PRESIDENT'S SCIENCE AWARD 2026

WU JISHAN

Provost's Chair Professor
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"For his contributions to molecular carbon science through the development of open shell and topologically complex molecules as designable systems, enabling new approaches to control properties for future electronic, magnetic, photonic and quantum technologies."

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Professor Wu Jishan is a world-leading molecular scientist whose pioneering work has transformed our understanding of how electrons can be controlled in carbon-based molecules. Through groundbreaking discoveries in open-shell molecules, aromaticity, and topological molecular carbons, he has established entirely new approaches to designing advanced materials for future electronic, magnetic, photonic, and quantum technologies.

Modern technologies–from computers and displays to communication systems–depend fundamentally on controlling the behaviour of electrons. For decades, scientists primarily relied on conventional closed-shell molecules, in which electrons exist in stable paired states. Professor Wu challenged this long-standing paradigm by demonstrating that open-shell molecules, previously considered too unstable to be useful, can be systematically designed, stabilized, and controlled. His research transformed these unusual molecular systems from scientific curiosities into functional materials with unique magnetic, optical, and quantum properties.

One of Professor Wu's most significant contributions is the development of stable diradicals and polyradicals–molecules containing unpaired electrons that interact with one another. His work established the fundamental principles governing these interactions, enabling scientists to precisely tune molecular properties. These discoveries have led to new classes of materials for spintronics, photonics, and molecular quantum technologies, including room-temperature magnetic materials, magnetoresistance devices, and highly efficient light-emitting systems. More recently, his team demonstrated long quantum coherence in molecular systems, opening exciting opportunities for molecular quantum sensing and quantum computing.

Professor Wu has also reshaped one of chemistry's most fundamental concepts: aromaticity. For more than a century, aromaticity was largely understood within the framework of two-dimensional molecules containing paired electrons. Professor Wu extended this concept into entirely new regimes by demonstrating aromaticity in open-shell systems and pioneering the development of three-dimensional globally aromatic molecular structures. His discovery of the first fully conjugated three-dimensional aromatic cages and the formulation of a new three-dimensional aromaticity rule fundamentally expanded how chemists understand electron delocalization and molecular stability.

A third major area of Professor Wu's research is the creation of topological molecular carbons– molecules with extraordinary shapes inspired by concepts from geometry and topology. His team synthesized some of the world's most complex carbon architectures, including Möbius and figure-eight molecular systems. These structures exhibit unique chiral and optical properties that cannot be achieved in conventional molecules. Beyond their scientific beauty, they offer exciting possibilities for advanced photonics, circularly polarized light technologies, spin-selective devices, and future quantum systems.

Collectively, Professor Wu's discoveries have established a unified framework for controlling electron behaviour through spin, electron delocalization, and molecular topology. This framework has been widely adopted by researchers around the world and has helped define new directions in molecular science and advanced materials research.

Beyond his scientific achievements, Professor Wu has made significant contributions to research leadership and talent development. Since joining the National University of Singapore in 2007, he has built one of the world's leading research programmes in molecular carbon science, attracting outstanding students and researchers from around the globe. Many of his former students and postdoctoral researchers now hold academic and leadership positions internationally.

Professor Wu's work exemplifies how fundamental scientific curiosity can lead to transformative discoveries with far-reaching impact. By revealing new ways to control electrons at the molecular level, he is helping to lay the foundation for future generations of electronic, photonic, and quantum technologies, while strengthening Singapore's position as a global leader in frontier science and innovation.