Welcome to the first

EvoEvo Workshop

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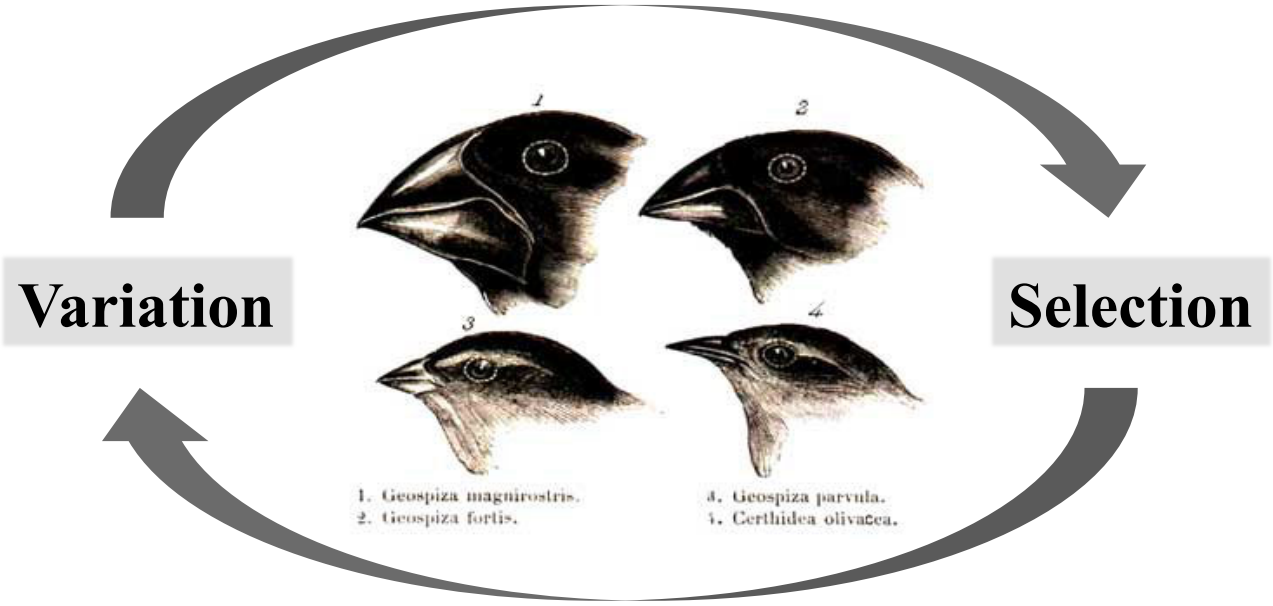
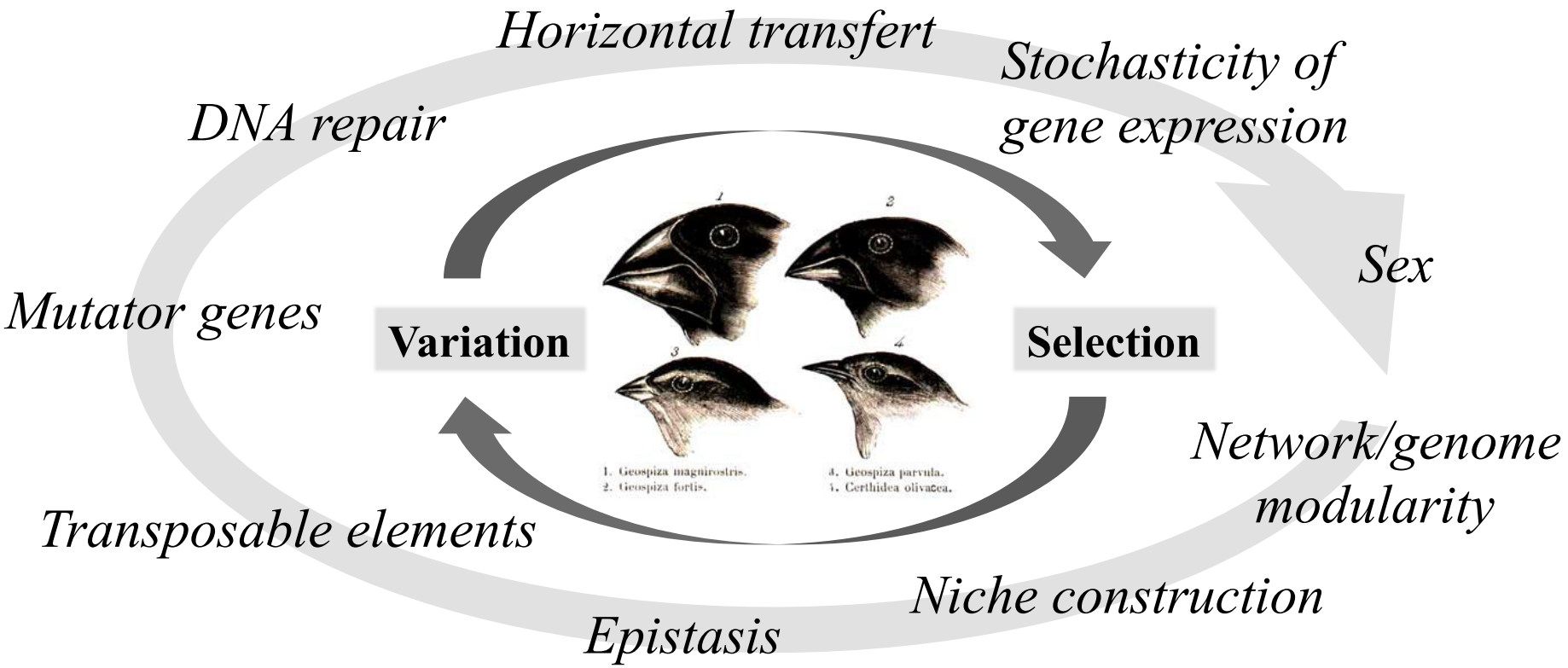
What EvoEvo?



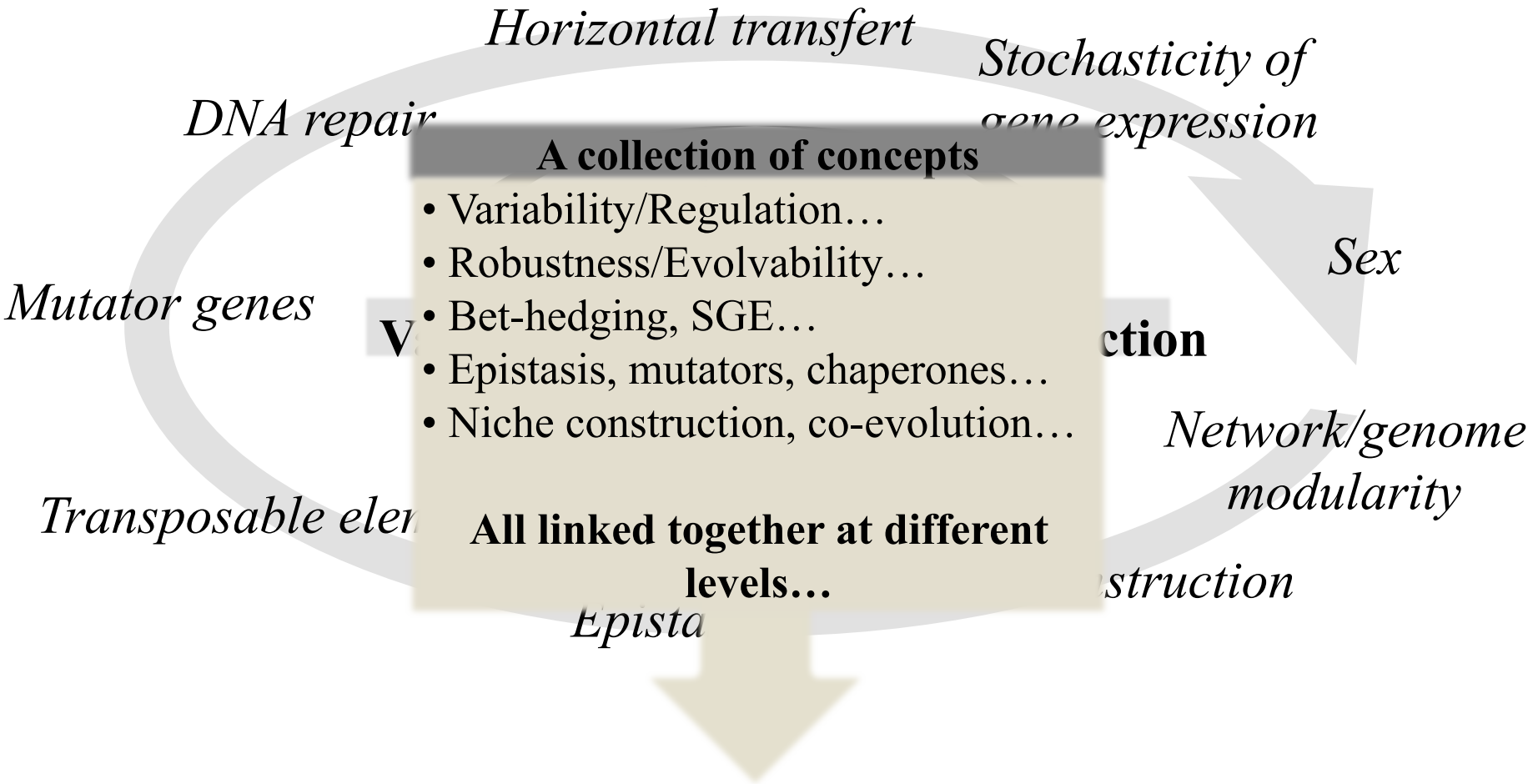
- The canonical view of evolution: an algorithmic optimization process with two alternating steps…
  - Popularized by population genetics, evolutionary computation, artificial life…

What EvoEvo?



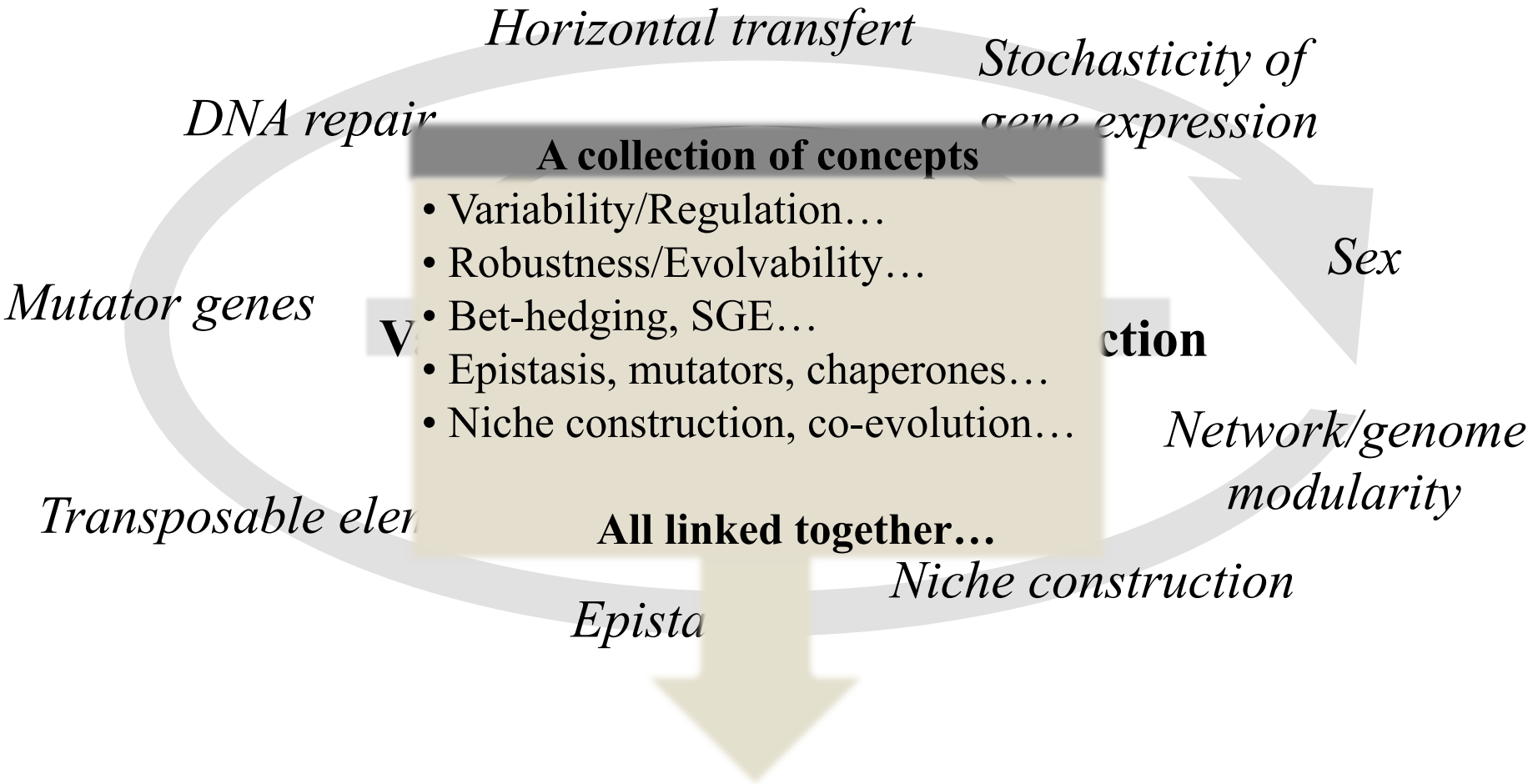
- Variation and selection are directly regulated by many processes that are themselves products of evolution.
  - → This results in the ability of evolution to self-modify its operators, hence its dynamics

Why EvoEvo?



We need an integrated concept to develop an integrated view

Why EvoEvo?


Horizontal transfert
Stochasticity of
gene expression
DNA repair
A collection of concepts
• Variability/Regulation…
• Robustness/Evolvability…
• Bet-hedging, SGE…
• Epistasis, mutators, chaperones…
• Niche construction, co-evolution…
Sex
Mutator genes
ction
Network/genome
modularity
Transposable eler
All linked together…
Niche construction
Epista
Evolution of Evolution
"EvoEvo"

Agenda

10:00-10:15 - Welcome + introduction (G. Beslon)
10:15-11:00 - The Role of Gene Origin in the Evolution of Evolvability (L. Altenberg)
11:00-11:20 - ***Coffee break***
~~11:20-11:35 - In vivo and in silico evolution experiments highlight signatures of "evolution of evolution"~~
11:35-11:50 - Quantitative Changes Underlie Robustness and Evolvability in an Experimentally Tractable Gene Network (A. Crombach, K. Wotton, E. Jimenez-Guri, J. Jaeger)
11:50-12:15 - Towards an Integrated Evolutionary Model to Study Evolution of Evolution (C. Rocabert, C. Knibbe, G. Beslon)
12:15-12:40 - Experiments with cascading design (B. Kovitz)
12:40-12:55 - Properties of Compensatory Mutation in Artificial Gene Regulatory Networks (Y. Wang, J. J. Bryson, N. K. Priest)
13:00-14:00 - ***Lunch***
14:00-14:45 - Tools and techniques to understand the evolutionary origins of modularity (J-B. Mouret)
14:45-15:10 - Endless evolutionary paths to Virtual Microbes (T. Cuypers, P. Hogeweg)
15:10-15:25 - Requirements for Open Ended Evolution in Natural and Artificial Systems (T. Taylor)
15:25-15:40 - Subspace Clustering for all Seasons (S. Peignier, C. Rigotti, G. Beslon)
15:40 - ***Closure and tea break***

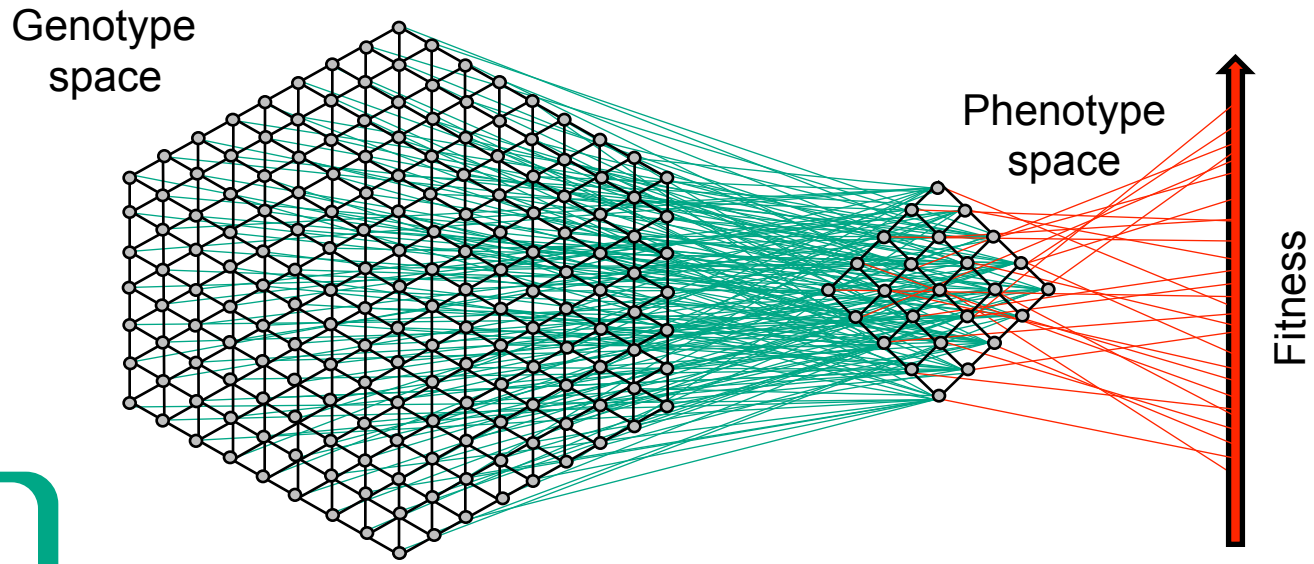
What EvoEvo?

Variation and Selection are the two core processes of Darwinian Evolution. Yet, both are directly regulated by many processes that are themselves products of evolution (e.g. DNA repair, mutator genes, transposable elements, horizontal transfer, stochasticity of gene expression, sex, network modularity, niche construction…). This results in the ability of evolution to self-modify its operators, hence its dynamics. We call this process "Evolution of Evolution" or EvoEvo. Different EvoEvo strategies have been proposed in the literature, including regulation of variability, robustness/evolvability strategies, bet-hedging… However, most of these strategies are poorly characterized and the conditions under which they evolve as well as their consequences are generally unknown.

The aim of the EvoEvo workshop is to seek for a unified theory of Evolution of Evolution by studying its biological mechanisms, evolutionary consequences and possible applications to bioinspired computation. The EvoEvo workshop is an initiative of the EvoEvo consortium funded by the FP7 EU-FET grant EvoEvo (ICT-610427).

How EvoEvo?

- Microorganisms are adapted *to evolve*
  - Evolution has optimized their ability to evolve as a primary mean to react to environmental changes
  - This optimisation process is the *Evolution of Evolution*
  - It is based on the evolution of the *genotype-to-phenotype mapping* and of the *fitness landscape*



(Figure from Stadler & Stephens, 2003)

EvoEvo: The key concepts

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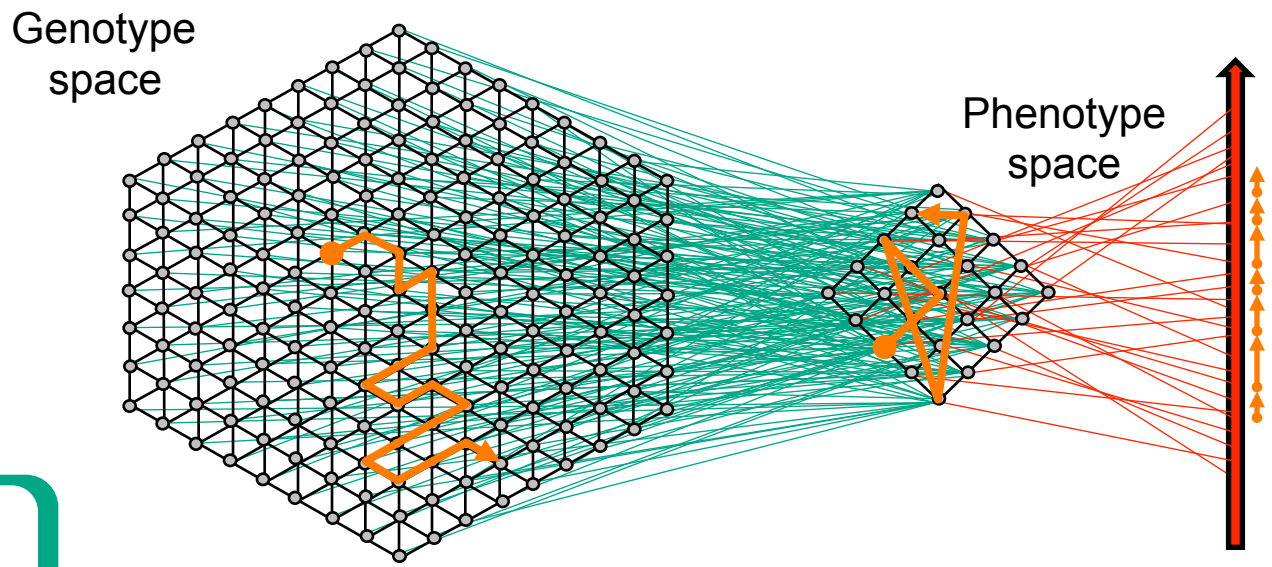

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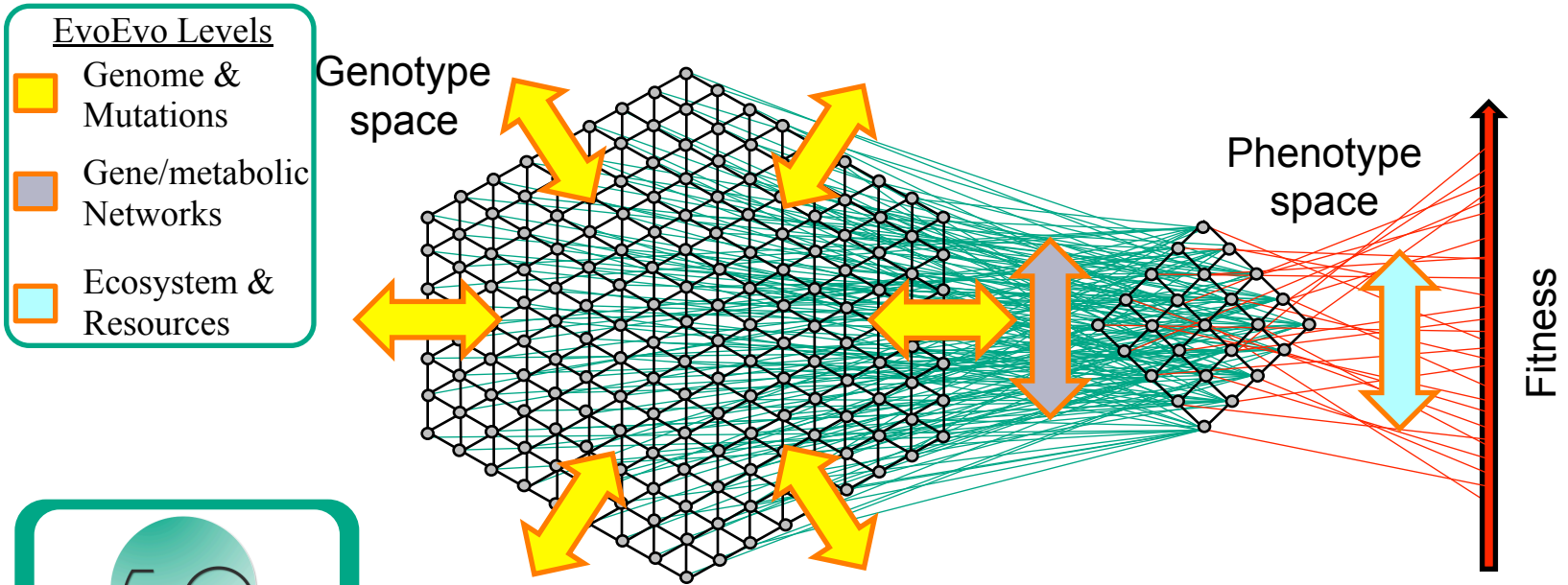

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