

Computational research in Microbiology

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Educational Conference, IBO2024 Astana



Who am I? Little background



Who am I? Little background



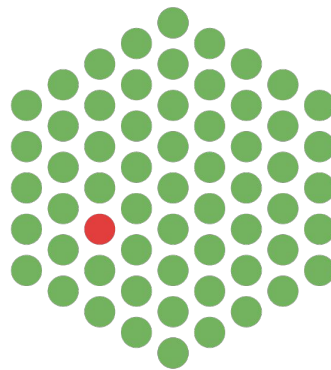
NAZARBAYEV
UNIVERSITY

B.Sc. in Biological Sciences

2014-2018

Who am I? Little background

EMBL



PhD in Microbial Genomics

2019-2024

Who am I? Little background



HARVARD
UNIVERSITY

Postdoctoral Researcher in
Clinical Microbiomics

From November 2024

Computational Research in Microbiology

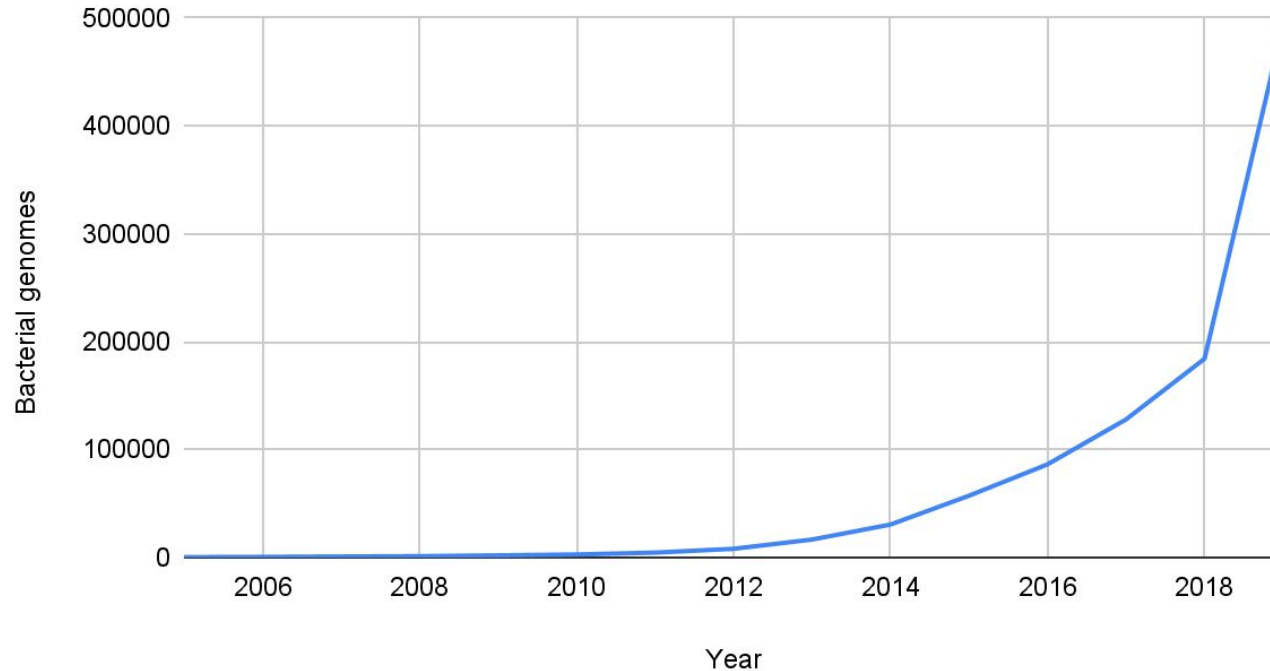
Census and Taxonomy of Microbial Life

Microbiomes

Experimental Microbiology

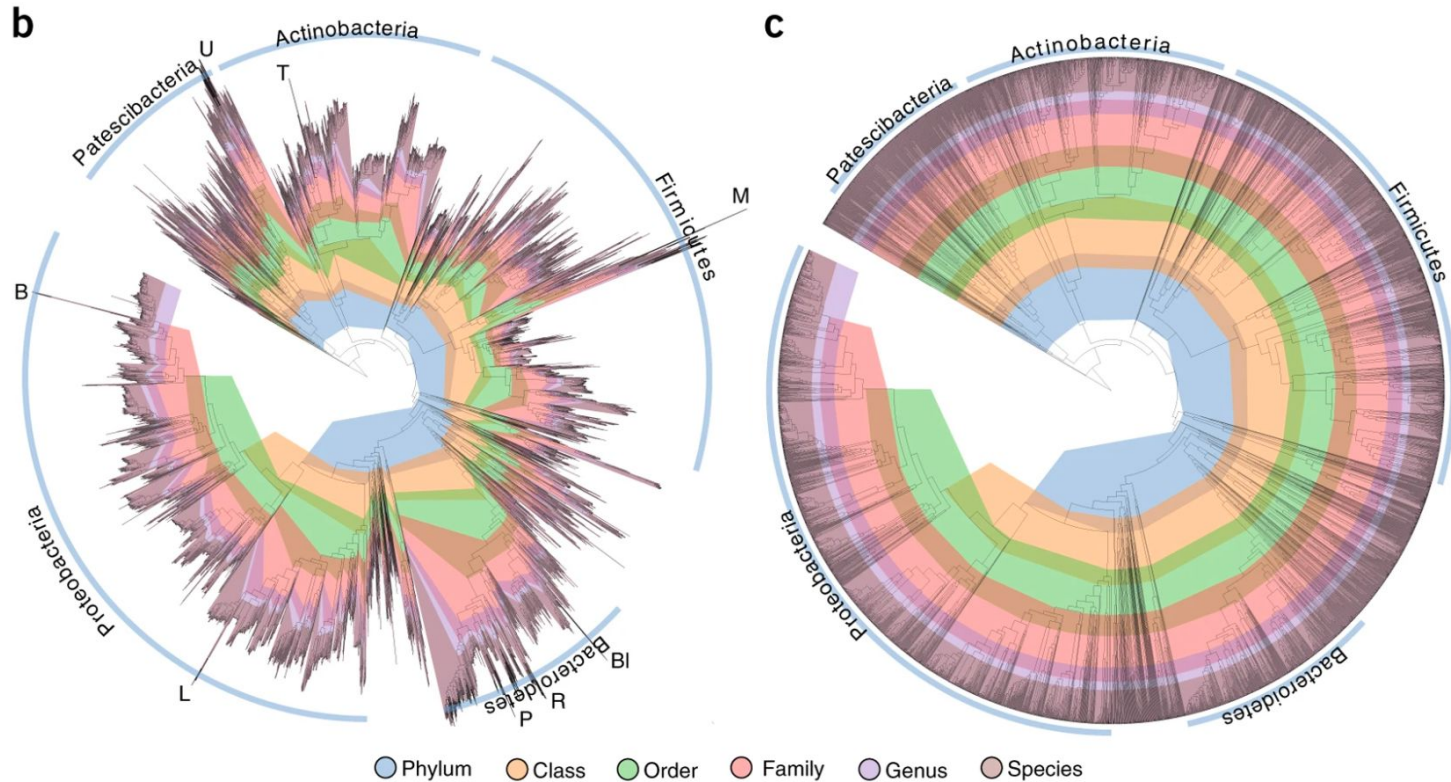
Census of Microbial Life

Number of bacterial genomes sequenced



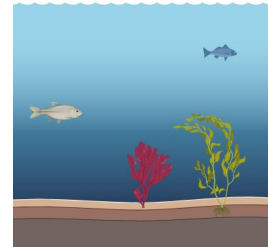
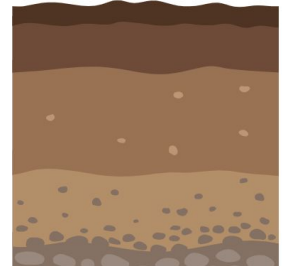
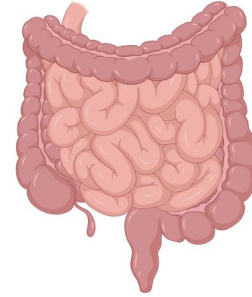
**> 2 million
genomes used
for my PhD**

Sequence-based Microbial Taxonomy



Microbiome Research

- Expanding research on vastly understudied microbial community life.
- High importance for the health of humans and Earth's ecosystems.
- Research is heavily computational:
 - Metagenomic assembly & binning
 - Metagenomic profiling



Diverse microbial communities



Experimental Systems Microbiology

Systems approach to bacterial
evolution experiments using

← 96-well plates (liquid)

1534-well plates (solid) →

Video credit: Nazgul Sakenova



Experimental Systems Microbiology

Large-scale experiments using such robots involve up to half a million wells.

Computational proficiency is needed to analyse the results.

Prospective of using machine learning and AI.

Bioinformatics in Biology Olympiads

Will inspire and prepare the next generation of computational biologists...

...who are in high demand in science these days

Thank you!



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