

Hopfield, J. J.**Neurons with graded response have collective computational properties like those of two-state neurons.** (English) [Zbl 1371.92015](#)

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Summary: A model for a large network of “neurons” with a graded response (or sigmoid input-output relation) is studied. This deterministic system has collective properties in very close correspondence with the earlier stochastic model based on McCulloch-Pitts neurons. The content-addressable memory and other emergent collective properties of the original model also are present in the graded response model. The idea that such collective properties are used in biological systems is given added credence by the continued presence of such properties for more nearly biological “neurons.” Collective analog electrical circuits of the kind described will certainly function. The collective states of the two models have a simple correspondence. The original model will continue to be useful for simulations, because its connection to graded response systems is established. Equations that include the effect of action potentials in the graded response system are also developed.

MSC:[92B20](#) Neural networks for/in biological studies, artificial life and related topicsCited in **817** Documents**Keywords:**[McCulloch-Pitts neurons](#); [sigmoid input-output relation](#)**Full Text:** [DOI](#)