Mathematical modelling of globothalamean foraminiferal shells: testing energy-saving morphogenetic strategies

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The modification in the shell forms in calcareous (calcium carbonate, $CaCO_3$) foraminifera (protozoan), the unicellular organisms, reflects their adaptability in accordance with the prevailing physical and chemical ambience. A comparison of the requirement for secreting mineral matter in the different types of chamber arrangements in the serial and coiled tests has been attempted based on a new mathematical equation developed for this purpose. Insight into the model for energy-saving by these organisms in efficiently engineered tests shows the degree of advantages of developing uniserial to complex serial and coiled tests. Aspects related to the secretion of material, proportional to the energy saved by their adaptive capabilities, have been discussed. The study shows how the saved energy is utilized to attain larger and stronger adult tests by foraminifera, which one required under adverse micro-environments for better survival, which they adopted through the geological periods.

Keywords: Energy-saving strategies, foraminifera, globothalamean (coiled) tests, mathematical modelling.