

1014-35-551

**Thanasis Fokas\***, Nonlinear Mathematical Sciences, University of Cambridge, England.  
*Nonlinear Fourier Transforms, Integrability and Nonlocality in Multidimensions*. Preliminary report.

One of the long standing open questions in the field of integrable nonlinear equations is the question of existence of integrable equations in higher dimensions. Do there exist analogues of these equations in three spatial dimensions? Gel'fand and the speaker have emphasized that the solution of the Cauchy problem of integrable nonlinear equations in one and two spatial dimensions, is based on a nonlinear Fourier transform method. The relevant nonlinear Fourier transform pair, in contrast to the classical Fourier transform pair, cannot be expressed in closed form, but is defined through the solution of certain linear integral equations. This suggests that in order to construct integrable multidimensional equations, one must first construct an appropriate multidimensional nonlinear Fourier transform pair. Such a pair in any number of dimensions will be presented. Furthermore, it will be shown that this transform can be used to solve the Cauchy problem of a large class of nonlinear equations. These equations have the distinctive feature that they involve a certain nonlocal commutator. As an illustration, the Cauchy problem of a multidimensional generalization of the DS equation will be solved. (Received September 20, 2005)