1046-I1-450 **Patrick J Van Fleet*** (pjvanfleet@stthomas.edu), 2115 Summit Avenue #OSS201, Department of Mathematics, University of St. Thomas, St. Paul, MN 55105. *Using the Discrete Wavelet Transform to Illustrate Concepts from Linear Algebra.*

Wavelet theory is a relatively new development in mathematics and its origins are in functional and harmonic analysis, approximation theory, and linear algebra. Applications of wavelets are numerous and many utilize the discrete wavelet transformation (DWT).

The simplest DWT is the Discrete Haar Wavelet Transformation (DHWT). The very structure of this matrix makes it ideal for illustrating many ideas from linear algebra. Its block form is useful for demonstrating the power of block matrix multiplication. Writing a routine to implement the DHWT gives students a different look at matrix multiplication as well as the need for properties such as $(AB)^T = B^T A^T$. An intuitive approach leads to the inverse of the DHWT and shows that Gauss elimination is not always needed to compute inverses. In many applications, it is necessary to modify the DHWT so that it is an orthogonal matrix and when this orthogonal version of the DHWT is applied to digital images, it is a similarity transformation.

In this talk, we will introduce the DHWT, illustrate many of the points described above, and discuss how the DWT can be used in image compression. In this way, we provide linear algebra students with an example of a linear transformation that is used in the "real world". (Received September 03, 2008)