北京大学 海外名家讲坛

量子技术，群论，相空间
Quantum technology, group theory, phase space

时间：2019年11月4-6日
地点：北京大学物理学院中楼215会议室

演讲题目与时间安排：

Nov 4, 10:00-11:00 AM
Lecture 1:
The standard phase spaces: Wigner, Q and P-function

Nov 5, 10:00-11:00 AM
Lecture 2:
Group theory foundations and complex extended phase-spaces

Nov 6, 10:00-11:00 AM
Lecture 3:
Techniques and applications to physics

主讲人：

Peter D. Drummond 教授
澳大利亚科学院院士
斯威本科技大学量子与光科学中心院长，杰出教授

澳大利亚科学院院士、斯威本科技大学量子与光科学中心主任Peter D. Drummond教授是量子信息与冷原子物理领域国际公认的顶尖学者之一，获得了本领域众多权威奖项，被哈佛、JILA等国外知名大学及学术机构聘为访问教授。在包括《自然》等期刊已发表250余篇研究论文，谷歌学术上引用超过16000次，h指数为66，仅在过去五年就有5000余次引用。他的大多数论文都有很高的引用率，平均每篇的引用次数超过60，并且每年的总引用次数以近1000次增加。Drummond教授有超过40篇文章发表在高引用、高影响力的杂志上：《自然》，《自然-物理》，《现代物理评论》，《物理评论快报》，其中有41篇文章在谷歌学术上引用超过100次。

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演讲题目与摘要：

Lecture 1:

The standard phase spaces: Wigner, Q and P-function

Quantum mechanics tells us that the universe is a many-body state, described by an exponentially large Hilbert space of enormous size. In this lecture, I will give explain how the phase-spaces of Wigner, Husimi and Glauber are obtained, and how they can be used for first-principles quantum simulations of many-body system dynamics in a number of areas of physics. These will include accurate, experimentally tested stochastic quantum dynamical simulations of Bose-Einstein atom interferometers, and proposals for a laboratory model of the quantum fluctuations in the 'Big Bang', as a type of quantum computer for the universe.

Lecture 2:

Group theory foundations and complex extended

This lecture will treat more general phase-space methods, and give a theory of quantum phase-space using group theory and the Cartan/Hua homogeneous spaces. Majorana fermions have an elegant representation in the Cartan/Hua classical domain of antisymmetric matrices. These other methods are needed to simulate many novel quantum technologies, including opto-mechanical entanglement, optomechanical quantum memories of 'on-demand' Schrödinger Cats, boson sampling quantum computers, and dynamics of quantum devices using Majorana fermions.

Lecture 3:

Techniques and applications to physics

This lecture will give the details of how one implements the actual simulations. A high-level, user-friendly Matlab based simulation package will be available. The lecture will be a tutorial, and students will be encouraged to bring laptops and try out their own code, with examples.

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