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Quantum Geometry in the Fractional Quantum Hall Effect II

While “toy models” exist which have a null space which maps into (Euclidean, not Lorentzian) CFT, with exact Laughlin, Moore-Read, etc., as maximum density states in the null space, “real” systems with generic interactions break conformal invariance, and some aspects of the model wavefunctions are non-generic, as their geometry is non-conformal. The reason CFT models can be useful in FQH systems is that the Hilbert space (but not the spectrum) of their low-energy edge degrees of freedom is described by a direct product of unitary irreducible representations of the Virasoro algebra. This is the second independent occurrence of this algebra in physics, independent of its appearance in CFT. An interesting case is a CFT-based “toy model” (called the “Gaffnian” model by its originator, S. Simon) where the CFT is non-unitary, with a single negative weight primary. This appears to describe a gapless critical point between two 2/5 FQHE states with composite bosons of opposite 2d-parity.