



The Abdus Salam
**International Centre
for Theoretical Physics**



**International Conference on Multi-Condensate Superconductivity and
Superfluidity in Solids and Ultra-Cold Gases
14 - 18 May 2018 (Trieste, Italy)**

**Anomalous Dimensions for Conserved Currents and
Extra Dimensions in the Strange Metal?**

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It is well known that conserved quantities cannot have anomalous dimensions. However, a recent proposal for the ubiquitous strange metal phase in the cuprates argues just the opposite. Namely, all of the properties of such 'strange metals' can be understood if the current has an anomalous dimension. My talk will focus on trying to understand this claim. To demystify this claim, I will first show that even in the standard formulation of gauge theories, there is a loop-hole in Noether's theorems which has remained 'almost' (Noether was aware of it) un-noticed until now, that can allow, in principle, for the current to have any allowable dimension. However, I will show that the only quantum theories to date which exhibit such odd behaviour are holographic models that are derived from a gravity theory that lives in higher dimensions. The corresponding boundary theory is inherently non-local as dictated by the exception to Noether's theorems. The existence of currents having anomalous dimensions, a direct probe of the existence of extra 'hidden' dimensions, can be tested with the Aharonov-Bohm effect. I will describe this effect and its potential impact for unlocking the secret of the strange metal in the cuprates.