

Physics Colloquium

Michigan Technological University

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11:00 am

Room 139, Fisher Hall



Lotus Lotus everywhere: A journey from Neumann's computer to our central nervous system

Dr. Anirban Bandyopadhyay

International Center for Young Scientists,
National Institute for Materials Science (NIMS)
1-1 Namiki, Tsukuba 305-0044, Japan

Abstract:

In this talk, I will present an unconventional way of computation. I wish to build a massively parallel bio-processor combining four fields, namely molecular electronics, cellular automata, multi-valued logic and artificial neural network. The goal is to mimic functional properties of neuron into molecules and designed them in such a way that they function like cellular automata cells. In cellular automata, lots of cells that are arranged together communicate with each other parallelly-forming a complete pattern on the surface that leads to the final solution of the problem. The computation is nearly powerless with no central control, and therefore the solution is robust. Robust here implies even if a particular part is destroyed the process does not collapse. For the first time, we have realized such automata in practice. Furthermore, instead of confining our work onto the substrate, we have started building a complete architecture (one of the smallest yet most powerful machines that deal with 4 billion solutions is shown below). During designing neurons to information processing on the monolayer we found a few fundamental hidden truths. The most important one is the symmetry of lotus, which is abundant in nature, in logic, and now even in computation. In the generalized phase-symmetry relationship, we connected von Neumann computer with our Central Nervous System.

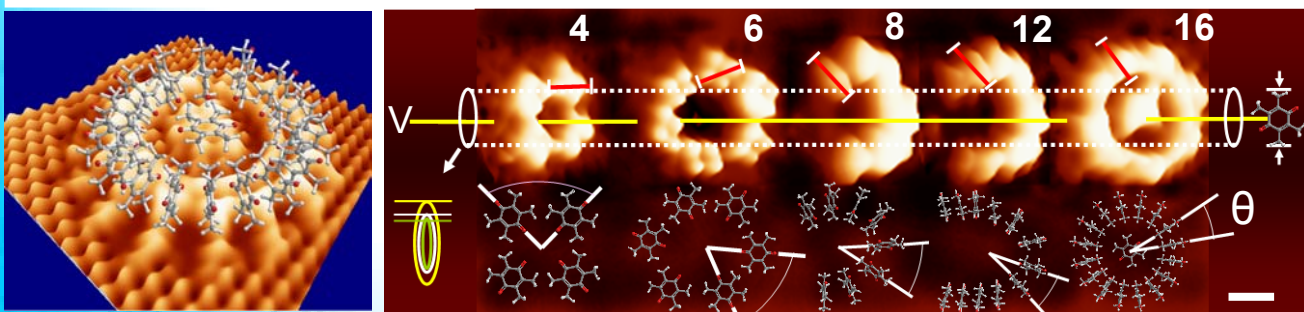


Image of smallest 2nm^2 yet most powerful processor, named as “nano-brain” capable of performing 16 works at a time; 16 times more powerful than the fastest processors of the world.