ACHIEVEMENTS

Prof. Pisin Chen Wins 2024 Chandrasekhar Prize of Plasma Physics

Prof. Pisin Chen receives the 2024 Chandrasekhar Prize of Plasma Physics.

The Association of Asia-Pacific Physical Societies Division of Plasma Physics (AAPPS-DPP) has bestowed upon Prof. Pisin Chen as the 11th Laureate of the prestigious Chandrasekhar Prize for Plasma Physics. This accolade is awarded to scientists who have made seminal contributions to the field of plasma physics, and Prof. Chen was recognized for his groundbreaking work in advancing the understanding of collective interactions in fundamental plasma physics. His seminal contribution includes the invention of the plasma wakefield accelerator (PWFA) and its acceleration and focusing processes. Incidentally, the European Physical Society conferred the 2023 Hannes Alfven Prize on Prof. Pisin Chen for the same contributions.

The plasma wakefield accelerator (PWFA) operates similarly to how a mother duck creates waves for her ducklings to ride in her wake. A high-current particle beam passing through plasma induces wakefields, allowing a trailing, lower current beam to be accelerated.

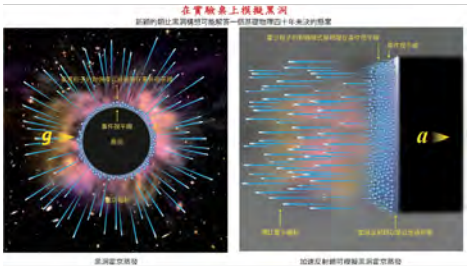
Prof. Pisin Chen is the NTU Chee-Chun Leung Distinguished Chair Professor of Cosmology. He has served as the Director of the Leung Center for Cosmology and Particle Astrophysics (LeCosPA) since its founding in 2007. In 2024, he became the Founding Director Emeritus of LeCosPA.

Prof. Chen earned international renown as the inventor of the plasma wakefield accelerator concept in 1985. His work demonstrated that a relativistic charged particle beam passing through a plasma could excite plasma waves as effectively as a laser pulse, an idea first proposed by Tajima and Dawson in 1979 with the laser wakefield accelerator (LWFA). Today, both LWFA and PWFA are actively pursued worldwide as major plasma accelerator schemes, with basic research being conducted at such prestigious institutions as CERN.

The physics of the plasma wakefield accelerator is often likened to a mother duck creating waves for her ducklings to ride in her wake—much like how a charged particle beam induces plasma wakefields, enabling a trailing beam to be accelerated. The PWFA concept has been explored and developed for decades, advancing research in particle physics and plasma science.

Trained as a theoretical particle physicist, Prof. Chen's contributions extend beyond plasma physics into particle astrophysics, cosmology, and black hole physics. Notably, in 2002, he proposed that plasma wakefield acceleration could explain the origin of ultra-high-energy cosmic rays. In 2017, he proposed using laser-induced relativistic flying plasma mirrors (plasma wakefields) to simulate black hole Hawking radiation in the laboratory—a concept he currently tests experimentally through leading the international AnaBHEL (Analog Black Hole Evaporation via Lasers) Collaboration, which includes research teams from Taiwan, France, and Japan.

This recognition of Prof. Chen's achievements underscores the profound impact of his research on both theoretical and experimental physics. His innovative ideas continue to inspire new explorations into the mysteries of the universe, from plasma physics to black hole phenomena.



An accelerating plasma mirror acts as an analog black hole. The analogy can be appreciated by invoking Einstein's Equivalence Principle. Just like a black hole emits Hawking radiation and traps partner modes near the horizon, the accelerating mirror also emits particles, offering a unique laboratory setting to study black hole phenomena.

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