Dr. Ta-You Wu

Dr. Ta-You Wu was born into a family of scholars on September 29, 1907 in Canton, China. He received his Ph.D. in 1933 from the University of Michigan, under the direction of Samuel A. Goudsmit. Wu's early work on heavy elements pointed to the existence of transuranium atoms. He returned to China in 1934 to teach at Peking University. In 1938 in Kunming, during the most difficult war time, he managed to write the first book on molecular spectroscopy, Vibrational Spectra and Structure of Polyatomic Molecules, for which he received the 1939 Ting Memorial Prize of the Academia Sinica.

From 1949 to 1963, Dr. Wu directed the Theoretical Physics Division of the National Research Council of Canada. Dr. Wu was appointed Director of the Institute of Physics of Academia Sinica in 1962; Chairman of the National Science Council of the Republic of China in 1967; and Chair of the Committee for Science Development of the National Security Council, Republic of China, in 1967, a position he held for many years. He was chair of the Department of Physics and Astronomy of SUNY-Buffalo from 1966 to 1969. Wu was President of Academia Sinica from 1983 to 1994. He was one of the senior presidential advisors to the government of Taiwan and lectured at several universities there.

Under Wu's leadership, the policies laid down by the National Science Council in 1967—as well as the revision of science curricula, the rewriting of science textbooks in high schools, and the revitalization of Academia Sinica—have made dramatic contributions to the development of science and technology in Taiwan.

Ta-You Wu was deeply respected for his honesty, integrity, and moral courage. He inspired four generations of physics students in prewar Peking, wartime Kunming, and the postwar United States and Taiwan. Among his students were Nobel Laureates Chen Ning Yang, who delivered the first Ta-You Wu lecture in 1992, and Tsung Dao Lee, our 1995 Ta-You Wu lecturer.

Dr. Wu authored twenty-one books, including a seven-part series on theoretical physics, and seven volumes of collected essays. He published more than 120 papers in a wide range of areas in modern and classical physics.

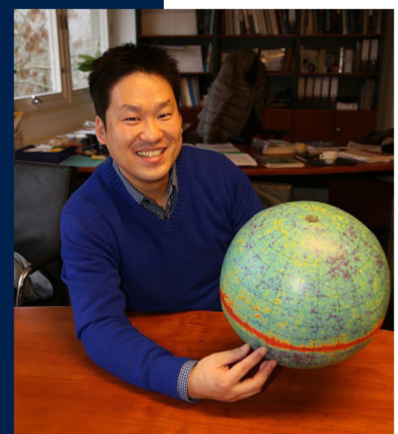
In 1991, the University of Michigan conferred an honorary degree of Doctor of Science on Dr. Wu. The citation reads in part:

> More than any other individual, Ta-You Wu is responsible for raising physics to its current level in both mainland China and Taiwan, [and] it is chiefly for his extraordinary work as a teacher and scientific statesman that Dr. Wu has become known throughout the world. Commending his exceptional influence as a science teacher and policy-maker, the University is proud to bestow upon Ta-You Wu its honorary degree, Doctor of Science.

In 1994, Dr. Wu was awarded the Presidential Medal in Taiwan for his distinguished achievements. He has also been awarded honorary doctorates from Nankai University in Tianjin, China, from the Hong Kong Science and Technology University, and from Tsinghua University in Taiwan. After an extended illness, Dr. Wu passed away on March 4, 2000, in Taipei. Dr. Wu is greatly missed.

The University of Michigan
Department of Physics presents the annual:

Ta-You Wu Lecture in Physics



Finding Cosmic Inflation

Dr. Eiichiro Komatsu

Director Max Planck Institute for Astrophysics, Garching, Germany

Wednesday, October 19, 2022
4:00-5:00 pm
Rackham Amphitheatre

LSA PHYSICS
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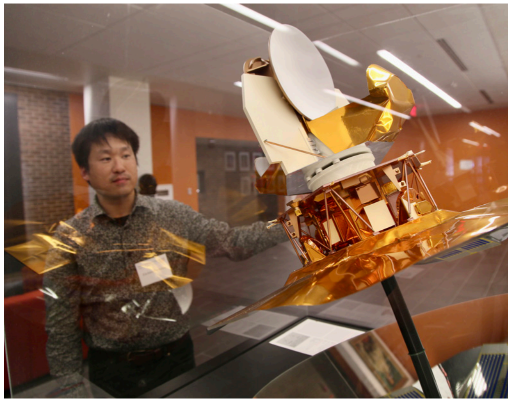


Eiichiro Komatsu with a model of the WMAP satellite. Image: Hiroto Kawabata

Professor Eiichiro Komatsu uses theoretical physics and observational data to study the origin, evolution, and constituents of our Universe. Since 2012, he has been Director of the Department of Physical Cosmology at the Max Planck Institute for Astrophysics in Garching, Germany. Prior to this, he was a postdoctoral fellow at Princeton University and a professor in the Department of Astronomy and Director of Texas Cosmology Center at the University of Texas at Austin. He received his Ph.D. from Tohoku University (Sendai, Japan) in 2001.

He is a Fellow of the American Physical Society. He is the recipient of the Alfred P. Sloan Fellowship, the Nishinomiya-Yukawa Memorial Prize, the Gruber Cosmology Prize, the Lancelot M. Berkeley Prize of the American Astronomical Society, the Chushiro Hayashi Prize of the Astronomical Society of Japan, the Breakthrough Prize in Fundamental Physics, and the Inoue Prize for Science.

His scientific achievements include proposing the most stringent test of the physics of the very early Universe known as "cosmic inflation"; innovative explorations of dark matter, dark energy and neutrinos in cosmology; and utilizing galaxy clusters as cosmological probes.

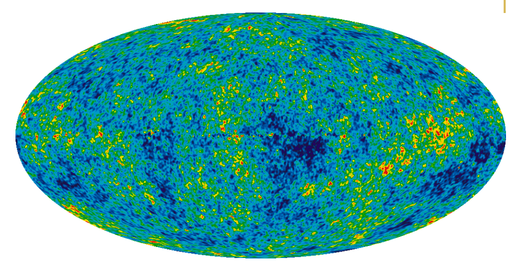
Primordial quantum fluctuation from cosmic inflation

The standard cosmological model, called ΛCDM, includes new physics beyond the standard model of elementary particles and fields. "Λ" denotes Einstein's cosmological constant, which is the simplest (yet one of the most difficult to understand) candidate for the dark energy responsible for the accelerated expansion of the Universe.

"CDM" stands for cold dark matter, which accounts for 80% of the matter density in the Universe.

Yet this is perhaps not the most surprising thing about the standard cosmological model. A less-known underlying assumption, not contained in the name of ΛCDM, is the idea that the origin of all structures in the Universe (such as galaxies, stars, planets and life) was a quantum-mechanical vacuum fluctuation generated in the early Universe. The observed properties of cosmic structures, most notably those of the afterglow of the primordial fireball Universe called the Cosmic Microwave Background (CMB), agree with this idea.

Using CMB data from NASA's Wilkinson Microwave Anisotropy Probe (WMAP), Prof. Eiichiro Komatsu has searched for evidence of these quantum fluctuations. And indeed this idea is not only consistent with all the observational data, but the evidence keeps accumulating. As a member of the WMAP science team since 2001, Prof. Komatsu has used the CMB data to find evidence of cosmic inflation, a period of rapid, exponential expansion right after the Universe was born, when the short wavelength of the quantum fluctuations was stretched exponentially to astronomical length scales. The team found that the density fluctuations in the CMB obeyed a certain probability distribution, called a Gaussian distribution, which depends on the physics of the creation of quantum fluctuations. These quantum fluctuations lead to density fluctuations in the CMB, shaping the Universe that we know today.



The detailed, all-sky picture of the infant universe created from nine years of WMAP data. Image: NASA / WMAP Science Team

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