



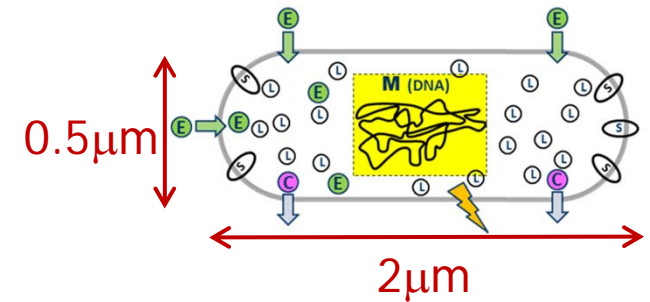
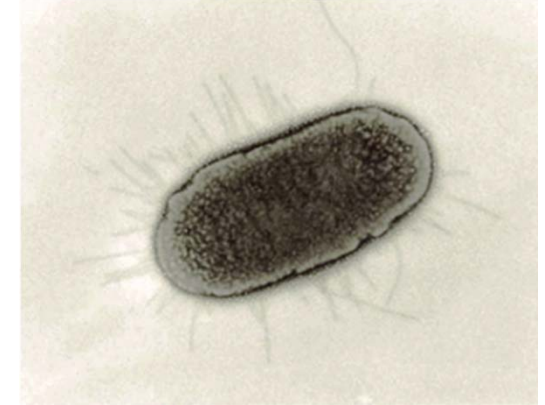
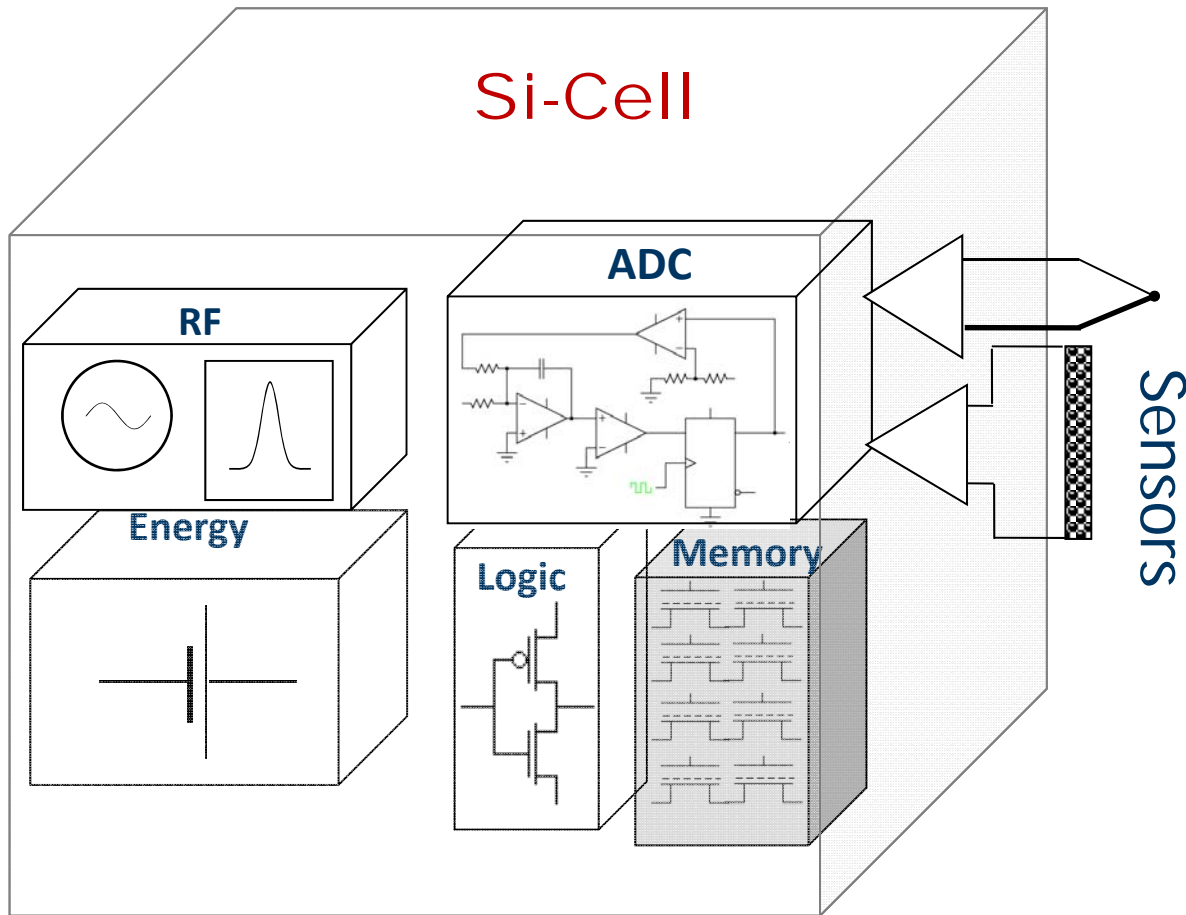
FISC colleagues; thanks for your excellent pre-work to identify research challenges

However I have a few extra-credit questions

Ralph K. Cavin, III
March 22, 2012

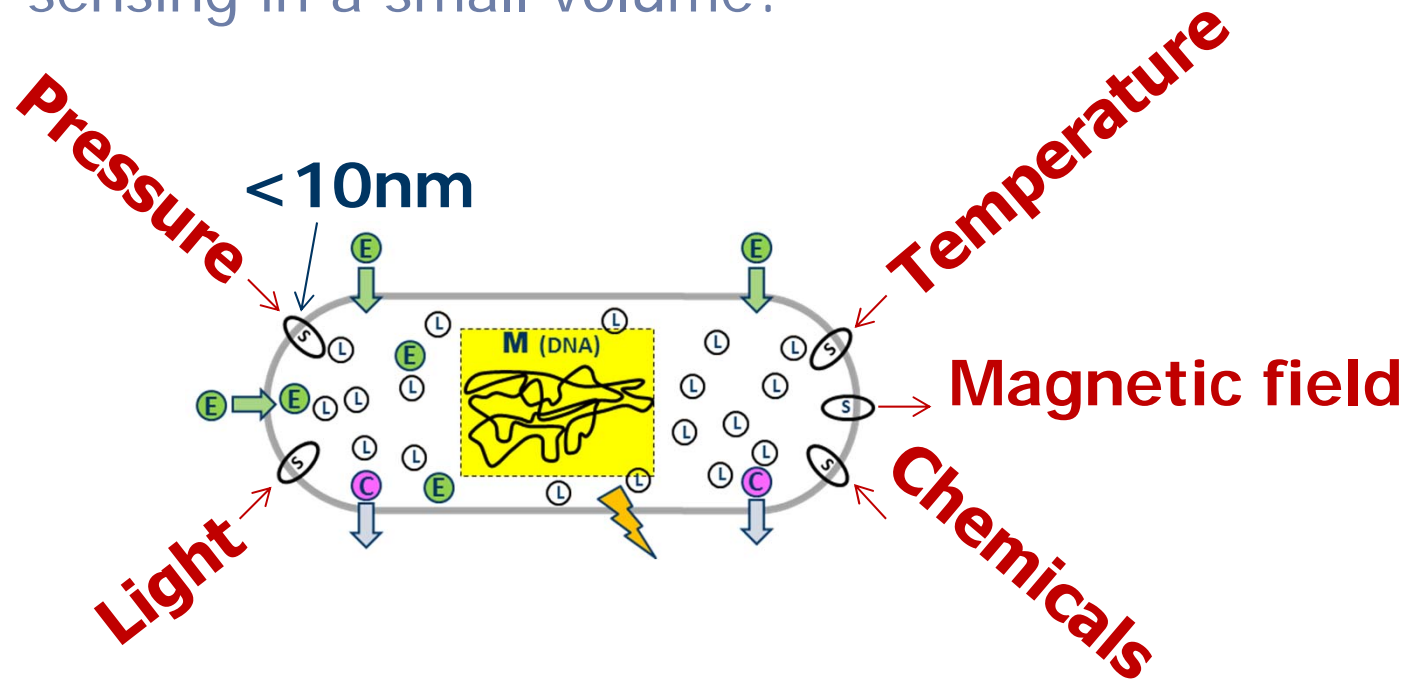


An Intelligent Integrated Sensor Node



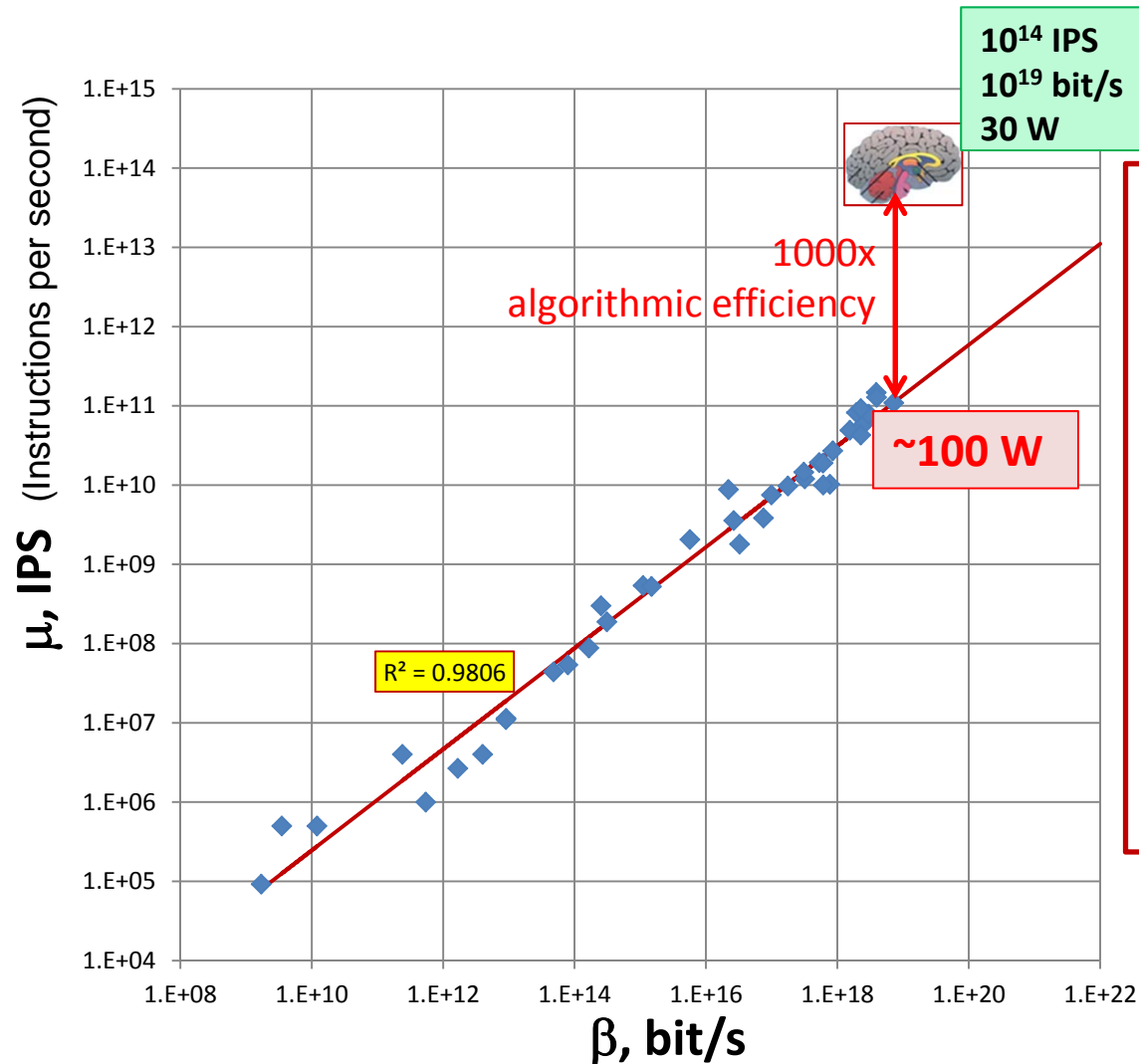
- E** 'Energy molecules', e.g. glucose
- L** 'Logic molecules', e.g. proteins
- C** 'Communication molecules'
- S** Sensor proteins

- There is a notion of Quantum Logic and Memory Devices
- Are there Quantum Sensors?
 - e.g. of nanoscale size and exploring quantum physics
 - Multi-sensing in a small volume?



Sensing for Intelligence?

Benchmark capability μ (IPS) as a function of β (bit/s)

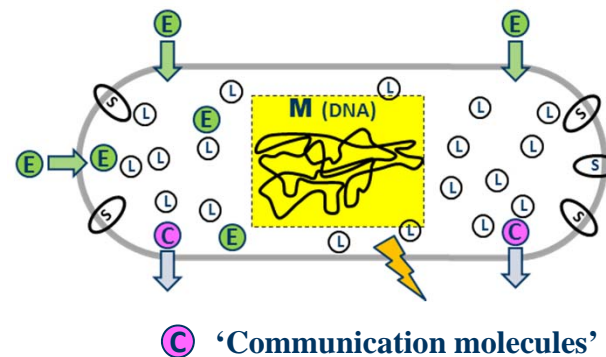


- It does not appear that the microprocessor trajectory will intersect the estimated brain performance
- The brain operates with multiple sensory organs
- Is it possible that IC's that sense are a necessary condition for intelligent computing?

What can we learn about information processing from Nature?

- Long-Distance Communication is a very expensive task
- Living cells communicate a lot, but
 - Long distance communication is not used by Nature!
- Swarm-facilitated communication?

A typical communication distance between bacteria
 ~10 μ m or 10x of cell size





Making Sense from Sensors?



- How can we effectively manage the explosion of data from a hyper-sensed world?
 - Challenge: Conversion of massive data into actionable information!
 - Are traditional approaches, e.g., digital pattern recognition, use of data-bases to extract meaning, etc. up to the task?
 - If not, what must be done?