



University of Crete
Department of Physics

Physics Colloquium

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Coulomb gap here, there, and everywhere

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ABSTRACT

In 1975 Alexei Efros and myself discovered that due to electron-electron interactions the density of localized electron states vanishes near the Fermi level as quadratic function of the energy distance to the Fermi level. We named this phenomenon the Coulomb gap and showed that it leads to the variable range hopping conductivity which depends on temperature T as $\exp[-(T_{ES}/T)^{1/2}]$. This ES law was observed in hundreds of experimental papers, where in many cases it describes 10^6 times variation of conductivity. After reminding the history and physics of this discovery I will review many new applications of ES law beyond lightly doped semiconductors, among which the Quantum Hall Effect is the most prominent. I will also dwell on McMillan-Shklovskii conjecture on the Coulomb gap evolution across an Insulator-Metal transition.