Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Computational modeling of the spatiotemporal dynamics of cancer stem cells ALEXANDRA SIGNORIELLO, MARCUS BOSENBERG, Yale University, MARK SHATTUCK, City College of New York, COREY O'HERN, Yale University — Cancer stem cells can differentiate into any cell type in a particular tumor, and thus can reform a tumor even when seeded from a single cell. Despite their importance, the identification of stem cells, their interactions, and how and why they malfunction to cause cancer and form tumors are not well understood. We have developed discrete element modeling (DEM) simulations to investigate the role of stem cells in the formation of heterogeneous cell populations in melanoma tumors. The DEM simulations include elastic, excluded volume, and signaling interactions between cells and rates for cell differentiation, apoptosis, and growth. The DEM is calibrated to results from experimental studies of melanoma tumor growth in mouse models. We use the simulations to generate virtual tumors and study their morphology and cell subtype populations as a function of time.

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Date submitted: 11 Nov 2014 Electronic form version 1.4