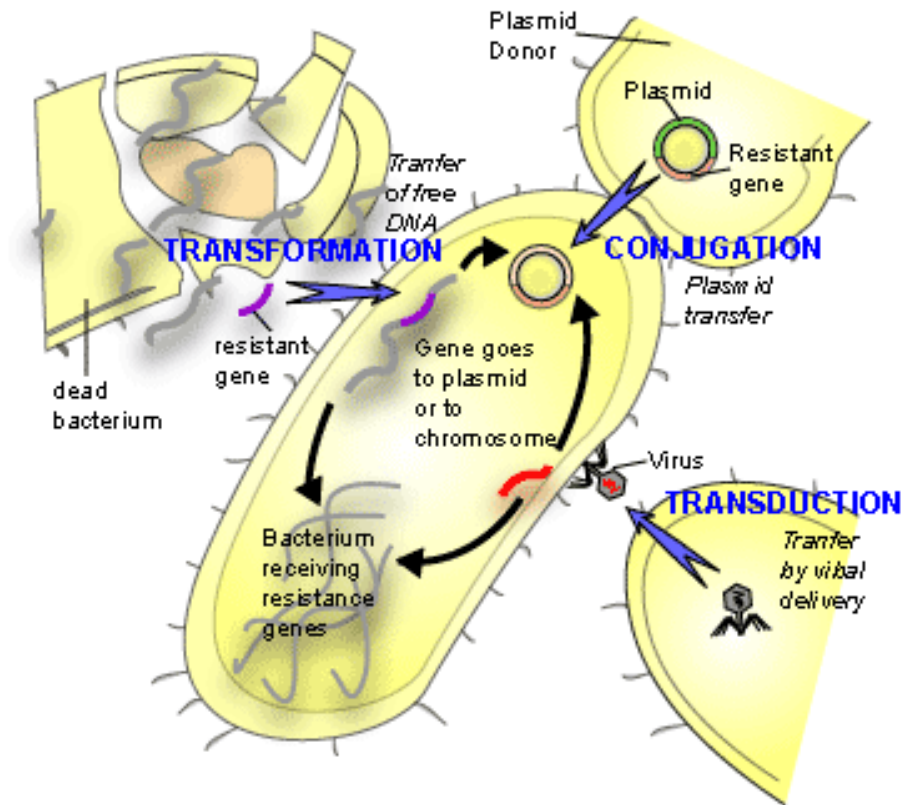
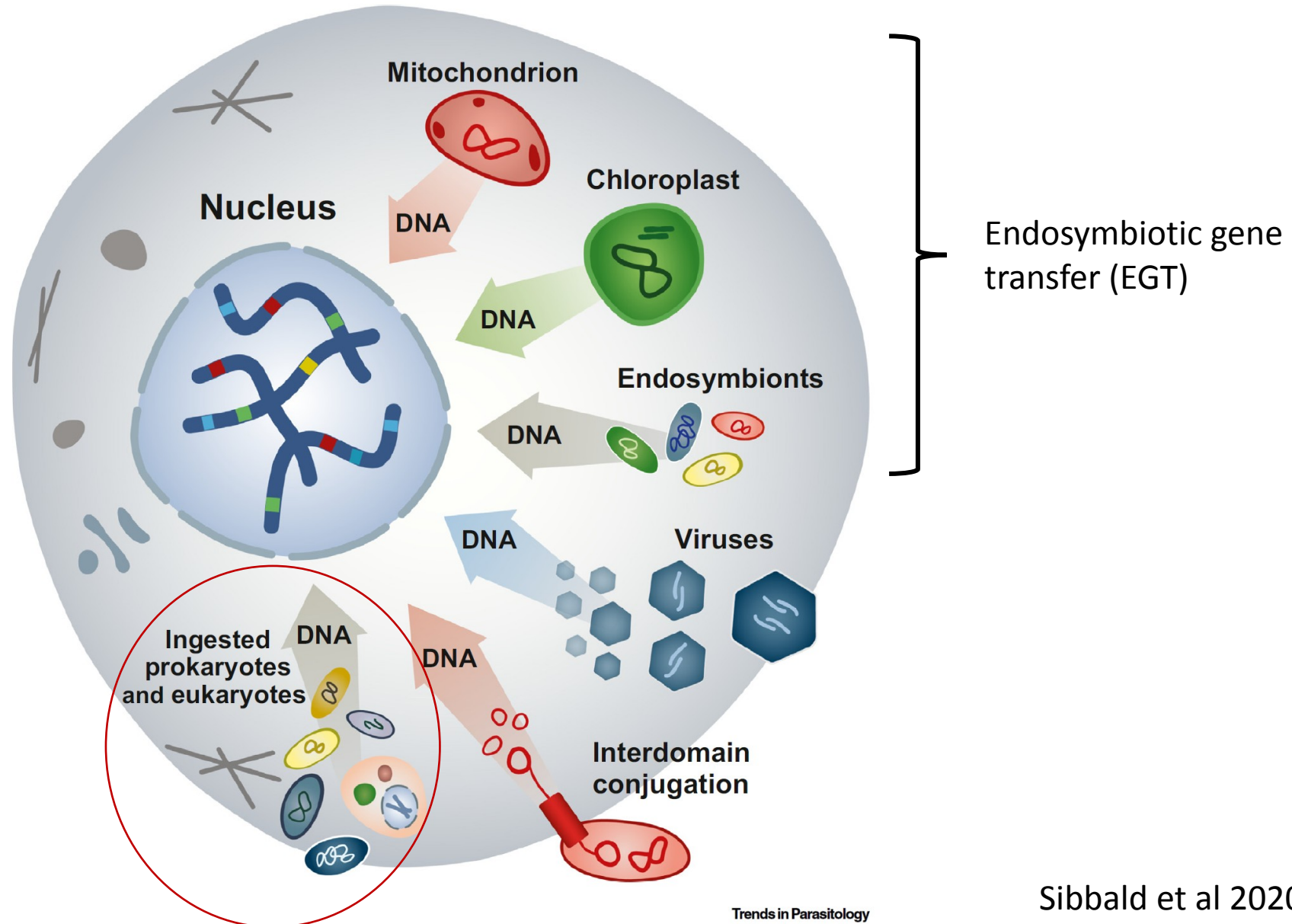


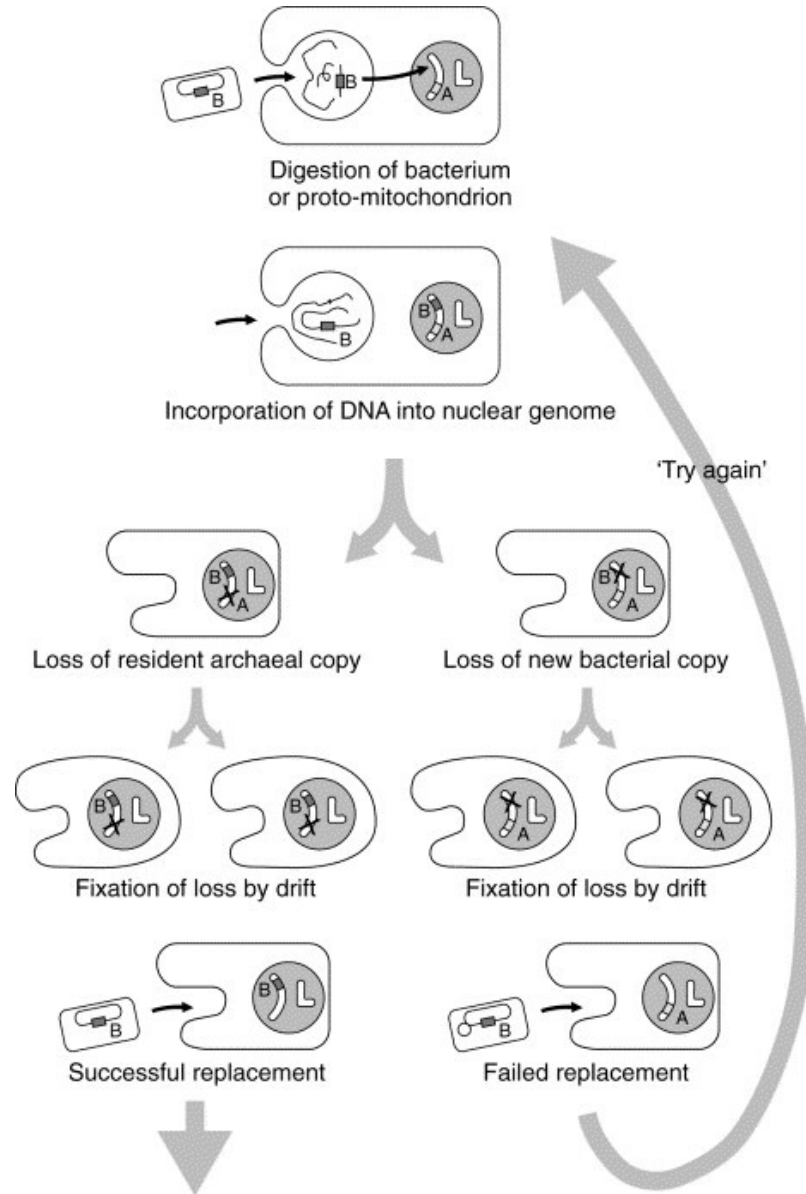
Horizontal Gene Transfer



HGT - Eukaryotes

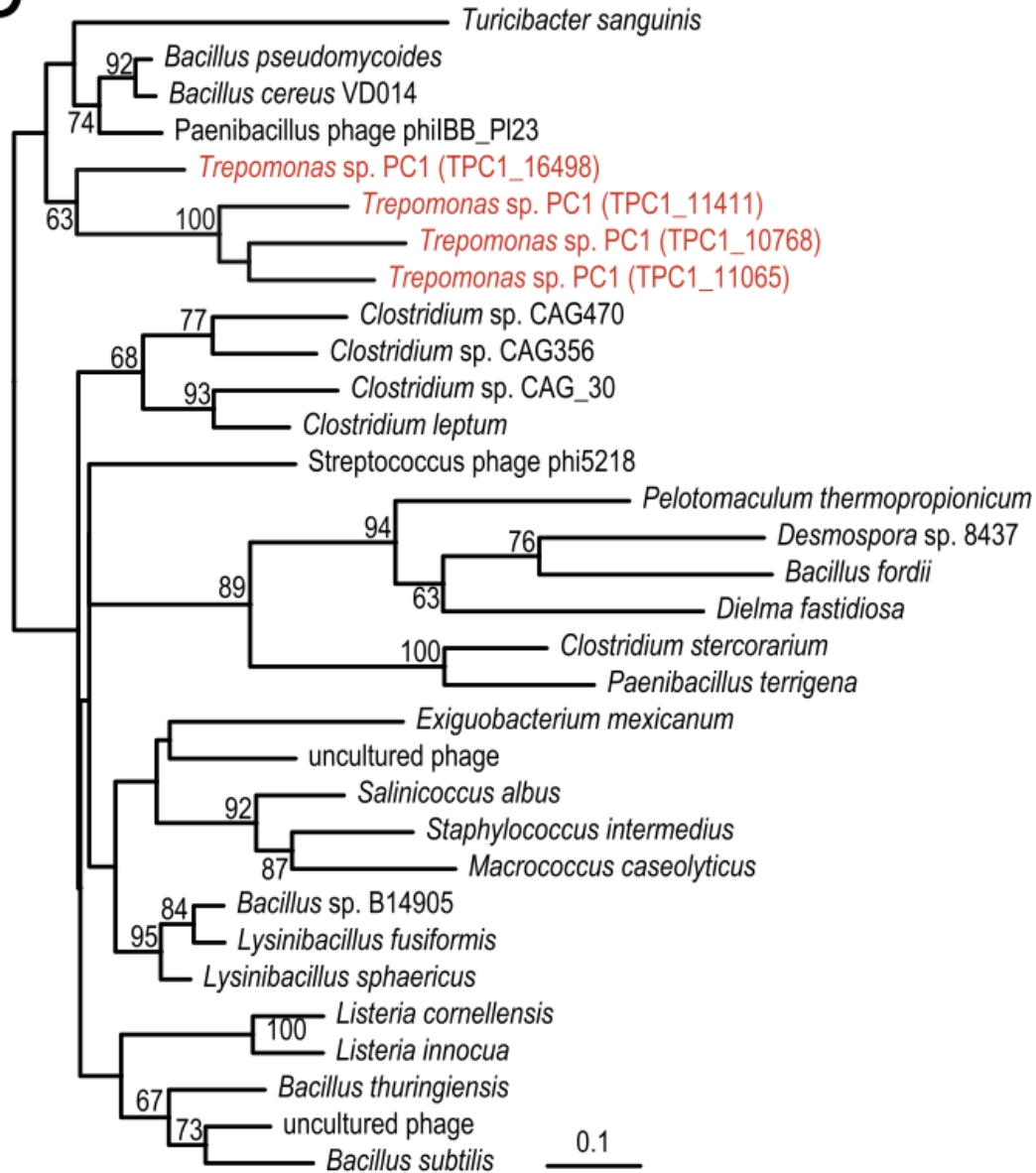


You are what you eat



How to infer HGT

C

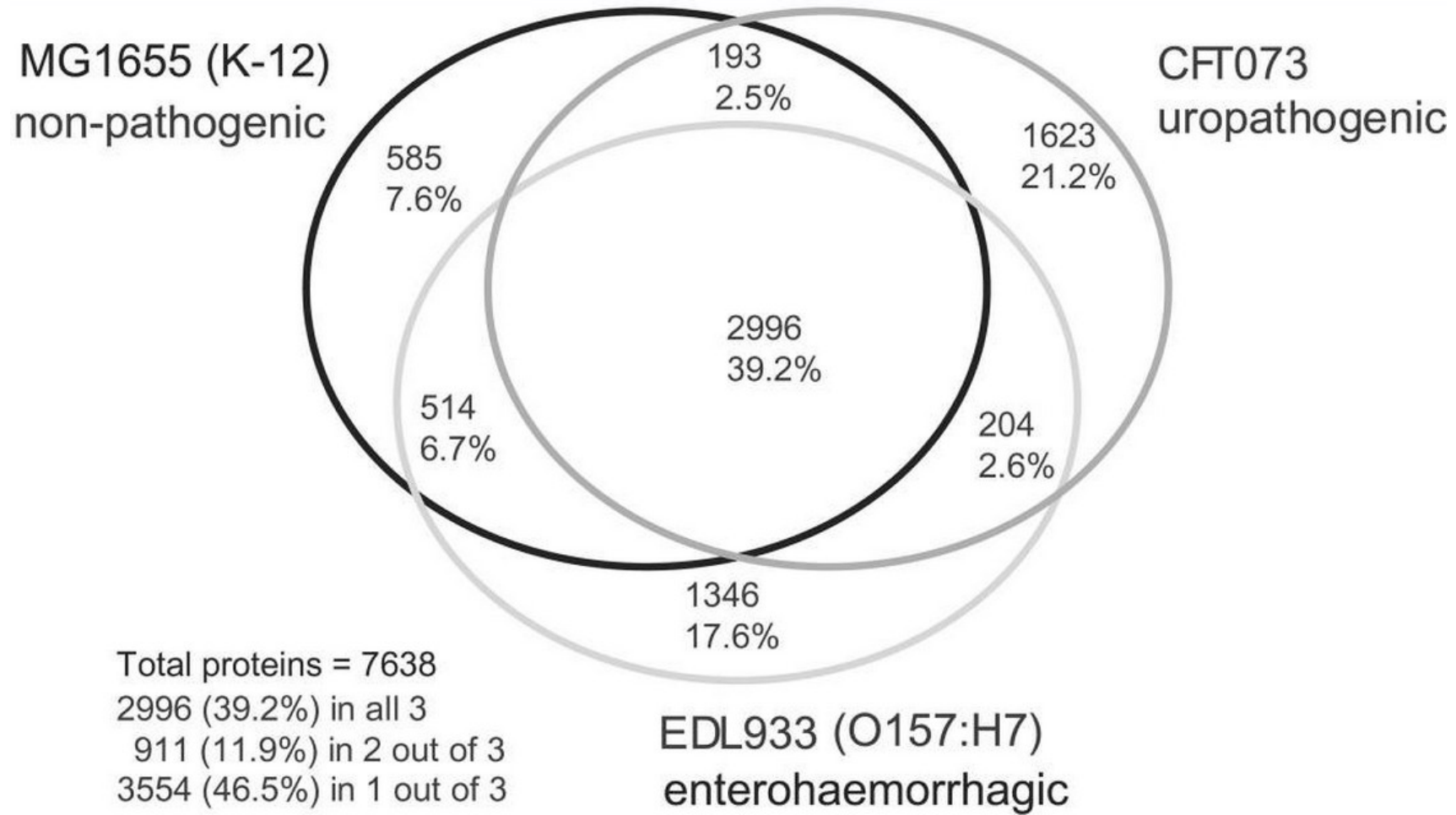


But – contamination?

Or

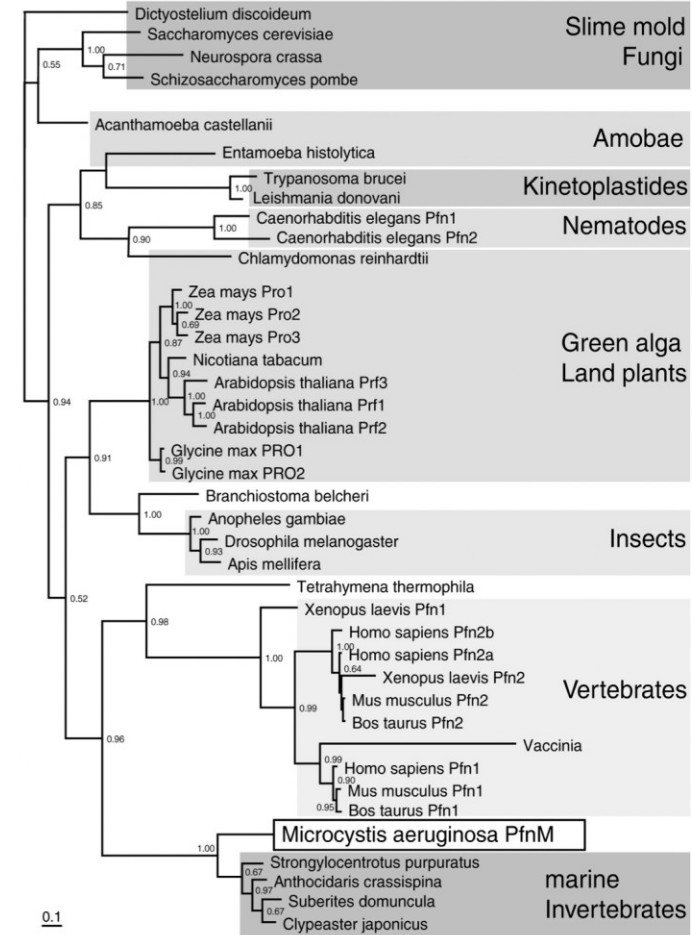
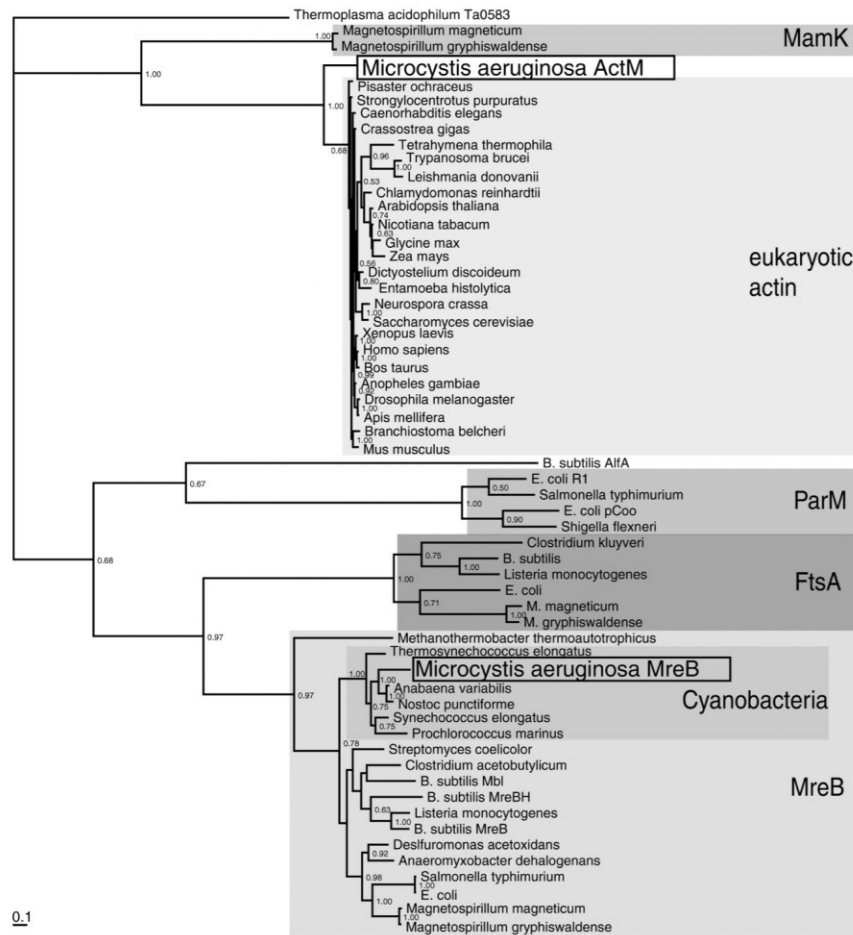
Poor taxon sampling?

Prokaryote to Prokaryote HGT



Eukaryote to Prokaryote HGT

- Extremely rare
- Example: cyanobacterium *Microcystis aeruginosa* actin ad profilin



HGT to Eukaryotes – controversial?

THINK AGAIN

Insights & Perspectives

 **BioEssays**
www.bioessays-journal.com

profilin

Too Much Eukaryote LGT

William F. Martin

THINK AGAIN

Insights & Perspectives

 **BioEssays**
www.bioessays-journal.com

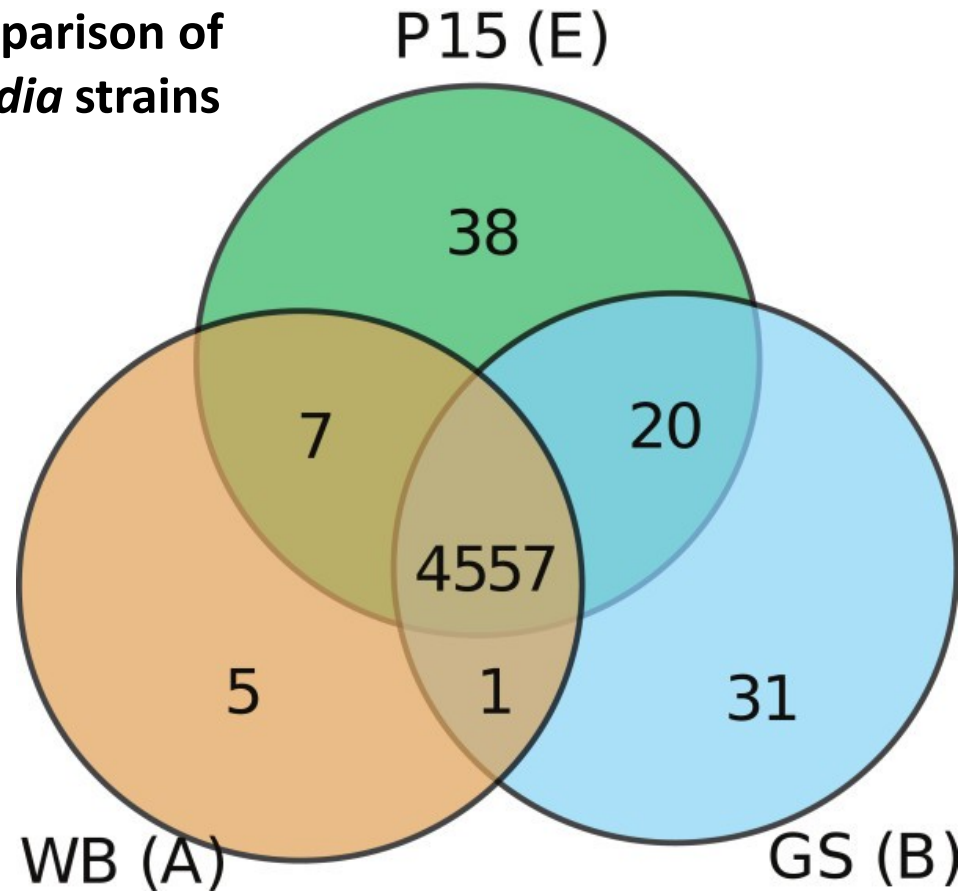
Demystifying Eukaryote Lateral Gene Transfer

(Response to Martin 2017 DOI: 10.1002/bies.201700115)

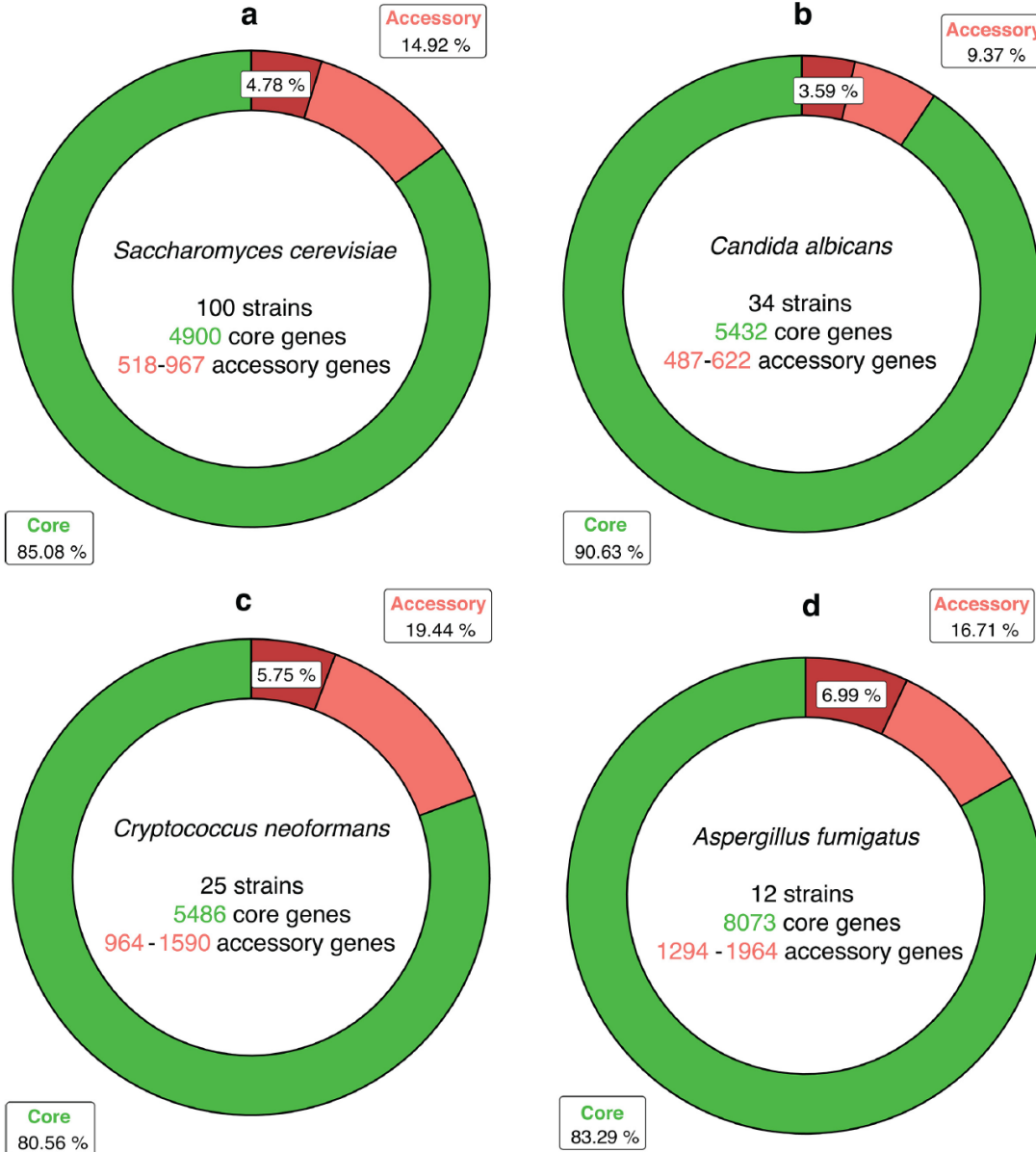
*Michelle M. Leger, Laura Eme, Courtney W. Stairs, and Andrew J. Roger**

HGT to Eukaryotes – controversial?

Comparison of
Giardia strains



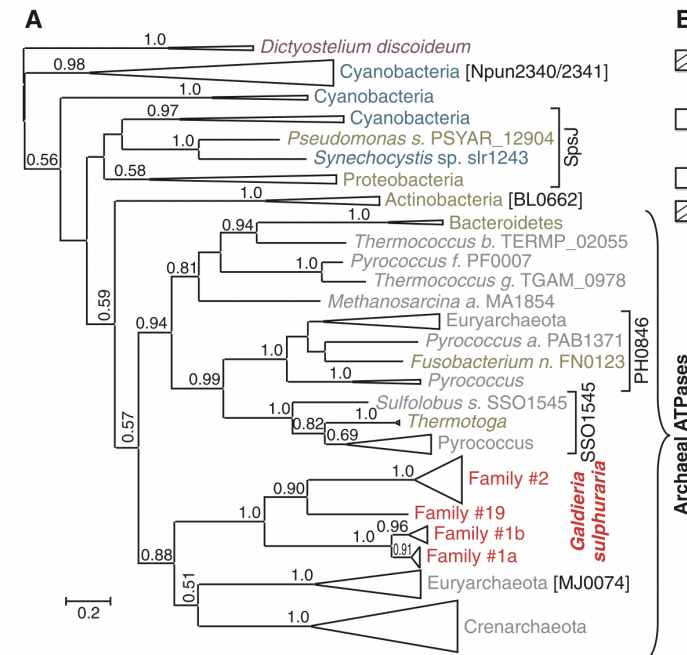
HGT to Eukaryotes – controversial?



HGT to Eukaryotes – controversial?

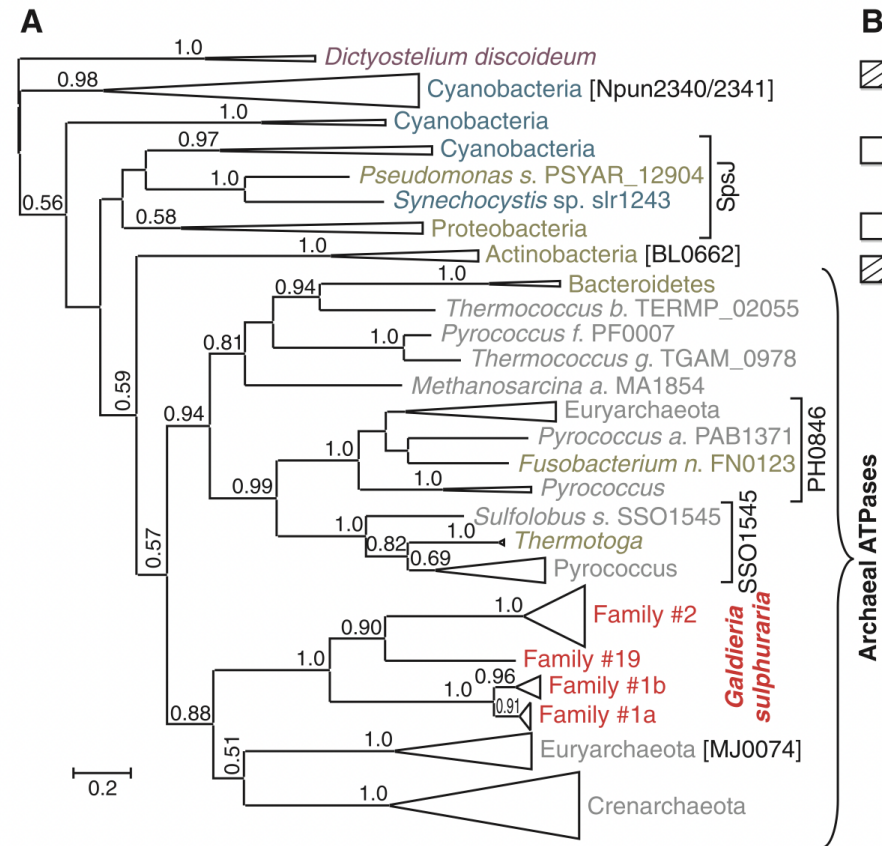
- HGT can be amazing source of new adaptations
- Help with lifestyle transitions – anaerobiosis, parasitism etc...
- But not only, marine diatom *Phaedactylum tricornutum* contains > 5% HGT genes.

- Extremophilic red alga (Cyanidiophyceae)
- **Adaptation to extreme conditions also thanks to HGT** (pH 0-4; temperature 56°C; high tolerance to toxic metals)
- Bacterial genes for various ion channels, membrane pumps
- Less introns and higher GC content in these genes
- Donors: extremophilic prokaryotes



Free-living Diplomonads

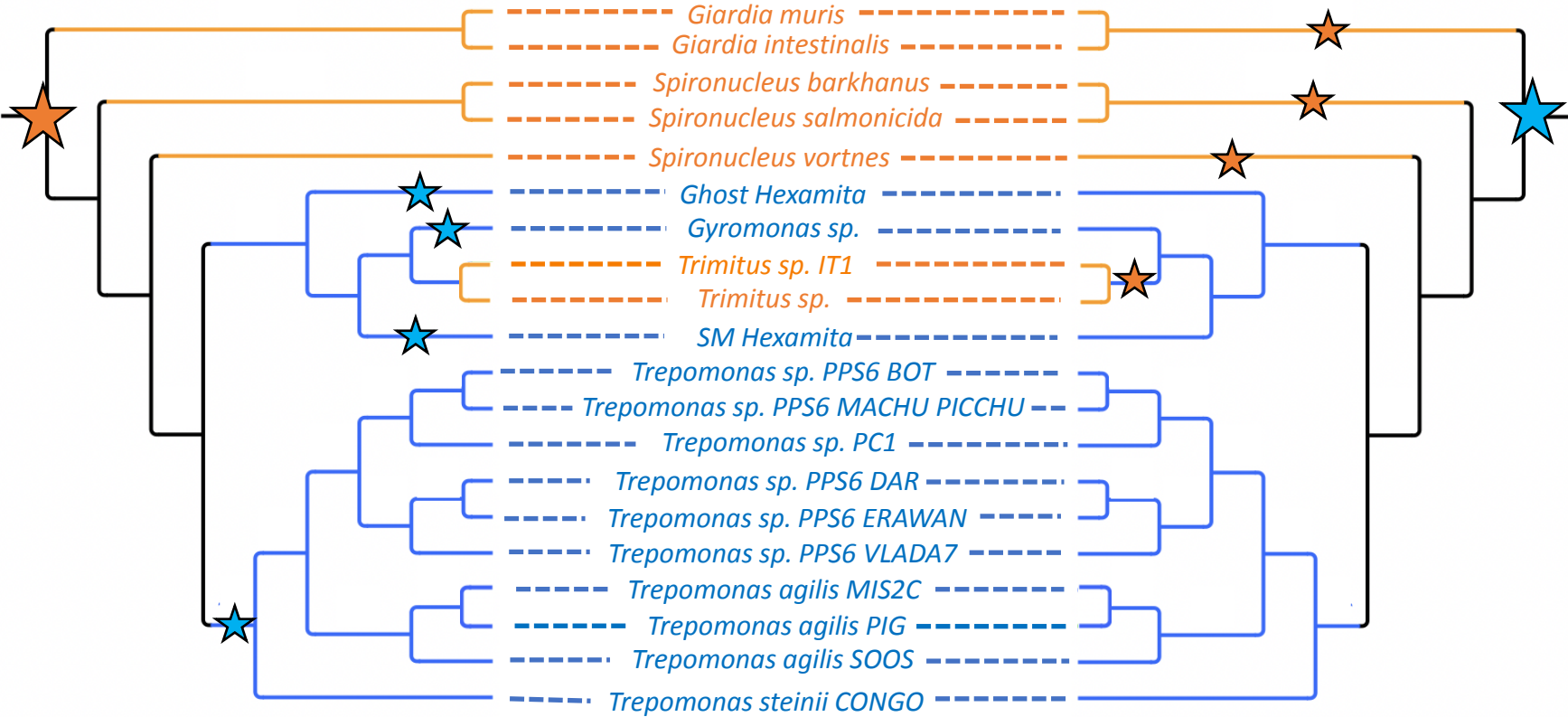
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BIG, NO NO!!!

Parasitic Ancestor

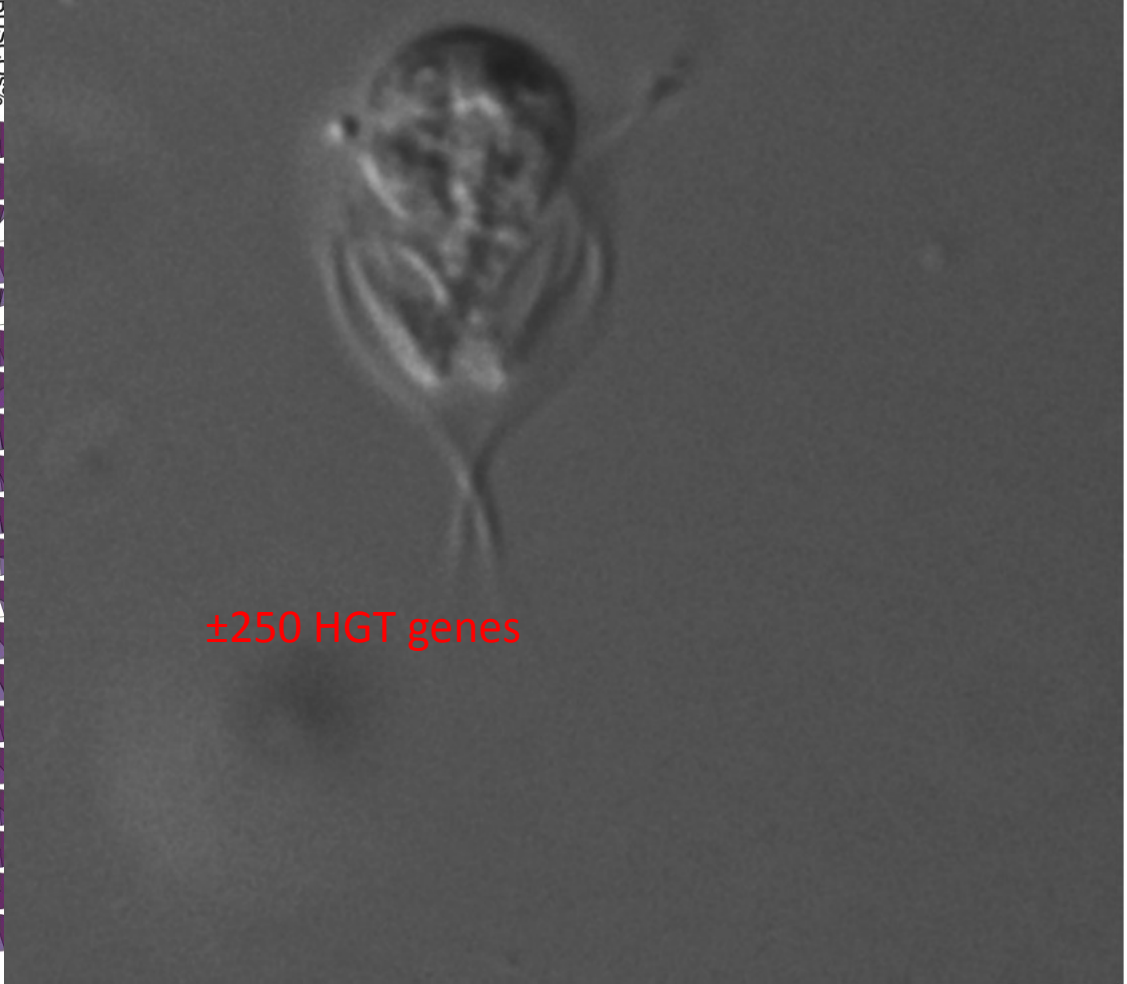
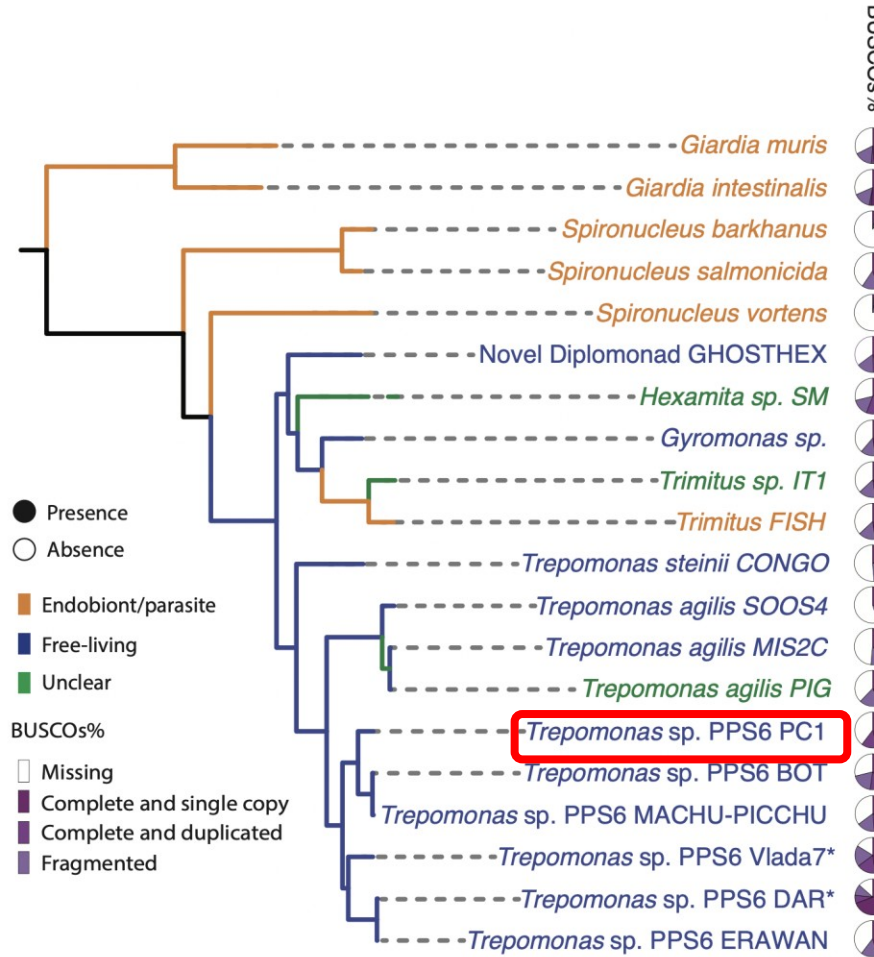
Free-Living Ancestor



Transition between lifestyles

SM Hexamita

A.



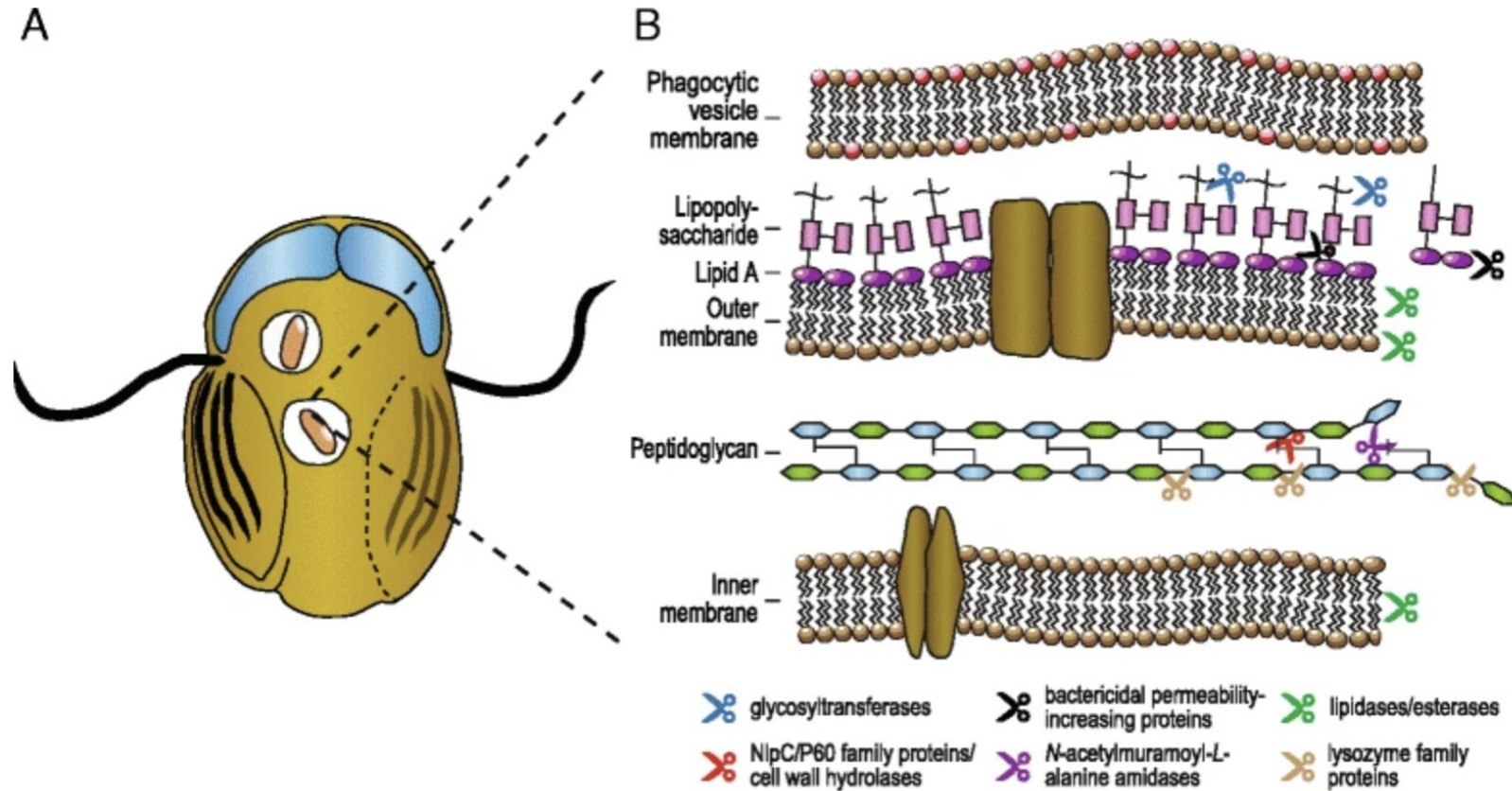
±250 HGT genes

VSPs
and
CRMPs

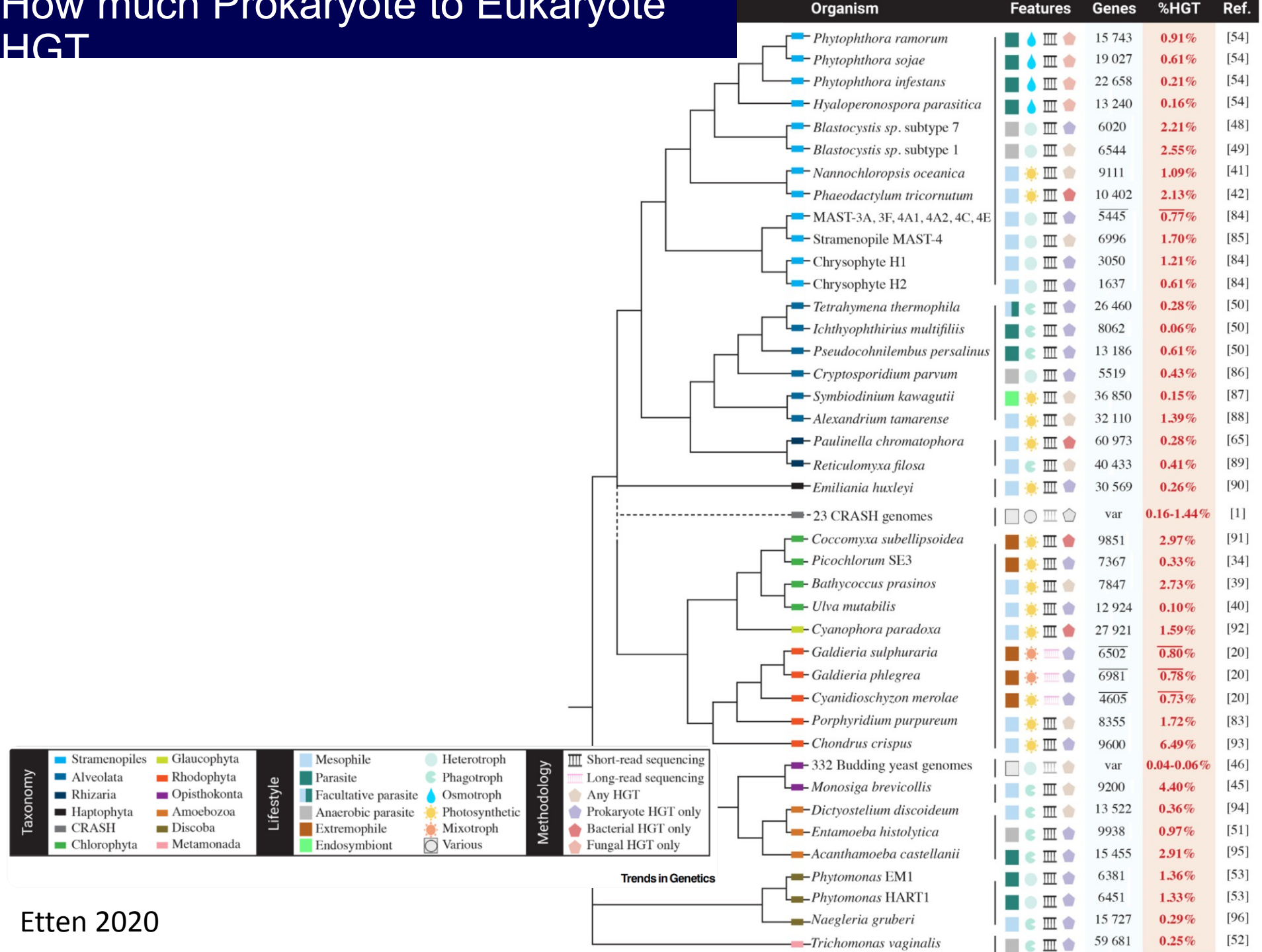
Giardia
pathogenicity

Other virulence factors

Treponemas NGTs – adaptive to free-living



How much Prokaryote to Eukaryote HGT



Taxonomy	Lifestyle	Methodology
Stramenopiles	Mesophile	Short-read sequencing
Alveolata	Parasite	Long-read sequencing
Rhizaria	Facultative parasite	Any HGT
Haptophyta	Anaerobic parasite	Prokaryote HGT only
Chlorophyta	Extremophile	Bacterial HGT only
Glaucophyta	Endosymbiont	Fungal HGT only
Rhodophyta	Heterotroph	
Opisthokonta	Phagotroph	
Amoebozoa	Osmotroph	
Discoba	Photosynthetic	
Metamonada	Mixotroph	
	Various	

Trends in Genetics

But...

- People tend to be conservative when inferring HGTs to Eukaryotes
- And unsystematic