

# Keith Taylor

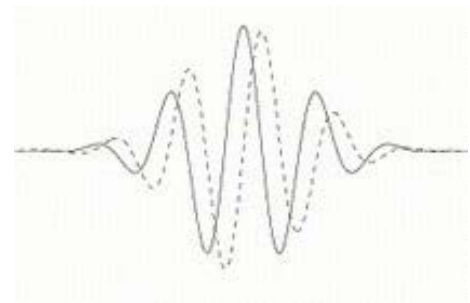
## Analysis



**Abstract Harmonic Analysis:** This is the area where mathematical tools are developed for analysis in the presence of a symmetry group. The applications of these tools are ubiquitous in mathematics and the sciences. Theorems from harmonic analysis are fundamental to areas as diverse as Quantum Mechanics, Crystallography, Number Theory, Signal Processing, and Statistics. Some areas of focus in the group:

- Locally Compact Groups and their Unitary Representations
- Mackey's theory of Induced Representations
- Group  $C^*$ -Algebras
- The Fourier Algebra of a Group

**Generalized Wavelet Analysis:** Wavelet Analysis emerged as a spin-off from Harmonic Analysis around 1985. The theory dramatically revolutionized signal and image processing at an astonishing rate. It is the mathematics behind the mp3 format for audio signals, which disrupted the music industry in the 1990s. It was also used to digitize the FBI's collection of fingerprints. Our group investigates the implications of the representation theory of matrix groups acting as affine transformations of Euclidean space for multi-variable wavelet analysis.



**Asymptotic Analysis of Spectra:** Research is conducted into the analysis of the spectra of sequences of matrices associated with families of hydrocarbons. This is a long-running collaboration with a team of mathematical chemists. The matrices that arise have a block Toeplitz structure that reflects the connectivity graph of the hydrocarbon. Many techniques of harmonic analysis apply to the study of these matrix sequences.

**For more information, contact:**

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