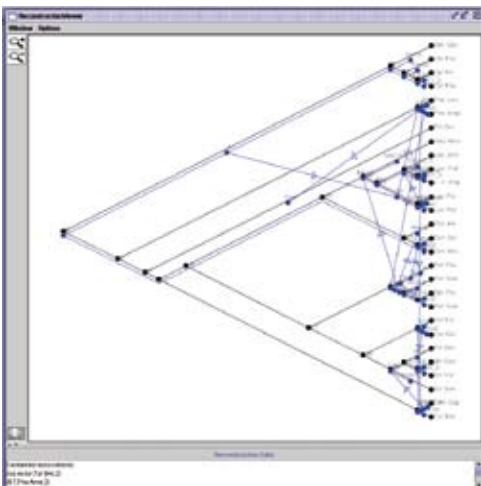


## KEYWORDS

- » Phylogeny
- » Swarm Intelligence
- » Complex Systems
- » Parallel Computing



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## PHYLOGENY AND SWARM INTELLIGENCE

Gene orders of the mitochondrial genome of species can be used to infer information about their phylogeny. Rearrangement scenarios for the gene orders with respect to possible rearrangement operations can be used to measure the phylogenetic distance between the species and to reconstruct corresponding phylogenetic trees. The research group of Prof. Dr. Martin Middendorf develops algorithms to find the most "plausible" rearrangement scenarios where constraints are respected that are imposed by gene groups which should not be destroyed by rearrangement operations.

Hosts and their parasites are model systems for the study of coevolution. The group has developed a software tool for the reconstruction of the common history of host and parasite taxa. An event model of evolution is used where transformation events like cospeciation of host and parasite or host switch have assigned costs. Starting with the current host-parasite associations and the host and parasite phylogenies the tool finds cheapest feasible reconstructions.

Swarm Intelligence is a field of optimization that is inspired by the behaviour of natural swarms. The group developed new methods in this field that use principles of communication and decision making of social insects. These methods are applied to study problems of emergent organisation in biomolecular systems.

## SELECTED REFERENCES

- MERKLE, D.; MIDDENDORF, M.  
Reconstruction of the Cophylogenetic History of Related Phylogenetic Trees with Divergence Timing Information. *Theory Bioscienc.* 4 (2005), 277-299.
- MERKLE, D.; MIDDENDORF, M.  
Dynamic Polyethism and Competition for Tasks in Threshold Reinforcement Models of Social Insects. *Adaptive Behavior* 12 (2004), 251-262.
- BERNT, M., MERKLE, D. AND MIDDENDORF, M.  
A Parallel Algorithm for Solving the Reversal Median Problem. *Proceedings of Parallel Bio-Computing Workshop (PBC'5)* 2005.