Laudatio

Recognizing his world leading role in Theoretical Atomic Molecular and Optical Physics over decades

Prof. Dr. Chris H. Greene

has been awarded the
Martin Gutzwiller Fellowship 2016/2017
of the Max Planck Institute for the Physics of Complex Systems.

Chris Greene, probably the most versatile contemporary theoretical atomic physicist, has advanced AMO physics significantly by developing theoretical frameworks and by using them to answer or pose key experimental questions.

Already as postdoc with Richard Zare at Stanford University in 1980–81 he developed a description of laser induced molecular alignment and orientation which has been widely used and cited ever since.

Subsequently, he conceptualized the description of long-range forces, the standard case in AMO systems, by combining R-Matrix theory with Multi-Channel-Quantum-Defect theory (MCQDT) to predict photo spectra of large atoms with two active electrons. Taking the adiabatic hyperspherical approach to a new level of quantitative accuracy, he developed a theory of doubly excited two-electron states around 1990.

With the advent of ultracold atomic physics in the second half of the 1990s Chris Greene extended MCQDT to ultracold two-body collisions providing accurate scattering lengths for relevant systems including the effect of resonances. He also turned his experience in hyperspherical approaches into an asset for Efimov physics complementing the experimental breakthroughs and opening the perspective on 4-body loosely bound states.

Ultrafast dynamics is the second thriving branch of atomic physics: Also here Chris Greene fundamentally contributed by extending the famous Fano profile to a situation of ultrafast atom-laser interaction in accordance with experiment and explained in a beautiful paper in Science.

In 2000 he predicted the existence of so called trilobites, very exotic molecules of thousands of atomic units bond length which can have huge dipole moments. Consisting of a Rydberg and a ground state atom, they find optimal "living conditions" in the environment of an ultracold gas. Indeed, almost 10 years later their existence was experimentally verified.

These trilobites are a beautiful illustration for Chris Greene's deep intuition regarding atomic physics and his conviction that only predictions and concepts which ultimatively have a chance for experimental verification are worthwhile to think about.