1135-49-3179 **Jonathan Goldfarb*** (jgoldfar@fit.edu) and **Ugur G Abdulla**. *Optimal Control of Coefficients in Parabolic Free Boundary Problems Modeling Laser Ablation.*

We develop a new variational formulation of the inverse Stefan problem, where information on the coefficients, heat flux on the fixed boundary, and density of heat sources are missing and must be found along with the temperature and free boundary. We employ an optimal control framework, where the missing data as well as the free boundary are components of the control vector, and optimality criteria consist of the minimization of the sum of $L_2$-norm declinations from the available measurement of the temperature flux on the fixed boundary and available information on the phase transition temperature on the free boundary. This approach allows one to tackle situations when the phase transition temperature is not known explicitly, and is available through measurement with possible error. It also allows for the development of iterative numerical methods of less computational cost due to the fact that for every given control vector, the parabolic PDE is solved in a fixed region instead of full free boundary problem. Discretization by finite differences is pursued, and convergence of the discrete optimal control problems to the original problem both with respect to cost functional and control is proven. (Received September 26, 2017)