1041-31-8 **Erin P. J. Pearse*** (erin-pearse@uiowa.edu), 25L MacLean Hall, Iowa City, IA 52246, and
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Operator theory of electrical resistance networks. Preliminary report.

An electrical resistance network (ERN) is a graph whose edges are understood as resistors of different weights. This gives a natural model for (discrete) diffusion geometry: the natural notion of distance on an ERN is the effective resistance metric R.

We construct a Hilbert space into which an ERN is naturally embedded, with R now given by the norm. This allows one to employ Hilbert space geometry in the study of functions defined on the vertices of the graph and the functions defined on the edges. We study potential theory on infinite graphs and use this to explore their asymptotic structure. We are able to find flows of minimal dissipation through the use of an operator which implements Ohm's law, and its adjoint.

It turns out that nonconstant harmonic functions (which appear neither for finite graphs nor in ℓ^2), play a crucial role in this analysis. Indeed, they play a crucial role in the relation of the Dirichlet energy form on the ERN and the discrete Laplace operator. Additionally, they are the key to constructing a boundary for arbitrary infinite graphs. We are able to give a discrete analogue of the Poisson integral representation with respect to this boundary. (Received April 25, 2008)