世纪物理情·系列讲座

Space-time group and dynamic crystal

【报告人】
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【 时间 】
2023/ 11/ 01 (周三)
下午 4:00

【 地点 】
清华大学高等研究院
科学馆104报告厅

【摘要】

A solid state textbook typically starts with crystals – static periodical structures in space. We provide a symmetry framework dubbed “dynamic crystal” for studying a variety of dynamic sys-tems (e.g. laser-driven solid state lattices, dynamic photonic crystals and optical lattices, etc). Dynamic crystal covers both crystal and the Floquet system as its special cases, and further ex-tends to systems with neither spatial nor temporal periodicities but exhibiting intertwined space-time symmetries. Similar to classifying crystals by using space groups, we constructed a new mathematic group structure “space-time group”, a dynamic counterpart of space group, to classify space-time crystal. It contains new symmetry operations of “time-screw rotation” and “time-glide reflection”, which are dynamic generalizations of nonsymmorphic symmetries of space group. Classifications on the 1+1 D and 2+1D dynamic crystals (groups) are completed, for which we have found 13 and 275 space-time groups, respectively.

References

1.S. L. Xu and C. Wu, Phys. Rev. Lett. 120, 096401 (2018) .
2.Congjun Wu, “Symmetry principle in condensed matter physics (I)”，in A Festschrift in Honor of the C N Yang Centenary，Scientific Papers, page 413-473, World Scientific.（2022）

【报告人简介】

Congjun Wu received his Ph.D. in physics from Stanford University in 2005, and did his post-doctoral research at the Kavli Institute for Theoretical Physics, University of California, Santa Barbara, from 2005 to 2007. He became an Assistant Professor in the Department of Physics at the University of California, San Diego in 2007, an Associate Professor in 2011, and a Professor in 2017. In 2021, he became a Chair Professor at School of Science, Westlake University. He was selected as a New Cornerstone Investigator in 2023, elected to a Fellow of American Physi-cal Society in 2018, and awarded the Sloan Research fellowship in 2008. His research interests are exploring new states of matter and reveling their organizing principles, including quantum magnetism, superconductivity, topological states, mathematical physics, and the numerical meth-od of quantum Monte Carlo simulations.

主办单位:清华大学高等研究院