Abstract Submitted
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**Self-organization in non-equilibrium systems**[1] GEORGI GEORGIEV, Assumption College, GERMANO IANNACCHIONE, WPI — The question about why complex systems self-organize to reach more efficient and robust states is still without a satisfactory answer. We approach it from a physics perspective, where energy gradients lead to change in the structure of systems to ensure the most efficient energy transport. This approach stems from fundamental variational principles in physics, such as the principle of least action, which determine the motion of particles. We compare energy transport through a cell which has random motion of its molecules, and a cell which can form convection cells. We examine the sign of change of entropy, and the action needed for the motion inside those systems. The system in which convective motion occurs, reduces the time for energy transmission, compared to random motion. For more complex systems, this convection cells become a network of transport channels, for the purpose of obeying the equations of motion in this geometry. Those transport networks are an essential feature of complex systems in biology, ecology, economy and society in general. This approach can help explain some of the features of those transport networks, and how they correlate with the level of complexity of systems.

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