1035-51-990 **Peter W Jones*** (jones@math.yale.edu), Yale University Mathematics Dept., PO Box 208283, New Haven, CT 06520-8283. *Coordinate Systems, Eigenfunctions, and Local Riemann Mapping Theorems.*

Large data sets appear in the sciences, analysis of texts, and many other applications. To extract information from these often complicated objects, they are often first embedded in a high dimensional Euclidean space. One then attempts to simplify them so they are easier to study. One could for example project such a data set on a low dimensional hyperplane. (This is an example of what is called dimensional reduction.) While such linear methods work well in certain cases, often they are ineffective in revealing hidden stuctures.

The search for newer, nonlinear methods for dimensional reduction has led to a method that is widely called "Diffusion Geometry". The idea here is to build on the data set something resembling a Laplace operator. The eigenfunctions of this operator have been empirically observed in many cases to provide effective, nonlinear coordinate systems. We present some results, obtained jointly with Mauro Maggioni and Raanan Schul, which explain why such methods can behave effectively and robustly. Our main result shows that D dimensional domains or manifolds M, of finite volume, have a local version of the Riemann mapping theorem. (Received September 18, 2007)