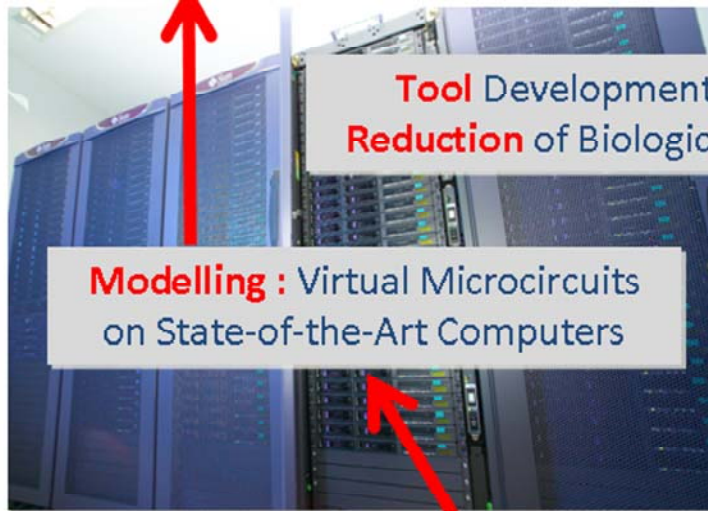


FACETS : Fast Analog Computing with Emergent Transient States

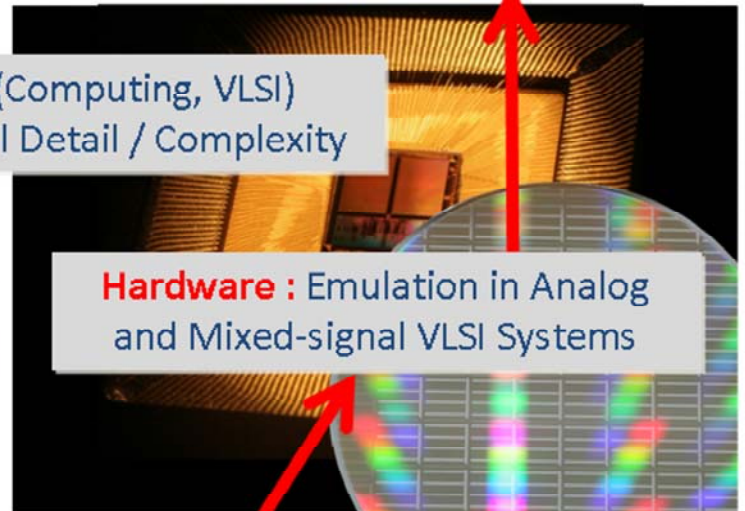
Common Goal : Study Non-classical Universal Computing Solutions

Benchmarking (Biology vs. Modelling vs. Hardware with Visual Tasks in VI)



Tool Development (Computing, VLSI)
Reduction of Biological Detail / Complexity

Modelling : Virtual Microcircuits
on State-of-the-Art Computers



Hardware : Emulation in Analog
and Mixed-signal VLSI Systems

Neurobiology : Structural and Functional Investigation of the Neocortical
Microcircuit and the Circuit Elements In-vivo and In-vitro

Contemporary IT systems

- Processor-memory based architectures with serial command execution (Turing)
- Pre-determined algorithms define capabilities and performance (software)
- Based on well defined reproducible states and well defined reversible time evolution
- Electronics implementation of Boolean operators, high power consumption
- Extremely high yield requirements, little fault tolerance
- Limited by atomic distance scale in components (nm) : **component limited**

→ **WELL UNDERSTOOD**

Neural computation

- Maximally parallel, non-linear computing elements with large diversity
- Time correlations drive the dynamics
- Learning by internal self-organisation and strong interaction with environment
- Low power consumption and high fault tolerance
- Limited by degree of complexity : **architecture limited**

→ **NOT UNDERSTOOD (listed as a major challenge for 21. century science)**