

What is Genomics?

Genomics: The study of genes and their function.

(http://www.ornl.gov/TechResources/Human_Genome/glossary/glossary_g.html)

Genomics: The study of genomes.

Genetics: The study of inheritance.

Goodfellow (1997) *Nat. Genet.* **16**:209

Genomics (1980s): The systematic generation of information about genes and genomes (by DNA sequencing projects).

Brent (2000) *Cell* **100**:169

Functional genomics: The systematic generation and analysis of information about what genes do.

Brent (2000)

Genomics: The generation of information about living things by systematic approaches that can be performed on an industrial scale. (high-throughput; not necessarily hypothesis-driven) (“Baconian” -- J. Sulston)

Brent (2000)

Bioinformatics: The science of managing and analyzing biological data using advanced computing techniques. Especially important in analyzing genomic research data.

(http://www.ornl.gov/TechResources/Human_Genome/glossary/glossary_g.html)

Other terms:

transcriptomics

proteomics

peptidomics

metabolomics

...etc...

ecogenomics

toxicogenomics

pharmacogenomics

One person's view of Genomics

- **Structural genomics** –(parts list/inventory)
 - DNA sequences (nucleotide order)
 - gene structure (predicted or from genome-cDNA comparison)
(gene discovery)
 - gene organization (gene order, chromosomal localization; mapping)
 - chromosomal organization
 - genome structure
 - macrovariation (gene complement, diversity; genome organization)
 - microvariation – interspecific
 - microvariation – intraspecific (polymorphisms)
 - regulatory sequences
 - inter-genic regions
 - repetitive elements, mobile elements
- **Functional genomics**
 - gene regulation
 - expression of RNA (measured via cDNA)
 - known versus unknown (“gene discovery”)
 - microarray (cDNA vs. oligo) versus other methods
 - proteomics
 - protein function (high-throughput analysis of e.g. protein-protein interactions)?
 - structural biology (structure-function relationships)
 - gene pathways and networks and their regulation
 - effects of gene deletion (knock-out, knock-down, saturation mutagenesis)
- **Bioinformatics / computational biology**

	<u>Biomedical</u>	<u>Ecology & Evolution</u>
Structural genomics		
DNA sequences	Gene discovery	Biodiversity Genome evolution
Sequence variation: intra-specific (SNPs)	Pharmacogenomics Molecular epidemiology (<i>disease susceptibility,</i> <i>polygenic diseases</i>) Anthropology	Population biology Biogeography
Sequence variation: inter-specific		Molecular systematics Molecular evolution Biodiversity
Functional genomics		
Gene expression	Molecular medicine (e.g. cancer)	
	Toxicogenomics	Ecotoxicogenomics
	Pharmacogenomics	
	Developmental biology	Evo-Devo Eco-Devo
	Physiology	Environmental physiology; Physiological ecology; Adaptation
	Pathogenicity, Parasitism	Parasitism, Symbiosis
Proteomics		
Bioinformatics; Systems Biology	(integration)	(integration)