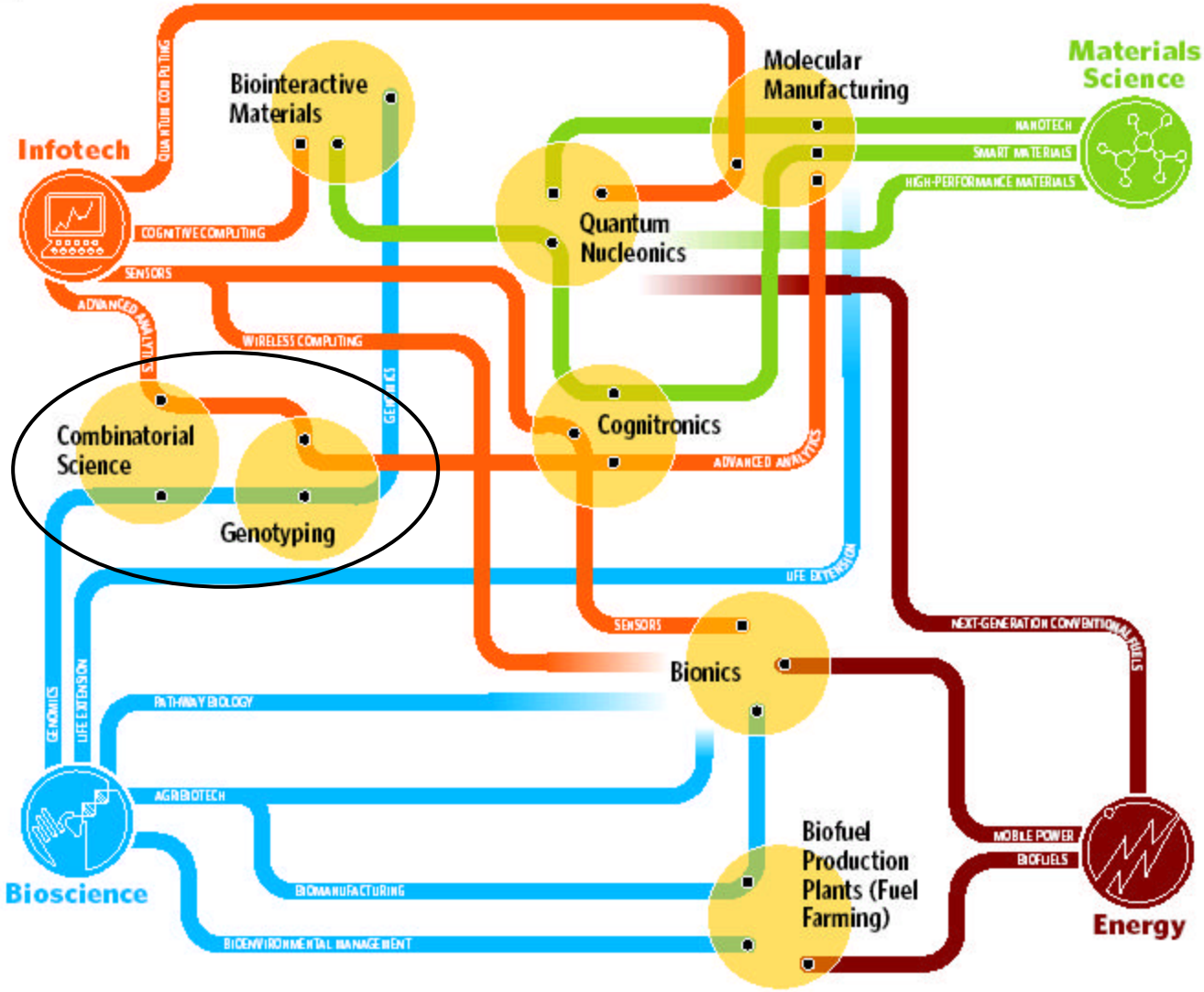
Bioinformatics @ NSF

Gary W. Strong
National Science Foundation

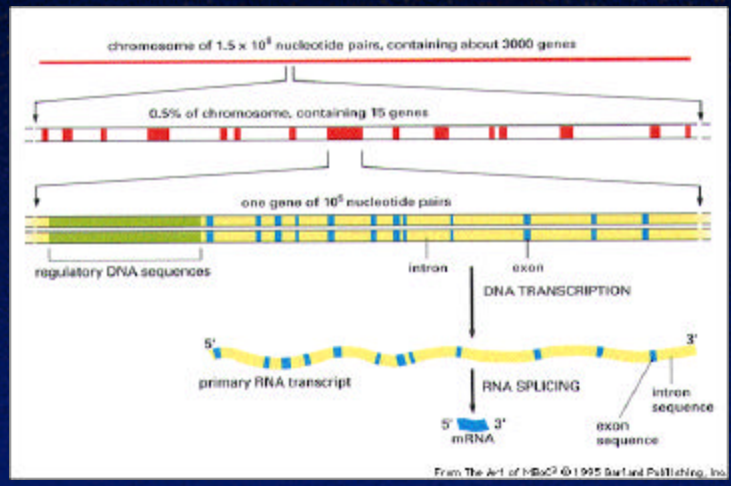
BUSINESS 2.0


Infotech
Biointeractive Materials
Molecular Manufacturing
Materials Science
Quantum Nucleonics
Cognitronics
Combinatorial Science
Genotyping
Bionics
Bioscience
Biofuel Production Plants (Fuel Farming)
Energy
QUANTUM COMPUTING
COGNITIVE COMPUTING
SENSORS
ADVANCED ANALYTICS
WIRELESS COMPUTING
GENETICS
NANOTECH
SMART MATERIALS
HIGH-PERFORMANCE MATERIALS
LIFE EXTENSION
NEXT-GENERATION CONVENTIONAL FUELS
PATHWAY BIOLOGY
GENOMICS
AGRIBIOTECH
BIOMANUFACTURING
BIOENVIRONMENTAL MANAGEMENT
MOBILE POWER
BIOFUELS

The Language of Biology is Information

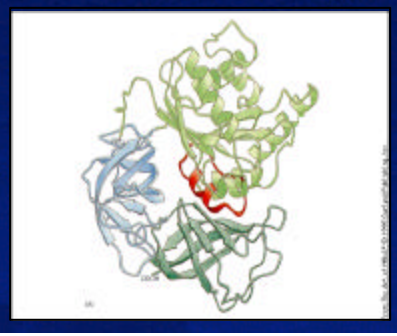
Gene Identification:

- Identification of exons, introns, and non-coding regions (approximately 10 exons per gene and 30,000 genes from Human Genome data)
- Sequence analysis and annotation of homologies, e.g. sequences that lead to similar 3D structural features that have implications for activity of the protein
- Evolutionary relationships across species.



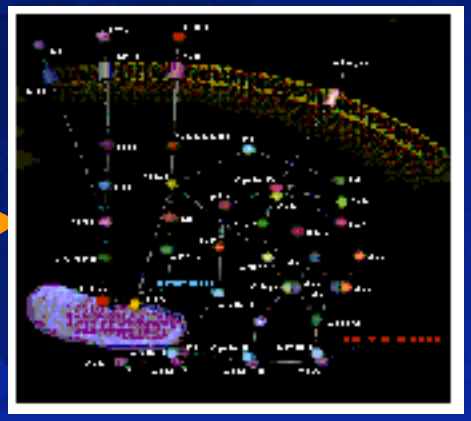
Structure prediction:

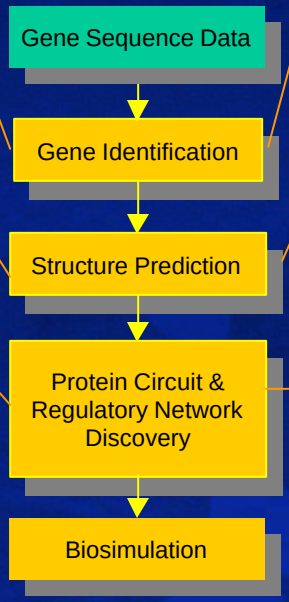
- Context sensitive grammars to predict structure from coding sequences
- Potential for modeling dynamic proteins, such as those that exhibit antigenic variability
- Computational models of protein evolution, e.g. for structure prediction from SNP sequences
- Combinatorial models for non-coding DNA role in regulatory circuits, such as timing of gene co-expression



Circuit Discovery:

- Tools for assigning meaning to protein interaction patterns
- Template extraction of protein-protein interactions within cells from scientific literature
- Construction of signal transduction networks
- Prediction of function effects from network disruption



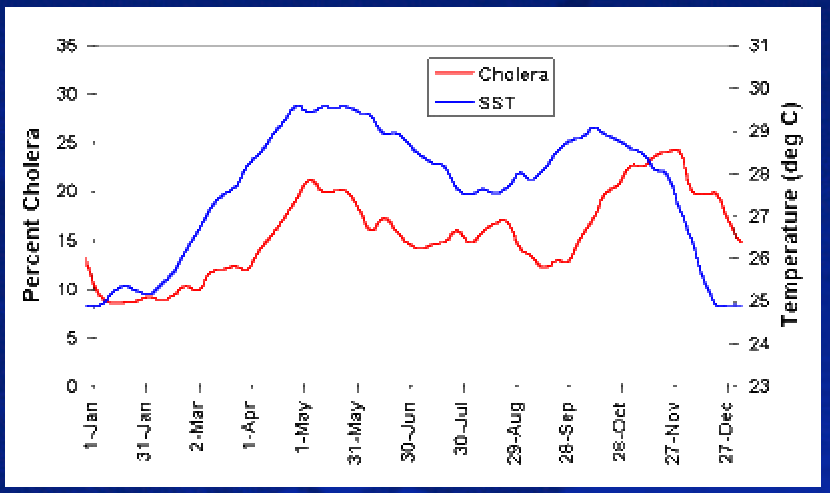


Also Need Research in …

Spatio-Temporally Indexed Models of Disease Events

Table 20.5 Large-scale changes in virus ecology introduced by humans

Air travel
Dams and water impoundments
Irrigation
Rerouting of wildlife migration patterns
Wildlife parks
Air conditioning
Blood transfusion
Xenotransplants
Long-distance transport of millions of head of livestock and birds
Moral and societal changes with regard to sex and drugs of abuse
Deforestation of massive proportions
Millions of used tires
Uncontrolled urbanization
Day care centers



Research at the Interface of Biology and Information Technology