry in Japan. During

S1089-5639(96)02910-6 CCC: $14.00 

the period 1955−1957 he went abroad, and it was natural that he should work with Professor R. S. Mulliken in Chicago and with Professor C. A. Coulson in Oxford. In 1959 he took a position as a full professor at the recently created Institute for Solid State Physics at the University of Tokyo, where he remained for 22 years. For 20 of these (1961−1981) he also directed the Physical Organic Chemistry Laboratory of the Institute of Physical and Chemical Research (RIKEN). The encouragement of young scientists has always been very close to Saburo's heart, and he was particularly pleased that this dual appointment enabled him to influence and help many people across wide fields of science. His students are to be found among the leading scientists in Japan today.

Saburo's industry knows no bounds, and while others might have been satisfied with what he had accomplished, he then worked hard to establish the Institute for Molecular Science, of which he served as Director General for six years following the retirement of Professor H. Akamatu. In 1985 he became President of the Okazaki National Research Institutes where he had another distinguished career. He remained convinced, however, that he could do more for young scientists, and to promote science in Japan, and consequently worked on plans to optimize the use of facilities belonging to the interuniversity research institutes including the Institute for Molecular Science, the National Institute for Basic Biology, the National Institute for Physiological Sciences, and 11 other institutions. This led to the creation of the Graduate University for Advanced Studies, of which he was President from 1988 to 1995. Few scientists can have created their own university! At present, Saburo is the Chairman of the Kanagawa Academy of Science and Technology besides being the President of the Japanese Center for International Studies in Ecology. It is extraordinary that someone who has established an international reputation for research contributed so much to the education of science and Japanese society, and at the age of 75 one wonders what he will do next. Many visiting scientists to Japan remembered his kindness and hospitality, and the time he always finds for others, with gratitude.

Saburo's research interests fall broadly in the field of molecular science, with emphasis on the study of electrons in molecules and their spectroscopy and the effect of electron spin and thus magnetic fields on chemical reactivity. He introduced the concept of intramolecular charge transfer in 1954 and used it to obtain a systematic understanding of the electronic structures of aromatic molecules with various functional groups and to interpret the electronic spectra of molecules containing conjugated double bonds. He proposed a charge transfer theory for electrophilic and nucleophilic substitution reactions of aromatic molecules in terms of the relative energies of the highest-occupied and lowest-unoccupied molecular orbitals of the reactants and substrates and demonstrated its validity through extensive experimental studies of reaction intermediates. In 1967 he reported phosphorescence from charge-transfer states of donor−acceptor complexes and confirmed the presence of the triplet charge-transfer state using both ESR and triplet−triplet absorption methods, lending strong support to Mulliken's intermolecular charge-transfer theory.

His studies on reaction intermediates, short-lived excited molecules, and excited molecular complexes and their electronic structure and reactivity were carried out by using many techniques, including nanosecond and picosecond flash photolysis. He recorded absorption, emission, and ESR spectra, all with corresponding kinetic measurements. A combination of careful experiments and novel theory led to a number of discoveries and to the elucidation of the mechanisms of several photochemical reactions.

In 1974, Saburo discovered the magnetic quenching of fluorescence from $CS_2$ which initiated theoretical and experimental studies on the effects of applied magnetic fields on the luminescence and photochemical reactions of gaseous molecules. Condensed phase studies of magnetic field effects on photochemical reactions involving radicals in solution soon followed and were interpreted in terms of singlet−triplet interconversion with the spin-correlated radical pair. This, together with independent and simultaneous work performed in Russia and Europe, developed into the new field now known as "spin chemistry". The advances independently made by Saburo and his co-workers were quite remarkable and greatly admired by their international colleagues.

He has been highly involved in scientific policy making and for many years served on the Science Council of Japan and on the Science Council and University Council of the Ministry of Education, Science and Culture.

Professor Nagakura has received many honors. He was President of the Chemical Society of Japan in 1984−1985 and President of the International Union of Pure and Applied Chemistry (IUPAC) in 1981−1983. He was elected to the International Academy of Quantum Molecular Science in 1979, to the Deutsche Akademie der Naturforscher Leopoldina in 1983, and to the Japan Academy in 1984. He became a Foreign Fellow of the Indian National Science Academy in 1989, an Honorary Member of the Royal Institution of Great Britain in 1989, a Foreign Member of the Royal Swedish Academy of Sciences in 1990, an Honorary Member of the Chemical Society of Japan in 1991, an Honorary Fellow of the Indian Academy of Sciences in 1994, and an Honorary Foreign Member of the Korean Academy of Science and Technology in 1995. He received an Honorary Doctor of Science at the University of Nebraska in 1994. Among the awards he has received are the Chemical Society of Japan Prize in 1966, the Asahi Prize in 1971, and the Japan Academy Prize in 1987. He became a Person of Cultural Merit in 1985 and received an Order of Cultural Merit in 1990. He was decorated with the Grand Cordon of the Order of the Sacred Treasure in 1995.

So much honor and achievement fail, however, to portray the man in his entirety. Above all, Saburo is a warm human being who has earned the respect and affection of his colleagues all over the world.

Keitaro Yoshihara

Keith A. McLauchlan

Mostafa A. El-Sayed