1056-42-1526 **Clifford J Nolan*** (clifford.nolan@ul.ie), Dept. of Maths and Stats, University of Limerick, Limerick, Limerick 00000, Ireland, and **Thomas Dowling** (thomas.dowling@ul.ie), Dept. of Maths and Stats, University of Limerick, Limerick, Limerick 00000, Ireland. *Imaging from Bistatic and Multiply Scattered Waves.*

We develop a new imaging technique that uses waves which scatter multiple times with either an unknown object of interest (to be imaged) or another known nearby scatterer.

In the context of RADAR imaging, radio waves are emitted from a moving air-borne antenna and its echoes are recorded. The data is collected over a range of positions (flight track) of the antenna. This so-called "Synthetic Aperture RADAR" (SAR) data is then processed by a "backprojection" method to obtain an image of the ground. SAR imaging doesn't account for waves that scatter multiple times.

We develop a model of the multiple scattering process which is encapsulated by a scattering operator:

$$F : \mathcal{E}'(X) \to \mathcal{E}'(Y)$$

where X is the earth's surface and Y is a set of points (s, t) where s denotes the current position of the antenna and t the echo delay time. We show that F is a Fourier integral operator with wavefront relation $\Lambda \subset T^*Y \times T^*X$. By analysing Λ we devise a new technique which yields improved images and avoids artifacts that would be produced by traditional SAR imaging. (Received September 22, 2009)