

MOLECULAR PHYLOGENY

Outline of Topics:

A Brief History of Phylogeny –

- ! Protein vs. nucleic acid informational characteristics.
- ! Compare and contrast cladistic vs. phenetic approaches.
- ! Polyphyletic vs. monophyletic regarding ancestors and traits.

Molecular methods –

- ! Analyses of naturally occurring microbial community structure and diversity.
- ! Every method has its biases.

Recent Revolution in Microbial Diversity –

- ! The discovery of three Domains.
- ! Controversy over the three Domains.
- ! Rooting the “Big Tree” with duplicated genes.
- ! Fundamental lessons from the “Big Tree.”

Algorithms as Models of Evolution –

- ! Compare and contrast character-based vs. distance approaches.
- ! How does the theory of parsimony fit into current evolutionary models.
- ! Maximum Likelihood as a method based on probability.
- ! The neutral theory of molecular evolution (effects on molecular phylogeny).
- ! Statistics in molecular phylogeny compared with experimental phylogenetics.
- ! Which algorithm is the best tool for the job.

Molecular Clock-Speed –

- ! Clock-speed in evolution and its relationship with the fossil record.
- ! Relative rates of evolution for the three Domains.
- ! Processes that alter clock-speeds at various levels of genetic organization.

Molecular Perspectives on the Origins of Life –

- ! Detecting the mythical urkaryote.
- ! Endosymbiosis theory regarding origins of mitochondria and chloroplasts.
- ! The phylogeny of hominid primates, examine the “Out of Africa” concept.