



# Physics Colloquium

## Electron orbital dynamics in solids



January 28, 2026 (Wednesday)



11:15 a.m.



CYCP1, LG1/F, Chong Yuet Ming  
Chemistry Building, Main Campus,  
HKU



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### Abstract:

For a long time, it has been believed that electrons' orbital angular momentum is quenched in solids unless induced by the spin-orbit coupling in magnetic materials. Contrary to common belief, recent studies have revealed that electron eigenstates may have finite orbital angular momentum even in the absence of spin-orbit coupling when inversion symmetry is broken. In centrosymmetric systems, on the other hand, electron eigenstates do not have orbital angular momentum unless the spin-orbit coupling is strong. Nevertheless, a flow of electrons with finite orbital angular momentum is generated in a transverse direction when an electric field is applied (orbital Hall effect). The first part of this talk aims to present basic ideas of a few key orbital dynamics, such as the orbital Rashba-Edelstein effect, the orbital Hall effect, and orbital torque. The second part deals with more recent topics such as the differences between spin and orbital dynamics, and orbital relaxation dynamics.

### Biography:

Hyun-Woo Lee is a Professor in the Department of Physics at Pohang University of Science and Technology (POSTECH), and the Director of the SRC Center for Quantum Dynamics of Angular Momentum funded by the National Research Foundation, Korea. He has worked on spintronics for the last 20 years. Starting from 2015, he has been working on orbitronics and exploring the extension of the angular momentum concept from electron spin to electron orbital angular momentum. He has pioneered various aspects of the electron orbital dynamics, including the orbital Hall effect, the orbital Edelstein effect, the orbital torque, and the orbital relaxation. He was invited as a plenary speaker at MML 2023, ICM 2024, and JEMS 2025, and his research achievements were recognized by various awards and honors, including the National Academy of Science Award from the National Academy of Science, Republic of Korea (2017), the Achievement Award from the Korean Physics Society (2019), Seokcheon Chair Professorship from POSTECH (2022), the Sudang Prize from the Sudang Foundation (2024), and the Changsung Academic Award from the Korean Magnetics Society (2024).