A tug of war between nanodots

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Present computers are based on Von-Neumann architecture and pre-programmed software [1]. But the more complex the process, the bigger the computer becomes and the more power it consumes [2]. Therefore, another approach for highly complex information processing is now attracting much attention: neuromorphic systems. They are called neuromorphic because neuronal networks inspired their hardware. For example more efficient computing shall be achieved by parallel processing using highly interconnected network-structures. Another example are devices that work like inorganic synapses [3]. We developed such an atomic switch which is able to show short term and long term plasticity [4]. This is achieved by a silver filament growing towards the counter electrode, when a bias is applied.

Our next goal is to interconnect these memristor devices into a network to achieve a completely new type of neuromorphic system. In order to do so, we first want to show that it is possible to control the filament growth by a tug of war approach [5]. Will an established connection grow back, when a new one is established towards another counter electrode? To achieve this tug of war function, we will analyze electrode sizes and distances, because the number of atoms that can build such a filament should be limited.

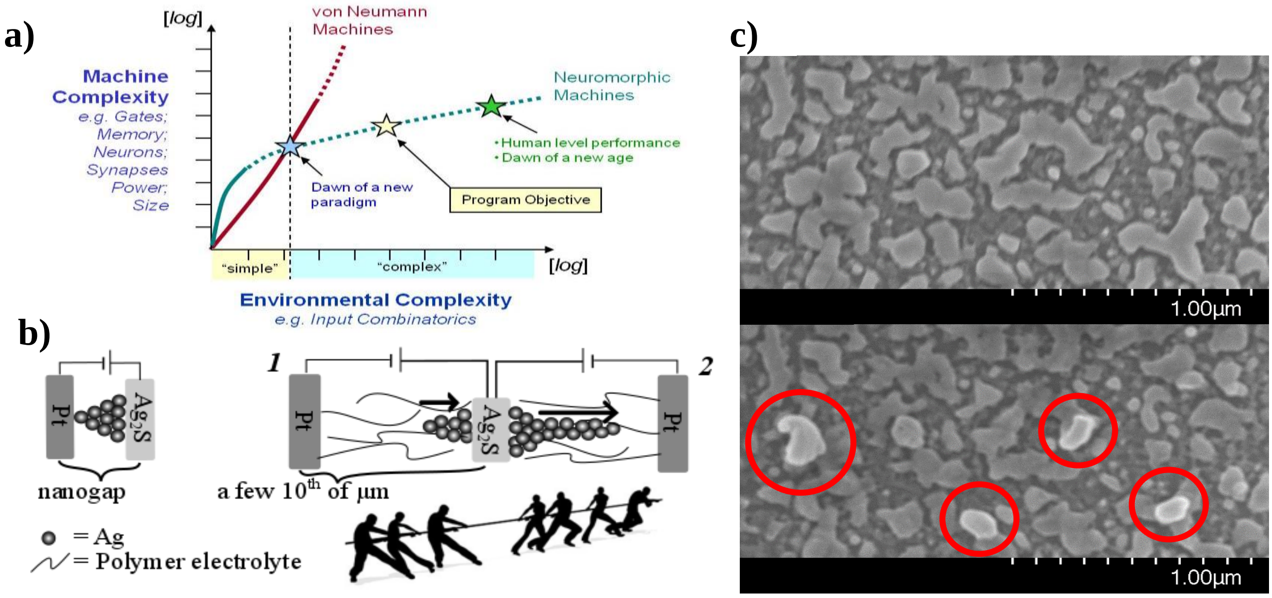

Figure 1 a) von Neumann Architecture vs. Neuromorphic Systems. b) left side: atomic switch as used for inorganic synapses; right side: tug of war switch as used for our experiments. c) formation of silver filaments from a Ag_2S electrode under e-beam of SEM.

Reference:

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