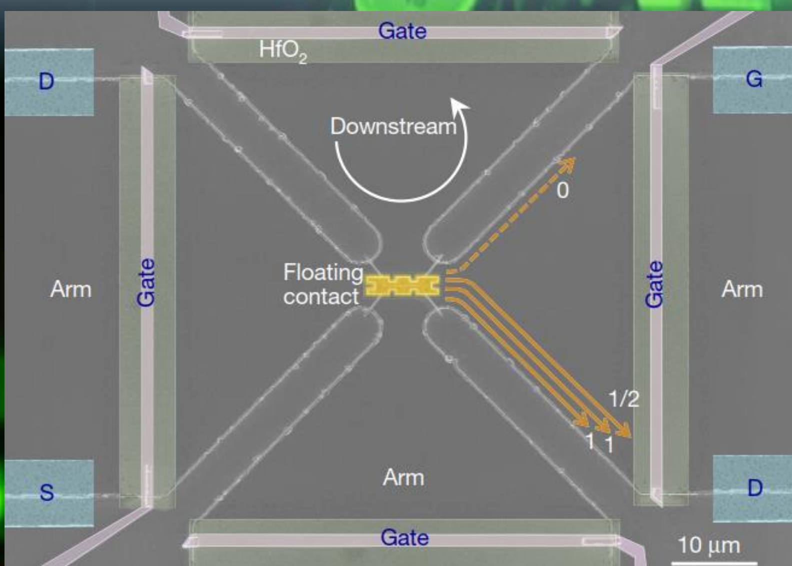
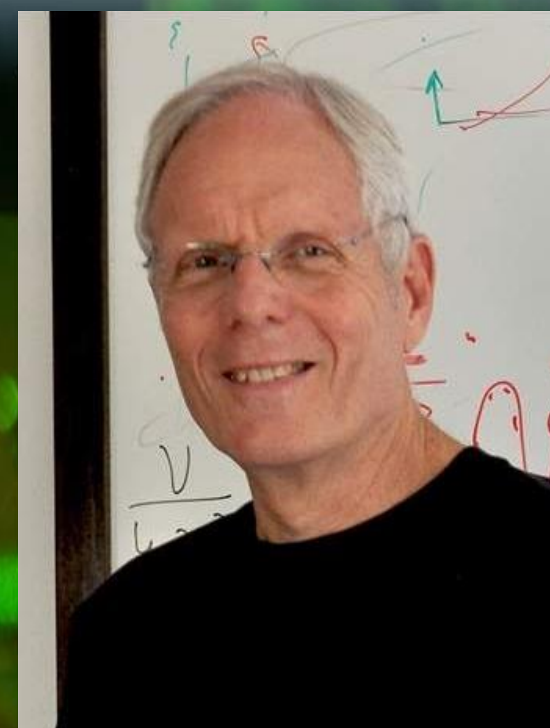
Department of Physics
THE UNIVERSITY OF HONG KONG

Physics Colloquium

Heat Flow in Quantum Hall States





February 10, 2021 (Wednesday) 5:00 p.m.

Zoom online lecture
https://hku.zoom.us/j/93129507589?pwd=NXJ5M3NaUVV5STVSY0xNYkJVd05UQT09
Meeting ID: 931 2950 7589
Password: 2859

Professor Moty Heiblum
Weizmann Institute of Science

Abstract:
Quantum mechanics sets an upper bound on the amount of charge flow as well as on the amount of heat flow in ballistic one-dimensional channels. The two relevant upper bounds, that combine only fundamental constants, are the quantum of the electrical conductance and the quantum of the thermal conductance. Remarkably, the latter does not depend on particles charge; particles statistics; and even the interaction strength among the particles.
Unlike the relative ease in determining accurately the quantization of the electrical conductance, measuring accurately the thermal conductance is more challenging - as heat flow is not conserved, and accurate and noninvasive temperature measurements are not trivial.
The universality of the thermal conductance was already demonstrated for weakly interacting particles: phonons, photons, and electronic Fermi-liquids. I will describe our work on thermal conductance measurements in the fractional QHE regime. I will concentrate on the method used in the measurements, which were focused on Laughlin's states and hole-conjugate states – in order to prove the universality of the thermal conductance (which violates the Wiedemann-Franz conjecture). The studies were extended to fractional states in the first-excited Landau level, and in particular on the *five half* state, which was predicted to be non-abelian. We found a fractional thermal conductance coefficient, indeed proving the non-abelian character of the state. Note our observed topological order of the state (*PH-Pfaffian*) was not expected in current numerical works (which expect the *anti-Pfaffian* order). However, our current measurements (using a different method) strengthen the observed topological order.

Biography:
Professor Moty Heiblum was formally trained in electrical engineering, receiving B.Sc. in Technion (Israel, 1973) and Ph.D. in UC Berkeley (USA, 1978), joining after it the IBM Thomas J. Watson Research Center (1978). In 1990 he joined the Weizmann Institute of Science (Israel), to conceive and found the Braun Center for Submicron Research and the Department of Condensed Matter Physics. Prof. Heiblum's studies are concentrated in quantum behavior of electrons in high purity mesoscopic materials, and in particular in the quantum Hall effect (QHE) regime. Among many of his famous works are detection of fractional charges via sensitive shot noise measurements and observation of quantized heat flow in the QHE regime. Prof. Heiblum was awarded the IBM Outstanding Innovation Award (1986), the Rothschild Prize (2008), the EMET prize (2013), and the Oliver E. Buckley Condensed Matter Physics Prize (2021). He is a Member of the Israel Academy of Sciences, a fellow of the American Physical Society, and a life fellow of IEEE.

Anyone interested is welcome to attend!

Department of Physics, The University of Hong Kong.
Phone: 28592360. Fax: 25599152