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Functional Analytic Methods in Quantum Many-Body Theory
Special Session B2

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This session aims at presenting the most recent developments in mathematical physics with an emphasis on the derivation of effective theories for describing complex many-body quantum systems at all scales. A paradigmatic example is the N-body Schrödinger equation

$$i\hbar\partial_t\psi = H\psi\ , \quad H = \sum_{i=1}^{N} -\hbar^2\Delta_i + \lambda \sum_{1\leq i<j\leq N} V(x_i - x_j)\ .$$

The particle number N is typically of the order 10^{23}. Due to the enormous number of degrees of freedom, the analysis of the Schrödinger equation is a massive mathematical challenge. However, in certain scaling regimes one may study physical quantities by proving convergence to certain effective (usually non-linear) theories such as Hartree–Fock theory or the Gross–Pitaevskii equation. Other important examples where this approach has proven useful are the quantum Hall effect or spin systems.

In recent years new functional analytic methods have been developed in this context, and our session is meant to provide a platform for the exchange of ideas among researchers working in the field with different mathematical background and research focus.

For more information visit `https://sites.rutgers.edu/umi-ams-joint-meeting`.

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