Stuttgarter Physikalisches Kolloquium

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Conductance Anomalies in Transport through Quantum Dots and Quantum Point contacts

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Abstract

Quantum dots and quantum point contacts, two elementary building blocks of semiconducting nanodevices, both exhibit famously anomalous conductance features: the Kondo effect in the former case, and the 0.7 anomaly in the latter. The microscopic origin of the Kondo effect is well established - it results from a localized spin degree of freedom that hybridizes with the delocalized conduction electrons of a metallic bath. The microscopic origin of the 0.7-anomaly, however, has been controversially debated for many years - is it, too, caused by localized spin states? And if not, what else is at its root? In my talk, I will present an overview of both the Kondo effect and the 0.7-anomaly and explain to what extent they are related. I will argue that the 0.7-anomaly has a simpler origin than the Kondo effect – it arises from a smeared van Hove peak in the local density of states at the bottom of the lowest one-dimensional subband of the point contact. Nevertheless, the low-energy phenomenology of both effects is similar, because both show Fermi-liquid behavior.