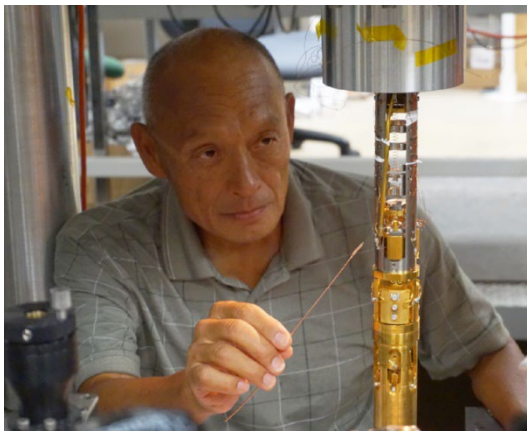
NARRATIVE BIOGRAPHY – Wilson Ho



Wilson Ho was born in 1953 in Taiwan. His early childhood was spent in Changhwa, a city near the middle of Taiwan, where he received his primary school education. Both his parents were middle school teachers. He had a great deal of freedom roaming the countryside around their home and developed a keen interest in planting sweet potatoes, Chinese cucumbers, and papaya trees as well as raising chickens for eggs. It was also a period when he developed his mathematics foundation. His parents believed that there were more opportunities abroad for their four children. In 1965, when he reached the age of 12, his family moved to Rokko, a suburb of Kobe in Japan. He was immediately immersed in a new culture and actively played baseball and learned to swim. Two years later, his family immigrated to San Francisco, California, to join his grandmother and two aunts. He attended A.P. Giannini Junior High School, followed by Lowell High School. He was naturally attracted to science and mathematics, mainly because he enjoyed the subjects and was good at them. In 1971, he attended the California Institute of Technology and gravitated toward Chemistry and received B.S. in 1975. Since he published 6 papers under the guidance of Professor Henry Weinberg and had taken enough courses, it was decided that he should also be given an M.S. degree. However, it was not all study at Caltech. He was able to find time to participate in intercollegiate sports: track, cross-country, and swimming; no previous experience or talents were required to join the teams. He was even given the Most Improved Swimmer trophy, obviously relative to his starting point. He also remembered with fond memory the experiences of carrying out research each summer with different professors: Aron Kuppermann, G. Wilse Robinson, William Goddard, III, and Henry Weinberg. Surface science was a rapidly emerging field at that time. Jumping on the exciting prospects, he ventured cross-country to the University of Pennsylvania to carry out Ph.D. work under the guidance of Professors E. Ward Plummer and J. Robert Schrieffer. During this period, he learned to appreciate instrumentation design and fabrication and became fully ingrained with the belief that advancement in science followed from the development of new techniques. His entire career has been guided by this belief and the assurance that something good will come from having an experimental capability that no one else has. For his thesis work, he constructed a spectrometer that allowed, for the first time, precise energy and angle resolved measurements of electrons scattered from a solid surface in ultrahigh vacuum. This novel instrument made it possible for him to detect previously unobserved vibrational modes and revealed a new electron scattering mechanism. In 1979, he received his Ph.D. degree in Physics and joined AT&T Bell Laboratories as a Member of Technical Staff. Being single in the New Jersey suburbs and away from academic institutions for the first time, the longing for campus life soon grabbed him by full force. Attracted by the natural beauty of Ithaca in New York, he became an Assistant Professor of Physics at Cornell University in 1980. He was promoted to Associate Professor in 1985 and Professor in 1991. In Ithaca, he enjoyed sculling and sailing on the Cayuga Lake while continuing to advance novel experimental techniques. He fabricated new energy resolving analyzers involving 96 parallel electron detectors, tapping into the resources of the high energy physics faculty, and femtosecond lasers, aimed to follow adsorbed molecules in real time. Since mid-1990's his efforts shifted to building the Scanning Tunneling

Microscope (STM) to see and probe single atoms and molecules, highlighted in 1998 with the singular discovery of atomic-scale inelastic electron tunneling to record the vibration of a single bond. Besides single molecule vibrational spectroscopy and microscopy, this work has enabled the detection of the rotation, spin excitation, light emission, and the advancement of the Inelastic Tunneling Probe to image the skeletal structure of single molecules intermolecular interactions. In 2017, with persistent instrumentation development, he succeeded in detecting the temporal coherent oscillations in a single molecule by combining a near-IR femtosecond laser with a low temperature STM. This led in 2022 to the development of the Quantum Superposition Microscope based on the superposition in the time domain of two levels in a single molecule to sense the atomic-scale electric field distribution on a surface by combining femtosecond THz radiation with a low temperature STM. However, the natural beauty in Ithaca did not come without a price. His wife did not like anything that fell from the sky, such as rain, hail, and snow, of which Ithaca had plenty. In 2000, he returned to sunny California and joined the young and dynamic Irvine campus of the University of California as Donald Bren Professor of Physics & Astronomy and Chemistry, and fully immersed in the cultural diversity of the student body and the city. With his homemade instruments, he continued to experience the excitement of accidental discoveries and unexpected results that were initially unplanned but turned out to be more exciting than imagined. A small-scale helium recycling plant was designed and built in his lab to conserve the nonrenewable helium gas for low temperature experiments. Results from his research have appeared in elementary, high school, and university textbooks due to the visual impact of the images and fundamental nature of the measurements. He has integrated his lab results into classroom teaching and the STM technology has been transferred to over a dozen institutions worldwide. He enjoys mentoring graduate students, classroom teaching and interactions with undergraduate students, particularly in large introductory classes, in addition to sharing the excitement of research results from his lab with the scientific community and the public.