



**Speaker:** Euan Spence  
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Tuesday, October 30, 2012  
1:30 PM  
258 Hurley Hall

**Title:** Is the Helmholtz equation really sign-indefinite?

**Abstract:**

The standard weak formulation of the Helmholtz equation is sign-indefinite (i.e. not coercive), and instead satisfies a Garding inequality. This is often for a good reason, since in bounded domains under certain boundary conditions the solution of the Helmholtz equation is not unique at certain wavenumbers (those that correspond to eigenvalues of the Laplacian), and thus the variational problem cannot be sign definite in these cases. However, even for boundary value problems where the solution is unique for all wavenumbers, the standard variational formulations of the Helmholtz equation are still indefinite.

In the literature, one often finds this sign-indefiniteness attributed to the Helmholtz equation itself, with papers often including phrases like "the Helmholtz equation is highly indefinite". In this talk I will present novel, sign-definite formulations of the Helmholtz equation, and argue that, whereas the standard weak formulations of the Helmholtz equation are sign-indefinite, this indefiniteness is *\*not\** an inherent feature of the Helmholtz equation, only its standard formulations.

This is joint work with Andrea Moiola (University of Reading, UK)