



University of
Zurich^{UZH}

About Me: Rie Shimizu-Inatsugi

Group leader

Evolutionary Biology and Environmental Studies, UZH



University of
Zurich^{UZH}

PostDoc

Marie-Heim Vögtlin Program (SNF)

Group leader



東京大学
THE UNIVERSITY OF TOKYO

Bachelor

Master

PhD

PostDoc (Higashiyama Lab)

ETH zürich

teaching some student courses

Main research interest: Evolutionary biology, Plant ecogenomics

Tree of Life -Truly Tree?-

Rie Shimizu-Inatsugi

University of Zurich

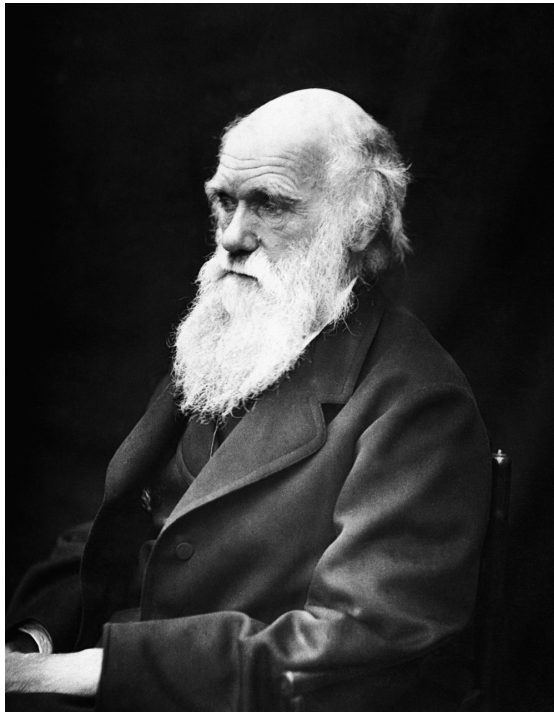
Evolutionary Biology and Environmental Studies



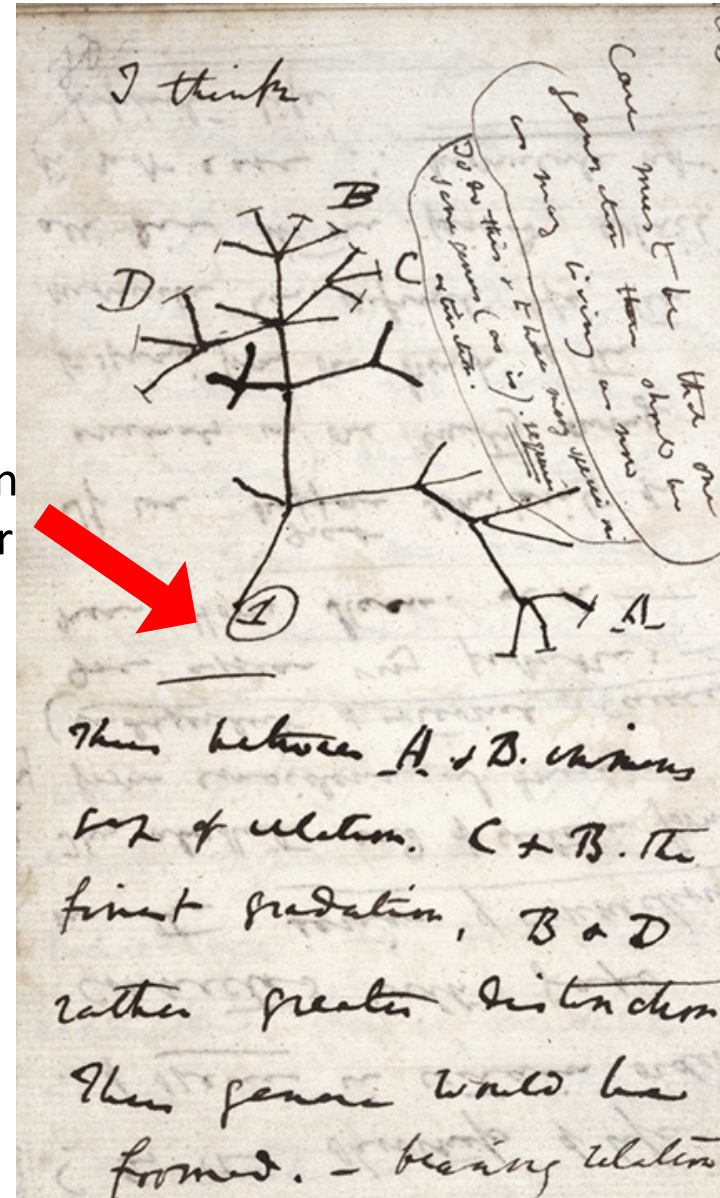
Early Idea of 'Tree of Life'

1837

Charles Darwin (1809 - 1882)
Father of Evolutionary Biology



Common Ancestor





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Truly Tree?



Feature of Tree

Canopy
Contemporary
Species

Expand as fan
Diversification

Branching
Speciation

Root
Common ancestor



No 'crossing' btw. branches is assumed

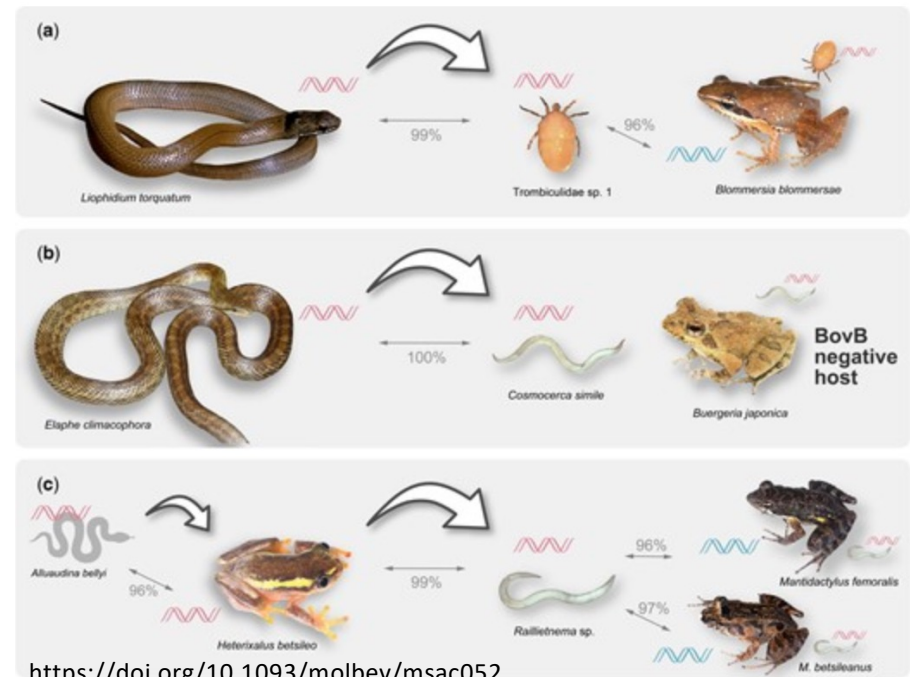
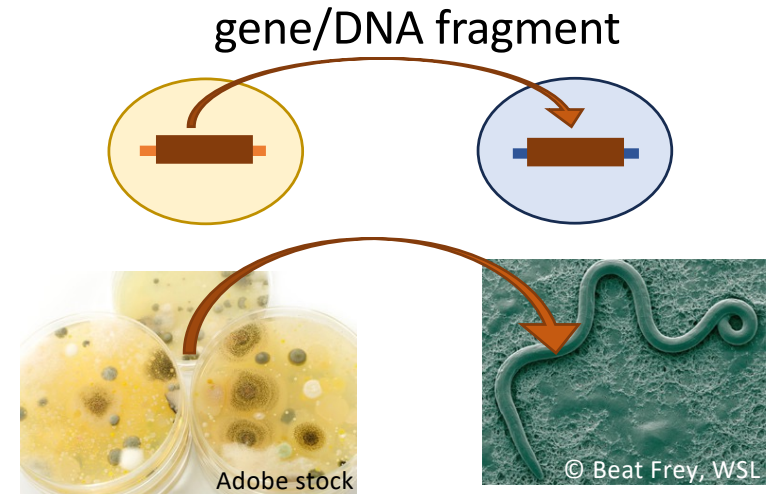
Many Types of 'Crossing' in real evolution

Ex. 1. Horizontal Gene Transfer

Bacterium to Bacterium
 Antidrug resistant genes

Fungi/Bacteria to Nematodes
 Cell wall digesting genes

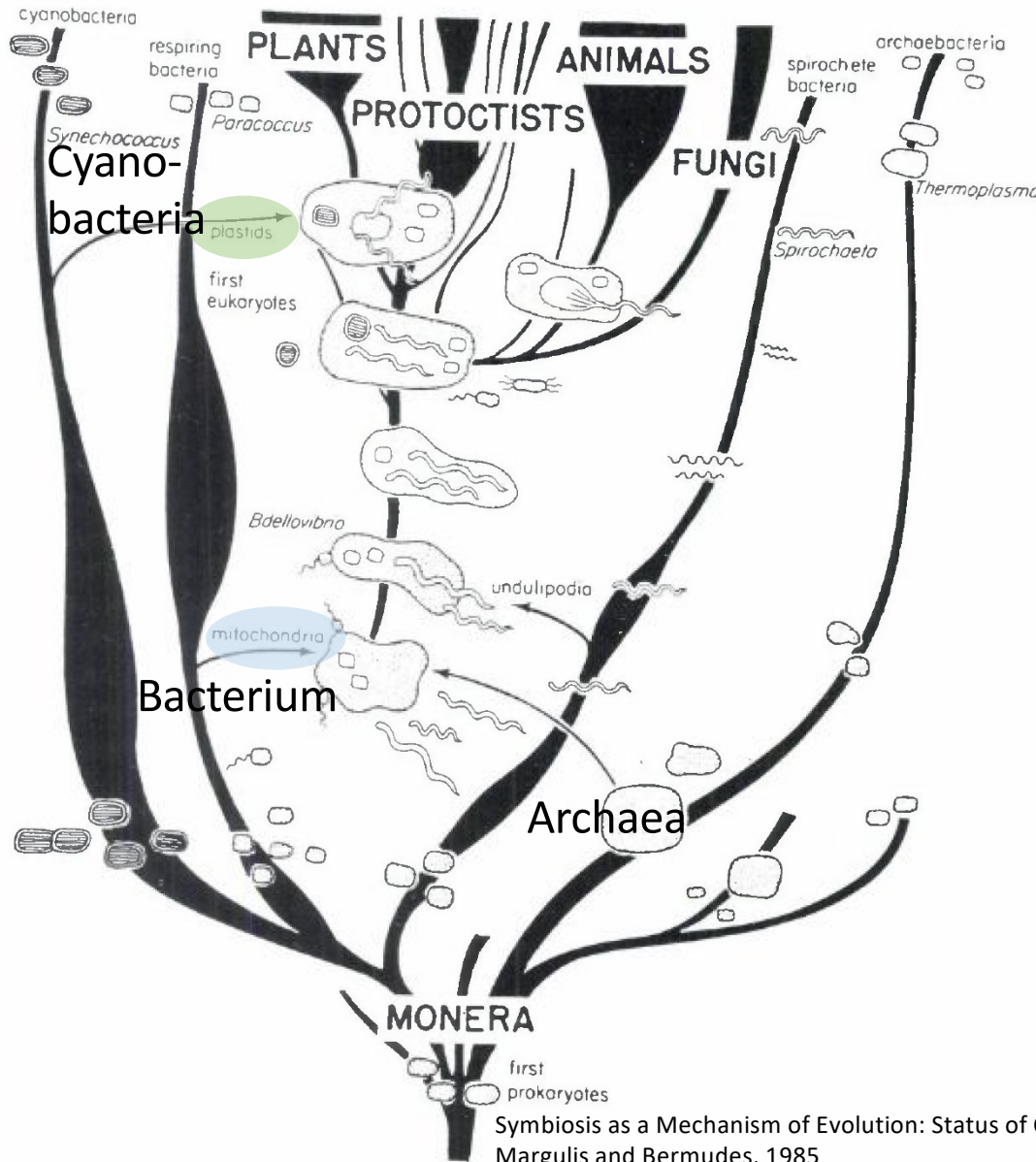
Multiple species
 BovB Retrotransposon
 in Madagascar



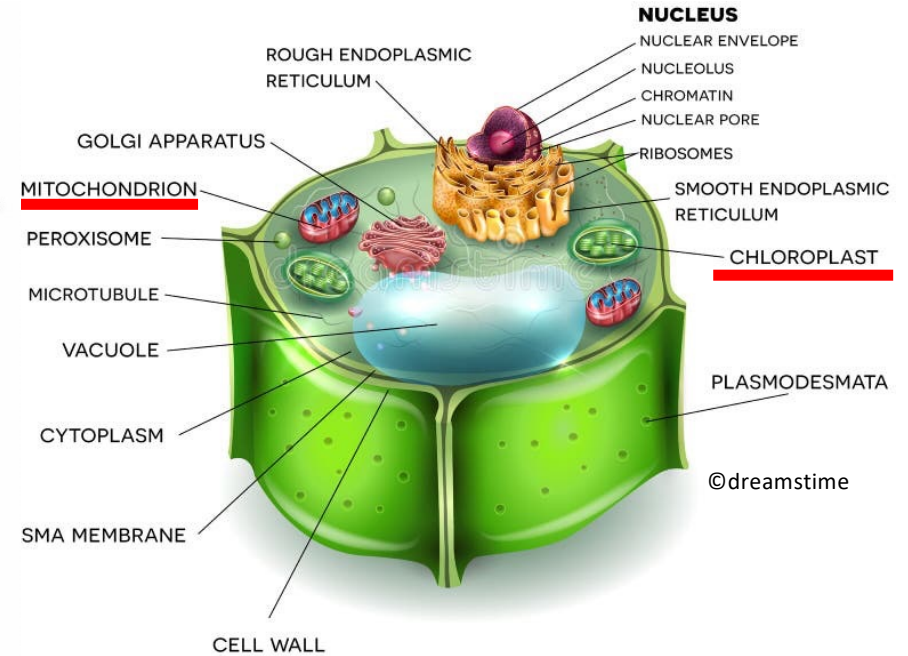


Ex. 2. Endosymbiosis

Eucaryote



Subcellular organelle in plant cell



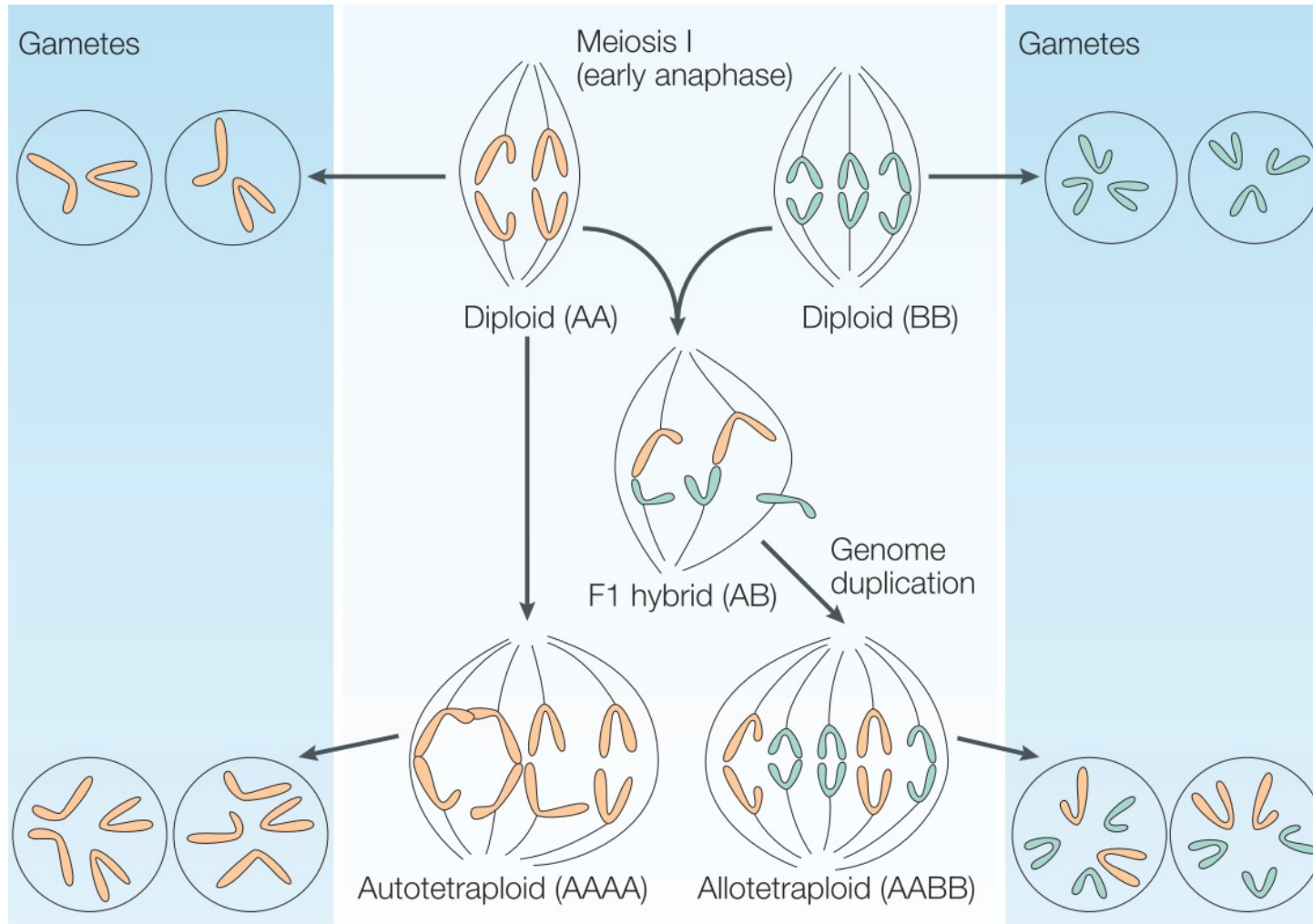
Mitochondria <- Aerobic Bacterium
Respiration

Chloroplast <- Cyanobacterium
Photosynthesis

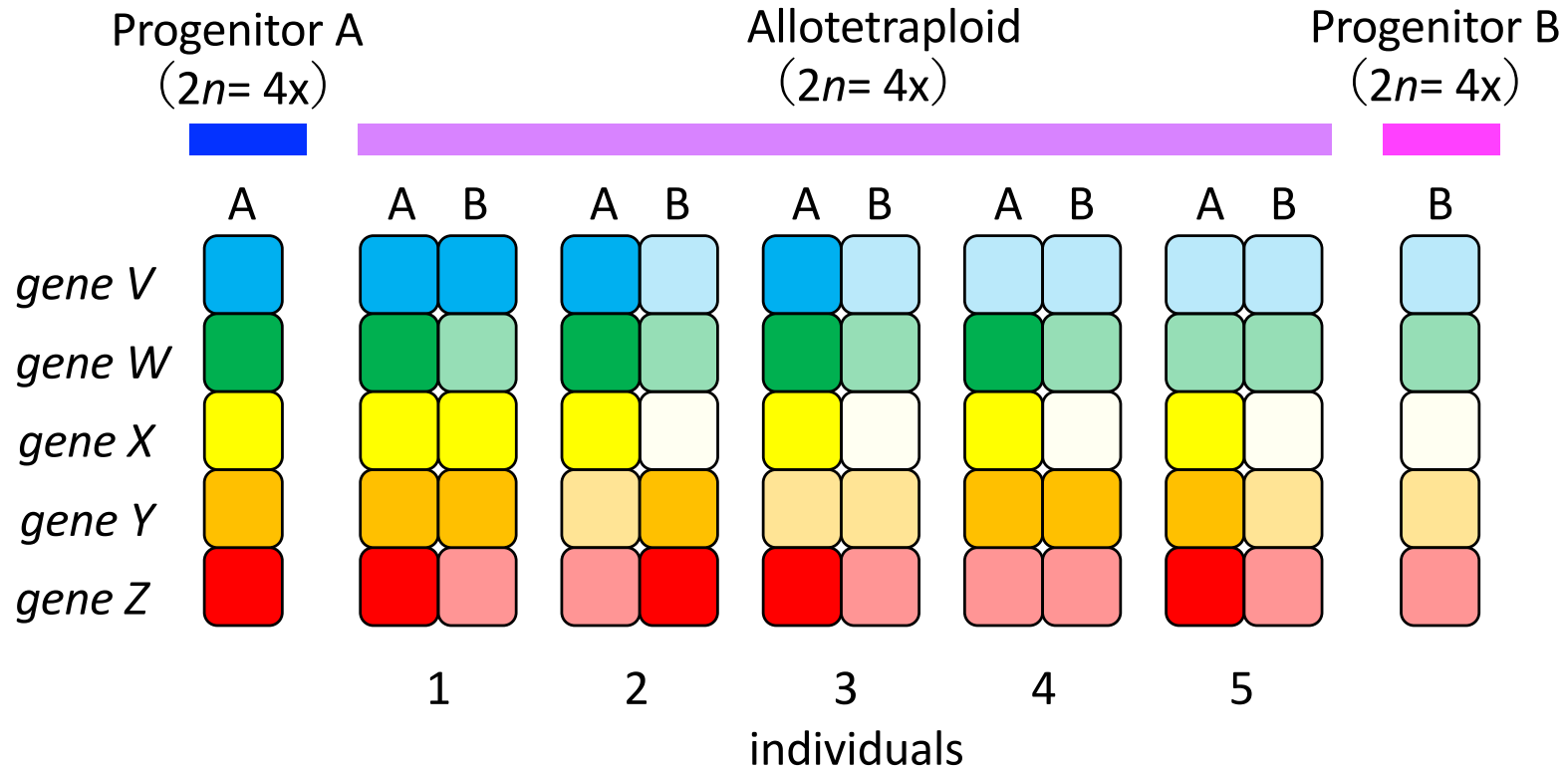
1-2 Billion years ago



Ex. 3. Allopolyploidization (Whole Genome Duplication)



Variety in transcriptome



New phenotypes

Chance of more evolvability



Many important crops are polyploid

hybrid vigor

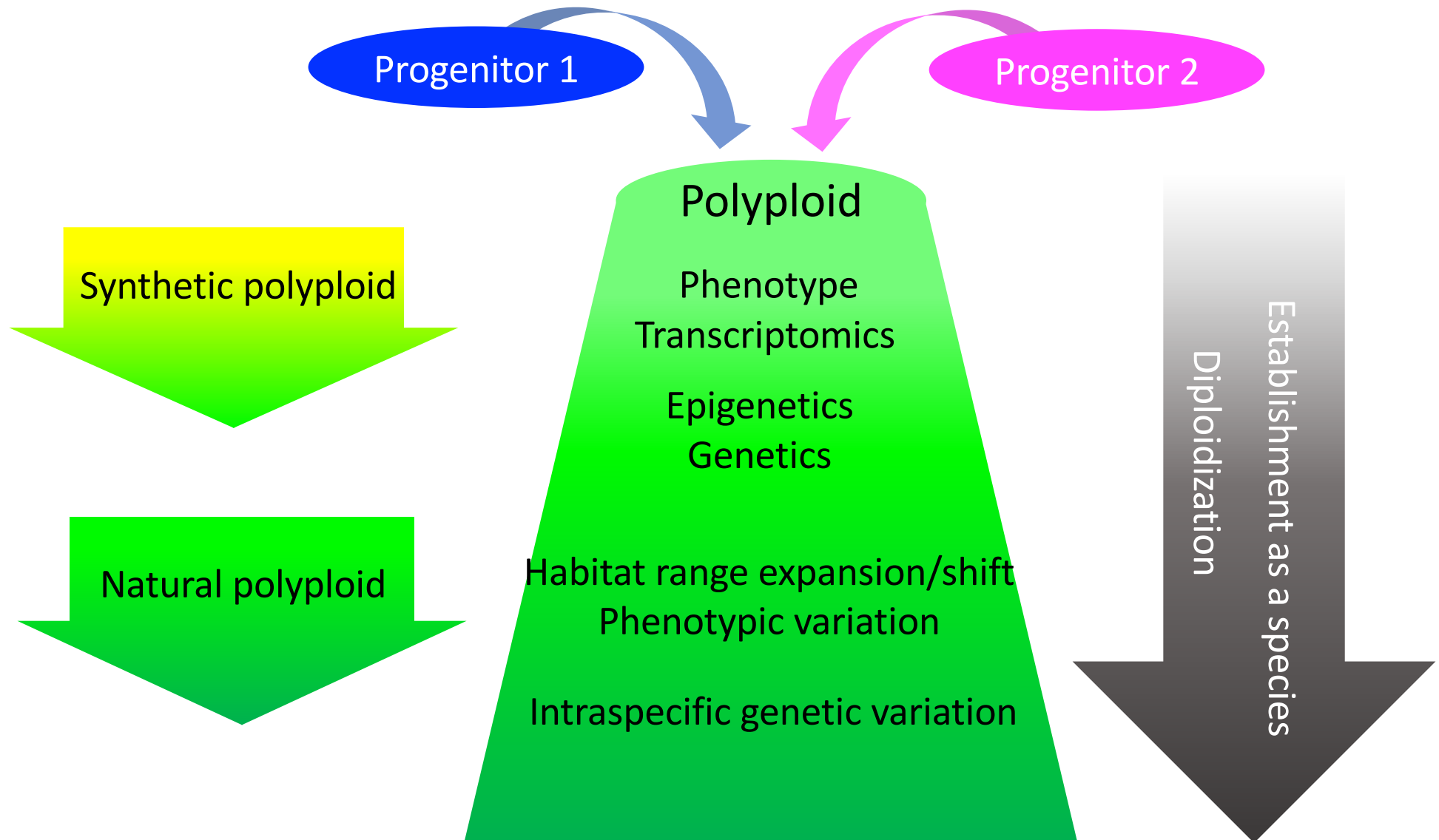
larger fruit/seed

wider cultivated area



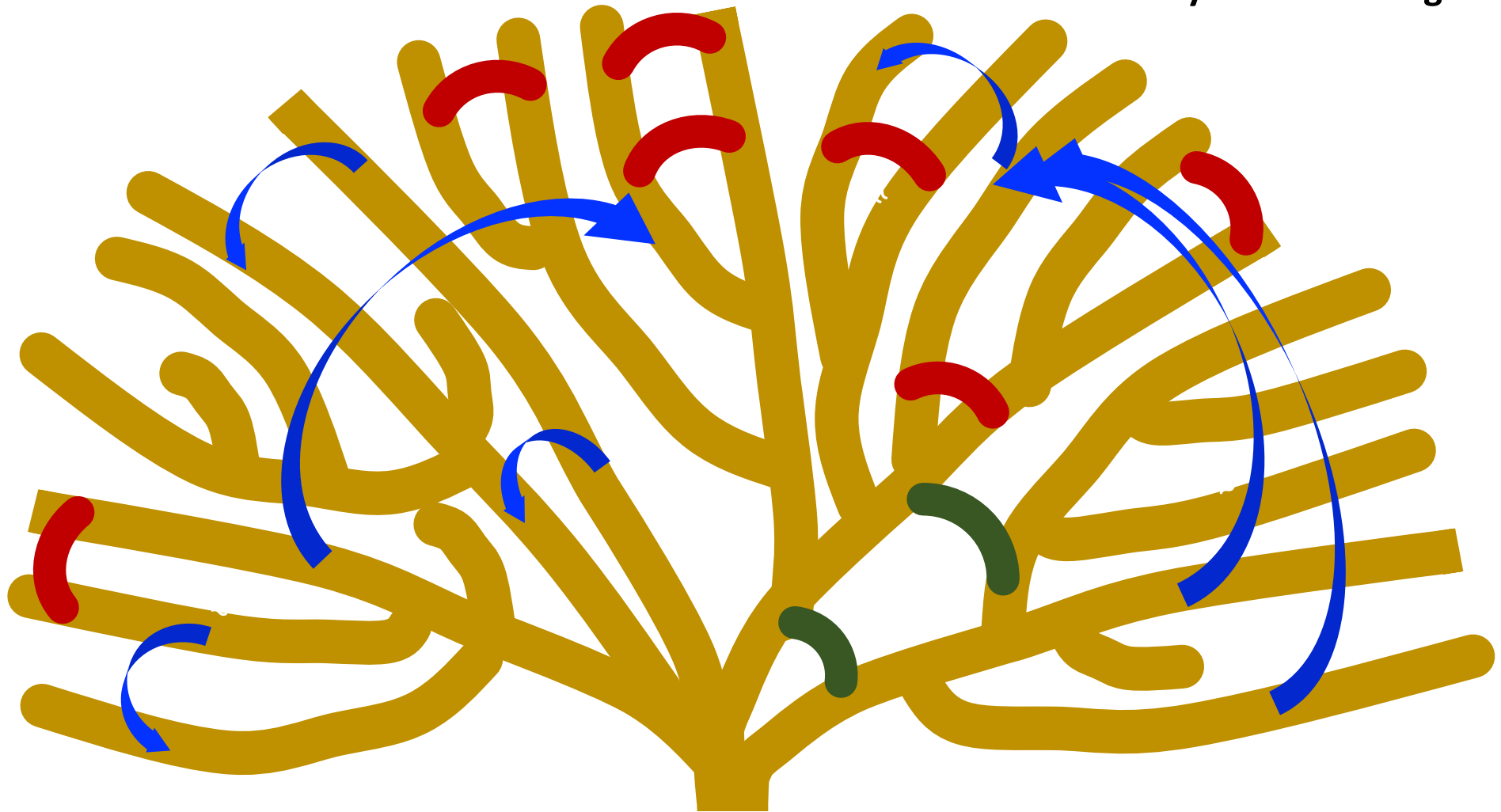
Fig. 1. A sample of agricultural crops that are polyploid, showing oil from oilseed rape (*Brassica napus*, $2n = 4x = 38$), bread from bread wheat (*Triticum aestivum*, $2n = 6x = 42$), rope from sisal (*Agave sisalana*, $2n = 5x = 180$), coffee beans (*Coffea arabica*, $2n = 4x = 44$), banana (*Musa* triploid hybrids, $2n = 3x = 33$), cotton (*Gossypium hirsutum*, $2n = 4x = 52$), potatoes (*Solanum tuberosum*, $2n = 4x = 48$), and maize (*Zea mays*, $2n = 4x = 20$).

My research interest: Ecological advantage of polyploid

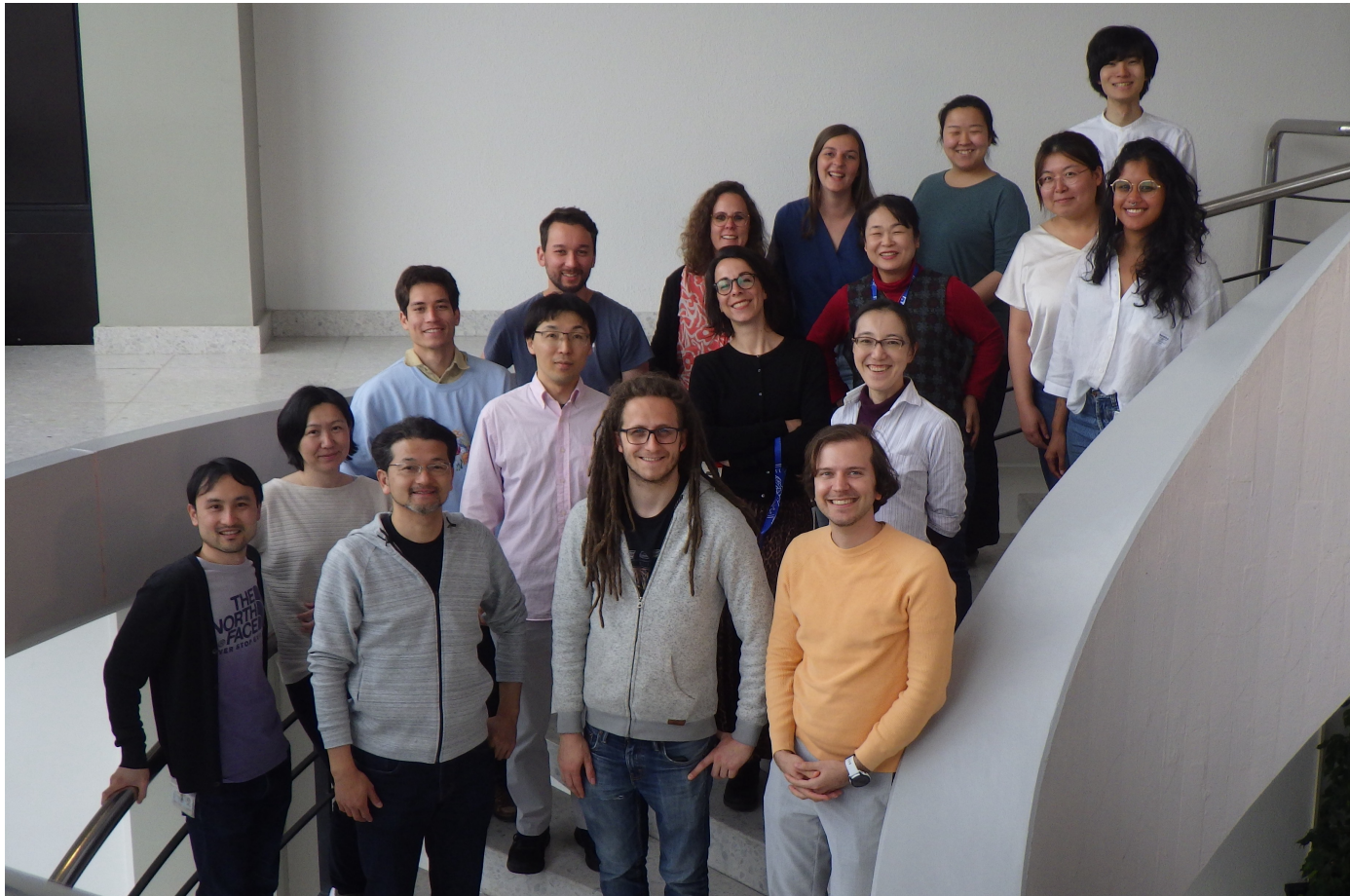


Tree of Life? Network of Life!

Endosymbiosis
Horizontal Gene transfer
Allopolyploidization
many other crossings



Thanks for your attention



Members of
Shimizu-Inatsugi & Shimizu groups