



PHYSIKALISCHES KOLLOQUIUM

Referent: **Prof. Dr. Christos Panagopoulos**
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Thema: **Spin Topology for Applications at Room Temperature**

Zeit und Ort: Dienstag, 24.4.2018, 16:40 Uhr
Recknagel-Bau, Hörsaal REC/C213, Haeckelstr. 3

Leiter: PD Dr. Markus Garst

Kurzfassung: Recent advances in thin film growth and in calculation capabilities in condensed matter physics enabled the synthesis of atomically flat surfaces and heterostructures, and the prediction of their electronic properties. Progress on Rashba interfaces, symmetry protected states and non-collinear spin textures allow novel spin, charge phenomena to emerge often robust to disorder and thermal fluctuations, with much promise for room temperature applications. Using particle-like spin structures as a paradigm, I will argue the states induced by engineering spin orbit coupling and inversion symmetry breaking open a broad perspective, with significant impact in the practical technology of spin topology. In one such example, multilayers of Ir/Fe(x)/Co(y)/Pt enable us tailor the magnetic interactions governing skyrmion (Sk) properties, thereby tuning their thermodynamic stability parameter by an order of magnitude. The Sk's exhibit a smooth crossover between isolated (metastable) and disordered lattice configurations across samples, while their size and density can be tuned by factors of 2 and 10, respectively. For a systematic investigation of the magnetization dynamics, we determined the damping parameter characterizing the magnetization response, and identified a gyrotropic Sk excitation that persists over a wide range of temperatures and across varying sample compositions. To tailor the phenomenology of nanoscale Sk's, including topological stability and malleability we also studied their formation and evolution at zero field through confinement effects. Notably, confinement-induced stabilization of room temperature Sk's at zero field in nanodots occurs over a wide range of magnetic and geometric parameters. The zero field Sk size can be as small as 50 nm, and varies by a factor of 4 with dot size and magnetic parameters. Crucially, Sk's with varying thermodynamic stability exhibit markedly different confinement phenomenologies. Through these studies, I will discuss quantifiable insights towards understanding Sk stability and dynamics in multilayers, and immediate directions for exploiting their properties in nanoscale devices.

Biographie: Prof. Christos Panagopoulos received his PhD from the University of Cambridge (Trinity College) and is currently Professor of Physics and Applied Physics & Nanyang Research Professor at the Nanyang Technological University – Singapore, and the Inaugural Investigator of the National Research Foundation, Prime Minister's Office – Singapore.

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