Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Optimizing exit times JEAN-LUC THIFFEAULT, University of Wisconsin, FLORENCE MARCOTTE, Ecole Normale Superieure, CHARLES DOERING, University of Michigan, WILLIAM YOUNG, Scripps Institution of Oceanography — A heat exchanger can be modeled as a closed domain containing an incompressible fluid. The fluid has some temperature distribution obeying the advection-diffusion equation, with zero temperature boundary conditions at the walls. The goal is then to start from some initial positive heat distribution, and to flux it through the walls as fast as possible. For a steady flow, this is a time-dependent problem, which can be hard to optimize. Instead, we consider the mean exit time of Brownian particles starting from inside the domain. A flow favorable to heat exchange should lower the exit time, and so we minimize some norm of the exit time. This is a simpler, time-independent optimization problem, which we then proceed to solve analytically in some limits, and numerically otherwise.

Jean-Luc Thiffeault
University of Wisconsin

Date submitted: 01 Aug 2015 Electronic form version 1.4