Preliminary Musings on Molecular Computing

Molecular Computing Group

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**What Is A Molecular Computer?**

**DEFINITION:** An ability to program functions over some domain, in this case using molecular scale building blocks and perhaps biased toward the increasingly well understood existence proof of biological building blocks?

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What Does A Molecular Computer Do?

- Massively parallel computation
- Programmable nano/meso/macro structures
- Transduction between the macroscale and the bio/molecular scale
- Exploiting biological solutions to engineering problems (like sensing? others?)
- Better control of biological systems (disease states or other)
- More energy-efficient(???????)
How To Build a Molecular Computer

- Build operational molecular blocks
- Self-assembly seems key
- Interconnect functional blocks
- Programming
  - typical functional description (using a language)
  - by structure
Key Issues

- Controllability of blocks
  - structure
  - behavior

- Coupling information in and out
  - Electromagnetic (from RF to photonic)
  - Matter-mediated

- Interconnectivity
  - Active transport vs. diffusion
  - Concentration AND timing
  - Scaling issues

- Architecture for unreliable and/or short-lived components