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A quantitative measure for organization of complex and co-evolving networks GEORGI GEORGIEV, Assumption College and Tufts University — To define evolution and self-organization in complex networks a quantitative measure for organization is necessary. Two systems should be numerically distinguishable by their degree of organization and their rate of self-organization. Here we apply as a measure for quantity of organization the inverse of the average sum of physical actions of all elements in a system per unit motion multiplied by the Planck's constant. The meaning of quantity of organization here is the number of quanta of action per one unit motion of an element. For example, a unit motion for electrons on a computer chip is the one necessary for one computation. This definition can be applied to the organization in any complex system. Systems self-organize to decrease the average action per element per unit motion in them. This is the attractor for a dynamical, nonlinear system evolving in time. Constraints increase this average action, so constraint minimization is a basic mechanism for action minimization. Increase of quantity of elements in the network, leads to faster constraint minimization through grouping, decrease of average action per element and motion and therefore faster self-organization and evolution.

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