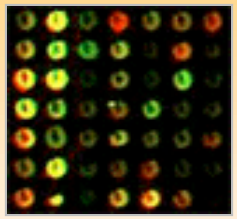
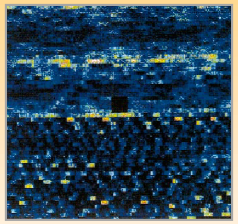
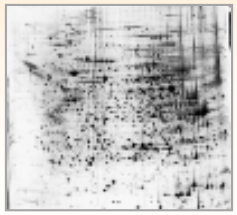
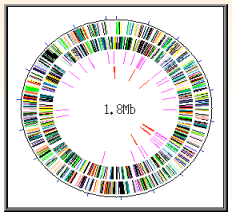
The Scientific Demand for *Modeling & Simulation*

High Throughput Data



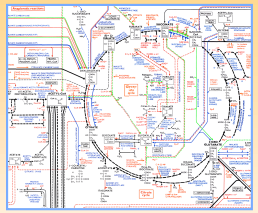


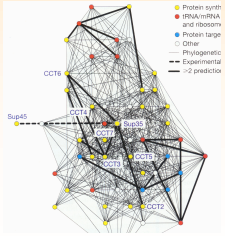


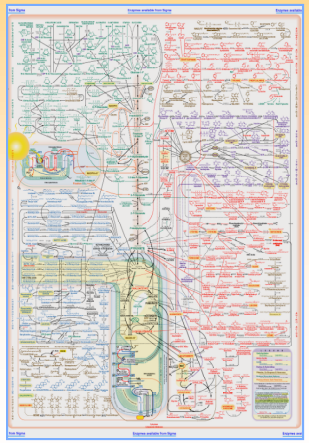


Data volume & cellular complexity **demand** formulation of in silico models

Cellular Complexity







Model-Driven
Biological Discovery / Systems Biology

*Increasing **R&D efficiency** and **productivity***

Model-Driven design, prototyping, and manufacturing

Microsoft Windows

intel inside pentium 4

Developing, implementing, and delivering model-driven research methodologies

1. Demonstrating how microbial models can drive biological discovery
   - Basic scientific understanding of energy-related biological systems (improve efficiency of discovery)
   - Bio-based economy, biomass-derived products
   - Bio-fuels
   - bioremediation

   Metabolic biochemistry at the systems-level
2. Tight integration with experimental approaches, guide experimental design
3. Illustrate how models provide the biological context for the integration of genomics, proteomics, metabolomics (focus on biologically driven integration as opposed to IT driven integration)
4. Demonstrated case studies with real biological impact! (Let the biology drive the math)

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5. Provide QA/QC of biological content in models to support Iterative Model Development
6. Distribution of Systems Biology/Modeling Platforms and Methodologies (visible impact)
7. Scalable modeling framework for examining cellular pathways on up to heterogeneous microbial populations (focused on metabolism)
8. Expectation management with the biological community (what data do I need?)