OAKLAND UNIVERSITY

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Assistant Professor Evgeniy Khain Models Malignant Brain Tumors

Assistant Professor **Evgeniy Khain**, of the **Department of Physics**, uses mathematical models to study the clustering of malignant glioma cells. A **glioma** is a type of incurable brain tumor. In the journal **Europhysics Letters**, Khain and his colleagues from Ohio State University and the University of Michigan published a paper about **Pattern Formation of Glioma Cells: Effects of Adhesion** (Volume 88, Article Number 28006), in which they compared Khain's numerical predictions to in-vitro experiments.

Khain's goal is to model the growth of malignant brain tumors that cannot be treated by current therapies. He formulates simple but insightful mathematical models to determine the role of basic biological processes--such as cell proliferation, cell motility, and cell-cell adhesion--in growth patterns of tumors. This novel and powerful approach may lead to a more effective and less destructive treatment for highly malignant brain tumors.

The abstract to their paper is reproduced below:

> "We investigate clustering of malignant glioma cells. In vitro experiments in collagen gels identified a cell line that formed clusters in a region of low cell density, whereas a very similar cell line (which lacks an important mutation) did not cluster significantly. We hypothesize that the mutation affects the strength of cell-cell adhesion. We investigate this effect in a new experiment, which follows the clustering dynamics of glioma cells on a surface. We interpret our results in terms of a stochastic model and identify two mechanisms of clustering. First, there is a critical value of the strength of adhesion; above the threshold, large clusters grow from a homogeneous suspension of cells; below it, the system remains homogeneous, similarly to the ordinary phase separation. Second, when cells form a cluster, we have evidence that they increase their proliferation rate. We have successfully reproduced the experimental findings and found that both mechanisms are crucial for cluster formation and growth."

SUMMARY
Assistant Professor Evgeniy Khain, of the Department of Physics, uses mathematical models to study the clustering of malignant glioma cells.

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