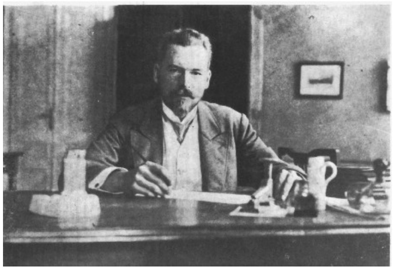

Contribution ID: **50** Type: **talk**

Weighted models for level statistics across the many–body localization transition

Monday, 3 September 2018 15:35 (20 minutes)

We study level statistics across the many-body localization transition. An analysis of the gap ratio statistics from the perspective of inter- and intra-sample randomness allows us to pin point differences between transitions in random and quasi-random disorder, showing effects due to Griffiths rare events for the former case. Defining a mean gap ratio for a single realization of disorder we show that it has a broad, system specific distribution across the whole transition. That explains the necessity of introducing weighted random matrix ensembles that correctly grasp the sample-to-sample variation of system properties including the rare events. We consider two such approaches. One is a weighted short-range plasma model, the other a weighted power–law random banded matrix model. Treating the single sample gap ratio distribution as input, the considered weighted models yield a very good agreement both for spacing distribution including its exponential tail and the number variance up to tens of level spacings. We show explicitly that our weighted models describe the level statistics across the whole ergodic to many-body localized transition much more faithfully than earlier predictions. We also demonstrate that our model describes level statistics in variety of spin, bosonic and fermionic systems. The remaining deviations for long-range spectral correlations are discussed and attributed mainly to the intricacies of level unfolding.

[1] P. Sierant and J. Zakrzewski, *Intermediate spectral statistics in the many–body localization transition*, arXiv:1807.06983

[2] P. Sierant and J. Zakrzewski, *Weighted models for level statistics across the many–body localization transition*, arXiv:1808.02795

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Session Classification: Mon afternoon