paper outline

Section 1: Fundamental Concepts

- Subsection: Fitness (Jose)
 - e.g., fitness as an outcome rather than a "cause"
 - Biological and EC fitness definitions
 - How does this inspire EC algorithms?
 - How is this captured within EC?
- 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/Anya)
- Subsection: Population Genetics (Alex)
 - sweeps and time to fixation
 - bottlenecking and effective population size

Theme: Existing Connections

Sections:

- 2. Theory Application: Selection Schemes (Jose)
 - A suite of diagnostic metrics for characterizing selection schemes
 - What can handcrafted search spaces tell us about selection scheme mechanism?
 - How are they applicable to real-world scenerios?
- 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 (Anya)
 - 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/10.1016/j.tree.2015.11.009)