Effects of Altruistic Tendencies on the Survival of Cells in a Simulated Environment

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Altruism is the tendency of individuals to behave in ways that benefit the whole at the expense of the individual. Due to the complexity of interactions between living organisms, it is challenging to ascertain the effect of altruism on group survival. However, the ability to measure the effects of altruism is important for understanding how individual behaviors relate to group success. To help answer questions related to altruism, this project consists of a computer program designed to simulate interactions between individual cells and measure survival outcomes of cell groups with different altruistic tendencies. Within the simulation each cell is modeled as a “black box,” having external characteristics but without internal functionality. Eight groups are allowed to interact with one another during each simulation. Each group consists of 5 to 10 cells differentiated by a set of values which define the behavior of cells within the group, with introduced random variation. Cells interact with other cells within their group via resource distribution, movement, and replication behavior. Cells are either healthy, dying or dead. Survival rate is the percentage of healthy cells remaining at the end of a simulation. Each group has an altruistic value dictating cell behavior, such as willingness to share resources. This value is between 1 and 3, least to most altruistic tendency respectively. Outcomes are sorted by altruistic value and ranked by mean survival rate. The final analysis demonstrates that groups with low-moderate altruistic values have a higher survival rate than groups with high altruistic values.

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