

paper outline

Section 1: Fundamental Concepts

- **Subsection: Fitness** (Jose)
 - e.g., fitness as an outcome rather than a “cause”
- **Subsection: Fitness Landscapes** (Bhaskar)
 - may also mention genotype-phenotype map
 - See “unclaimed refs RE local optima/evolvability/genotype-phenotype maps” in [issue 9](#)
- **Subsection: Phenotypic Plasticity** (Anselmo/Nick)
 - incl lifetime learning, epigenetic memory?
- **Subsection: Ecology and Coevolution** (Luis/Emily/Any)
- **Subsection: Population Genetics** (Alex)
 - sweeps and time to fixation
 - bottlenecks and effective population size

Theme: Existing Connections

Sections:

- **2. Theory Application: Selection Schemes** (Jose)
 - A suite of diagnostic metrics for characterizing selection schemes
- **3. Theory Application: Diversity Measures** (Shakiba)
 - What Can Phylogenetic Metrics Tell Us About Useful Diversity in Genetic Algorithms
 - Untangling Phylogenetic Diversity’s Role in Evolutionary Computation
 - perhaps useful to give a general overview of “biodiversity” theory/measures?
 - correspondences/contrast to typical EC measures (e.g., https://gpbib.pmacs.upenn.edu/gp-html/Nguyen_2006_ASPGP.html)?
- **4. Theory Application: Diversity Maintenance** (Emily)
 - Applying Ecological Principles to Genetic Programming
 - Ecological Theory Provides Insights about Evolutionary Computation
 - Reachability Analysis for Lexicase Selection via Community Assembly Graphs
 - comparison/contrast with e.g., <https://doi.org/10.1145/3638530.3648430>, <https://arxiv.org/pdf/1801.10087>?

Theme: Promising Opportunities

Sections:

- **5. Biological Perspectives on Variation Operators** (Nick/Anselmo)
 - e.g., recombination asymmetries (modularity?), horizontal gene transfer, etc.
 - correspondences/contrasts with schemata/building block theory?
- **6. Biological Perspectives on Local Optima** (Vinnie)
 - could also frame title as “premature convergence” rather than “local optima”
 - might connect adaptive momentum to fitness peak escape, exploration vs. exploitation (eg super-explorers)?
 - see “unclaimed refs RE local optima/evolvability/genotype-phenotype maps” in [issue 9](#)
- **7. Biological Perspective on Population Structure** (Oana)
 - draw connections/contrasts with EC theory around “island model” populations?(e.g., “46.3 On the Spread of Information in Parallel EAs” in https://doi.org/10.1007/978-3-662-43505-2_46)
- **8. Biological Perspectives on Coevolution** (Any)
- might compare/contrast with “cooperative/competitive” coevolution” framing in EC
- might reference early work by Richard Watson (e.g., <https://www.cs.brandeis.edu/~richardw/symbiosis/>)
- **9. Biological Perspectives on Evolvability** (Bhaskar)
 - might compare/contrast dynamic “evolution of evolvability” perspective with more static genotype-phenotype map design framing?
 - see “unclaimed refs RE local optima/evolvability/genotype-phenotype maps” in [issue 9](#)
- **10. Evolutionary Computation Insights on Evolvability** (Matthew)
 - learning theory/generalization (e.g., <https://doi.org/10.1371/journal.pcbi.1005358> <https://doi.org/10.1016/j.tree.2015.11.009>)