Public Abstract

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Title:Mathematical problems from cryobiology

Cryobiology is the study of life and death at low temperatures and provides a fascinating setting for applied mathematics. The interdisciplinary nature of cryobiology mirrors the diversity of applications ranging from animal agriculture to laboratory cell and species preservation to critical human clinical applications for the preservation of life and for the killing of cells during cryosurgery. The work comprising this thesis develops approaches for optimization of cryobiological protocols. In particular this thesis develops theoretical protocols that reduce important cryobiological protocols by a factor of four to fourty fold. Additionally, because these new protocols call into question some of the founding hypotheses of the model on which they are based, this thesis defines and then explores a new model for common cryobiological procedures.