1128-68-203 **Predrag T. Tosic*** (predrag.tosic7@yahoo.com), School of EECS, and Department of Mathematics & Statistics, Washington State University, Pullman, WA 99164. *On Quantitative Models of Associative Memory from Discrete Dynamical Systems and Computer Science Standpoints.*

It has been argued that complex behavior in many biological systems, including human and animal brains, is to a considerable extent a consequence of high interconnectedness among the individual elements, such as neurons. Hopfield Networks are a popular mathematical and computational model of associative memory. It has been posited that the theoretically and experimentally established complexity of possible dynamics of Hopfield Nets is largely due to their typically high level of interconnectedness. We show, however, that many aspects of provably complex, and practically unpredictable, behavior can be obtained in very sparsely connected Hopfield networks. In particular, we have shown that the most fundamental problems about the memory capacity of an associative memory are computationally intractable, even for restricted types of networks that are uniformly sparse, with only a handful of neighbors per each node. One implication is that some of the most fundamental aspects of biological networks' dynamics do not require global or even local high density, in order to exhibit provably complex, computationally intractable behavior. (Received February 26, 2017)