

Categorical description of plant morphogenesis

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Incredible complexity, variability and beauty of living plants and their organs are caused by partially deterministic successive activity of the formative tissues called meristems. There is finite number of developmental processes and types of traffic relations at the cellular level common for all plants, which gives rise to the species-specific geometric structure of their organs and tissues. In this work the formalistic description of plant morphogenesis is presented. Spatial structure of tissues was described combinatorially as a simplicial object in the category of sets and using Haken approach by S. Matveev as a three dimensional manifold. Dynamical properties of the structure such as developmental changes of tissues and traffic relations between cells were described using the Petri nets formalism. The categorical language of data representation and analysis enabled to reveal basic principles of the programming of plant form and shape development.
