1046-Z1-1237 **David K Hammond*** (david.hammond@epfl.ch), EPFL - STI - IEL - LTS2, Station 11, 1004 Lausanne, Switzerland, and **Pierre Vandergheynst** (pierre.vandergheynst@epfl.ch) and **Remi Gribonval** (remi.gribonval@inria.fr). *Wavelets on Graphs via Spectral Graph Theory.*

We propose a novel method for constructing wavelet transforms of functions defined on the vertices of an arbitrary finite graph. In the traditional continuous setting, wavelets are generated by translating and scaling a small number of "mother" waveforms. One challenge for extending this theory to graphs is the difficulty of defining appropriate translations and scalings for functions on an arbitrary irregular graph. In our approach we define a notion of scaling using the graph analogue of the Fourier domain, namely the space of eigenfunctions forming the spectral decomposition of the discrete graph Laplacian L. Given an arbitrary measurable function g, the spectral decomposition allows one to define the operator $T_g = g(L)$. Scaling by t may then be defined by $T_g^t = g(tL)$. Our graph wavelets $W_{t,j}$ at scale t and j are produced by localizing this operator to the vertex j by $W_{t,j} = g(tL)\delta_j$, where δ_j is the indicator function for the vertex j. The transform coefficients are then given by taking inner products with these wavelet waveforms. We show that, subject to an admissibility condition on g, this procedure defines an invertible transform. In addition, we explore the localization properties of the wavelets in the limit of fine scales. (Received September 15, 2008)