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ABOUT THE COVER

The cover image is a screenshot from an experiment used in an agent-based model of ecological dispersal theory applied to neoplastic progression. Resource limitation is an unavoidable consequence of exponential growth and thus a universal limitation on survival and reproduction within ecological systems. Intensive resource use generates competition tending to favor individuals who can escape resource limitation through dispersal. The model (constructed in Netlogo 4.0.2) tested whether high resource use through cell metabolism promotes the evolution of cell motility, in turn selecting for cancer cells with a dispersal phenotype allowing them to find resources in spite of local scarcity. The experiment on the cover introduced metabolically altered “neoplastic” cells (blue borders) into a population of “normal” cells (yellow-green borders). Higher (light red) and lower (dark red) concentrations of microenvironmental resources are reflected in the inter-cell spaces. The consumption, or metabolic, rate is 1.5-fold greater in neoplastic than in normal cells. As shown in this screenshot, an increasing number of neoplastic cells appeared at a middle time point of the experiment, throughout which neoplastic cells (i.e., cells with a higher metabolic rate) evolved higher rates of motility while the motility rate of normal cells remained low (not shown). This work suggests that an evolutionary, ecological framework can provide insights into the transition of benign to invasive and metastatic cells. See article by Aktipis, Maley, and Pepper (beginning on page 266) for more information.