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Remembering a Shape — Assembling a Memory ZORANA ZERAVCIC, ARVIND MURUGAN, MICHAEL BRENNER, School of Engineering and Applied Sciences and Kavli Institute for Bionano Science and Technology, Harvard University, STANISLAS LEIBLER, School of Natural Sciences, Institute for Advanced Study, Princeton and Laboratory of Living Matter, The Rockefeller University — Recently we have been developing a new connection between self-assembly and neural networks, where a multi-component particle system with specified interaction rules between its components is mapped onto a multi-state Hopfield neural network model. Within this framework, a fixed interaction pattern of neurons representing a "memory" maps to particle interactions encoding a certain structure. Properties of neural networks motivate new types of questions: Can the interaction energies of particles code for multiple structures at the same time? Can stored structures be retrieved by throwing in a nucleation seed (i.e., a small assembly of particles) and have it complete into the desired stored structure? Can we define a capacity, i.e., a maximal number of structures that can be retrieved with limited error? We investigate these questions using numerical simulations of different types of building blocks with short-range interactions.

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