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Supersymmetry and fluctuation relations for currents in closed networks VLADIMIR CHERNYAK, Wayne State University, NIKOLAI SINITSYN, Los Alamos National Laboratory — The discovery of fluctuation theorems and nonequilibrium work relations has stimulated considerable interest in nonequilibrium statistical mechanics and theory of counting statistics. It is important to obtain exact relations that do not directly rely on the thermodynamic concepts, such as work or entropy, but rather describe unambiguous microscopic characteristics, such as statistics of particle currents in systems driven by time-dependent fields. We identify hidden supersymmetry in evolution, governed by the master equation, that survives on the level of the counting statistics of stochastic particle currents. Supersymmetry connects the evolutions in the spaces of populations (boson component) and empirical currents (fermion component). We present exact relations for statistics of currents in strongly driven mesoscopic stochastic systems. Being reminiscent of known fluctuation theorems, a part of our exact result is not directly related to the condition of microscopic reversibility but rather follows from *supersymmetry* of the counting statistics of currents.

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