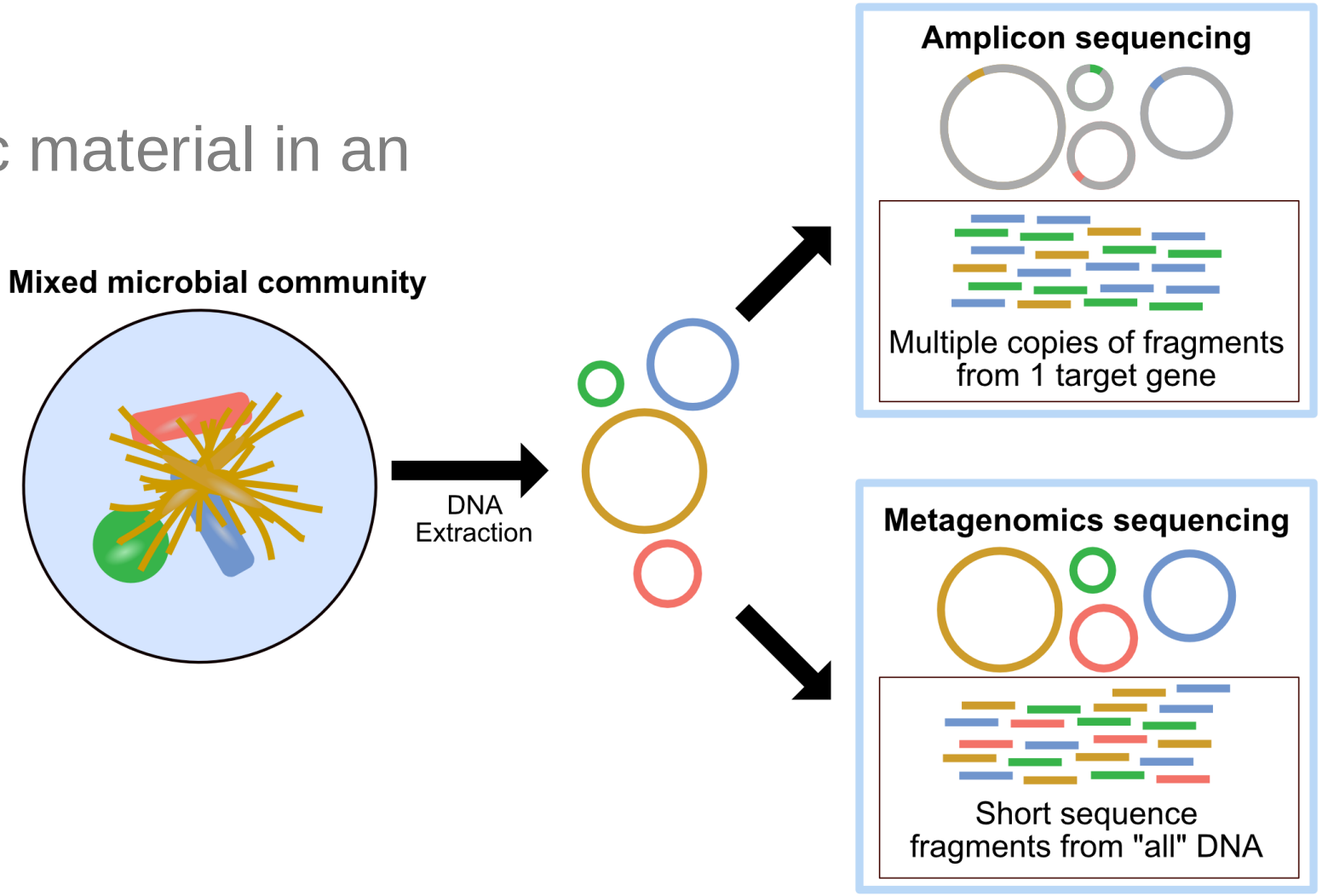
Metagenomics

Short introduction

Metagenomics

- Study of all genetic material in an environment



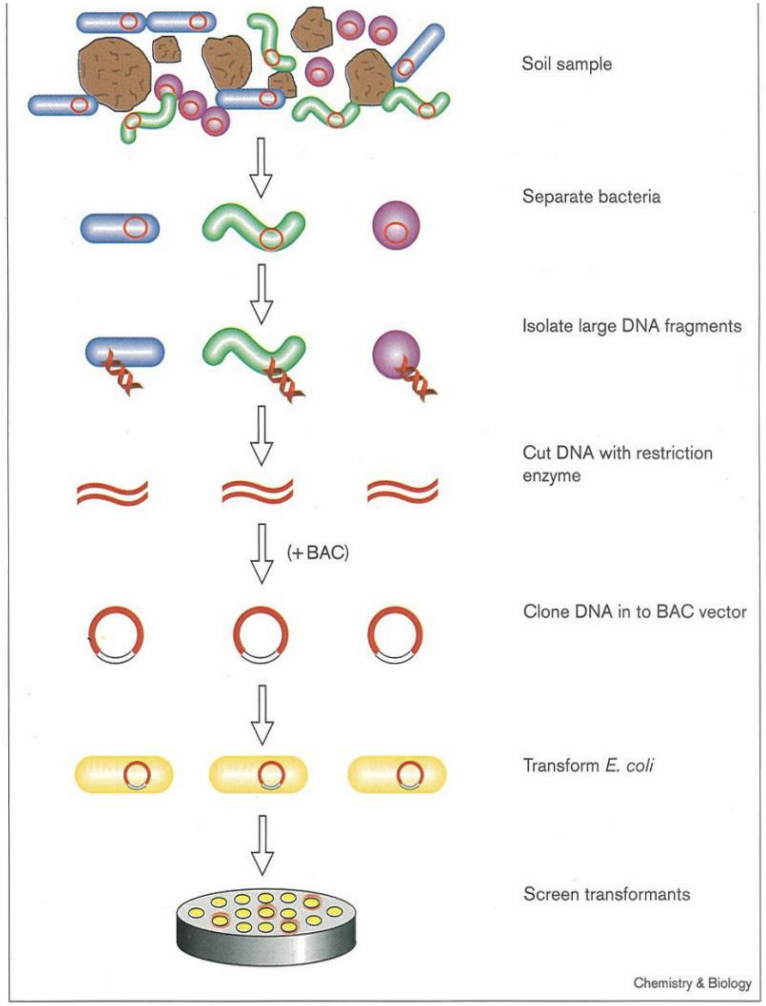
https://doi.org/10.21105/jose.00053

Metagenomics

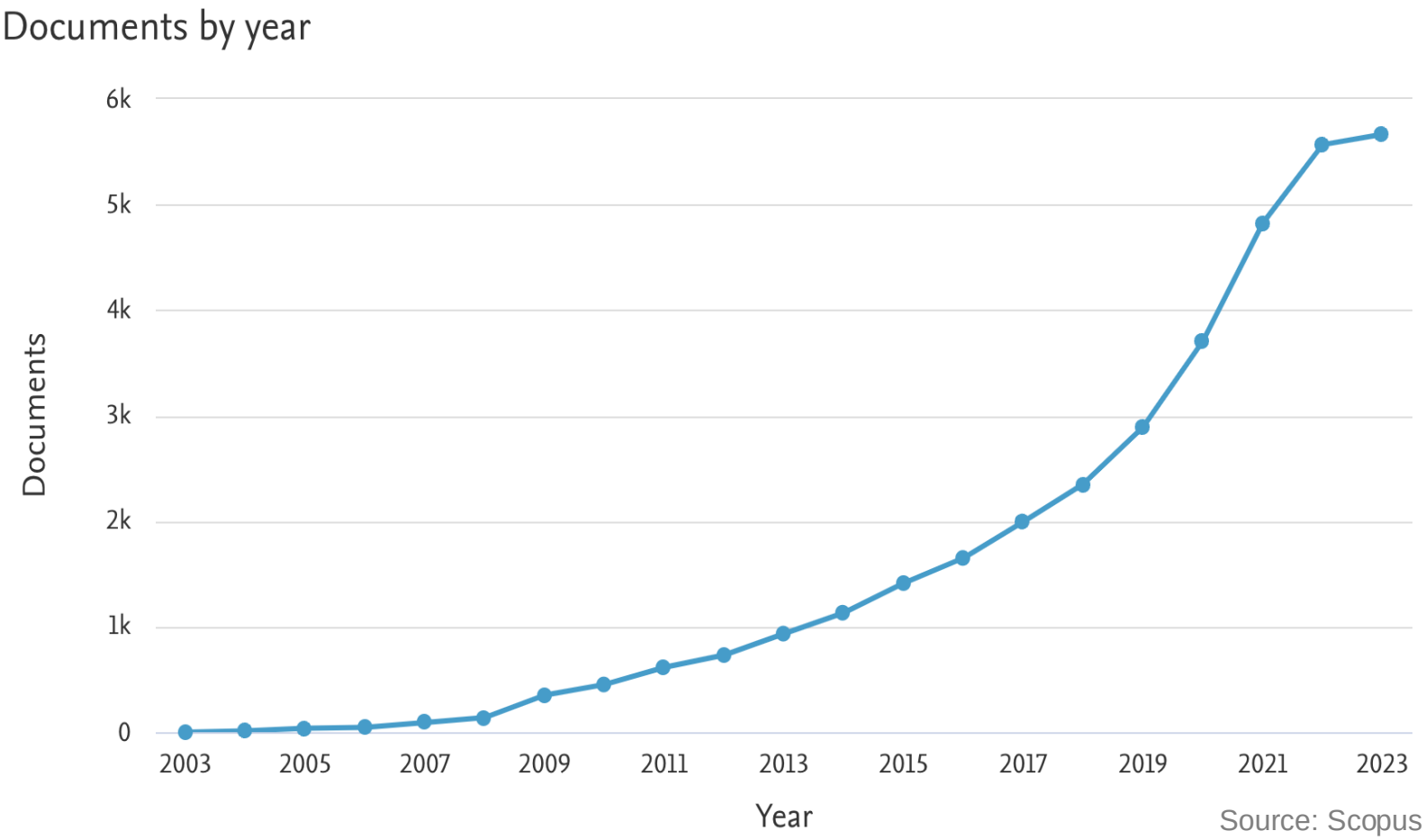
- Jo Handelsman et al. 1998

Molecular biological access to the chemistry of unknown soil microbes: a new frontier for natural products

Jo Handelsman[1], Michelle R Rondon[1], Sean F Brady[2], Jon Clardy[2] and Robert M Goodman[1]

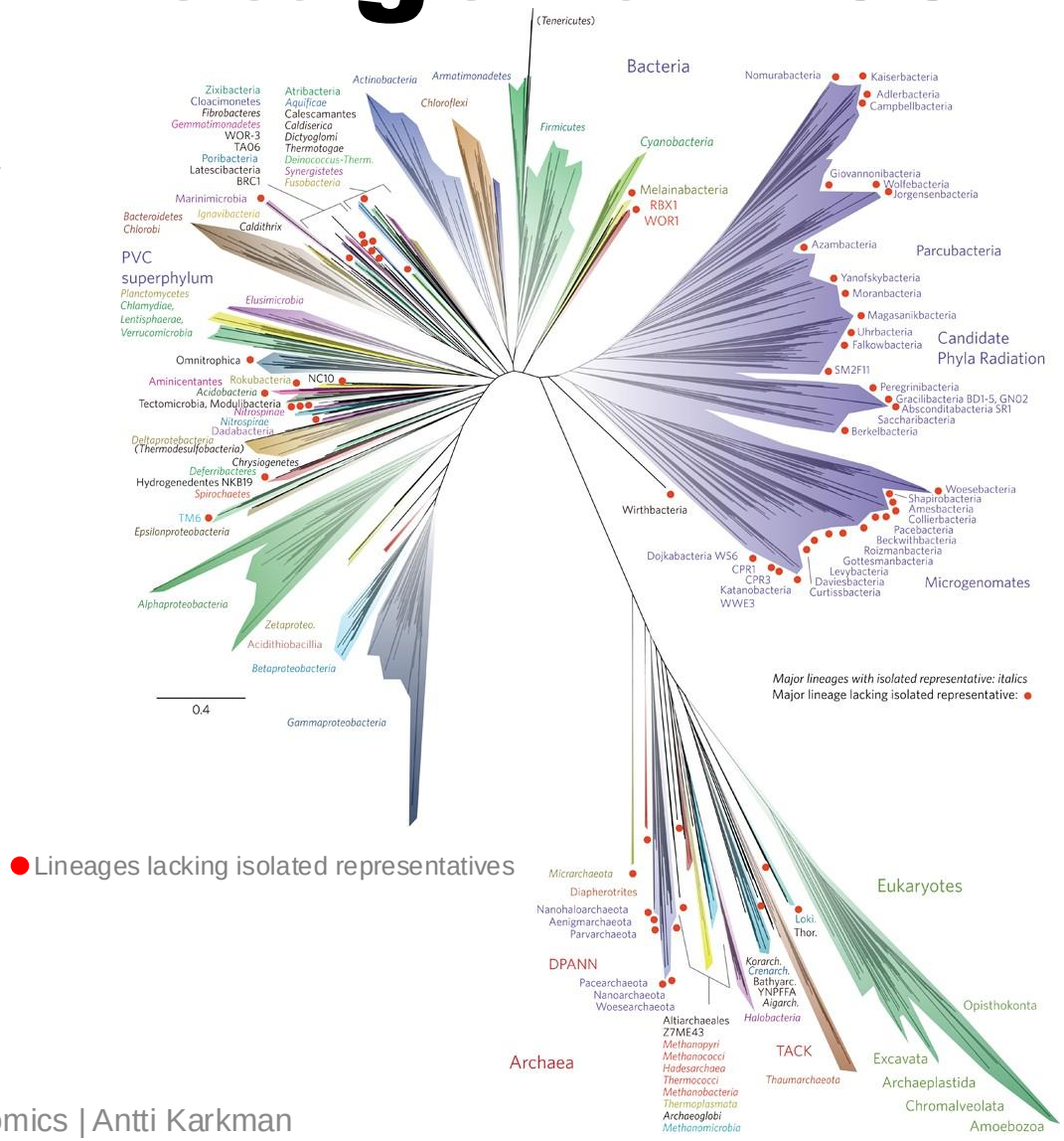


Articles published in metagenomics



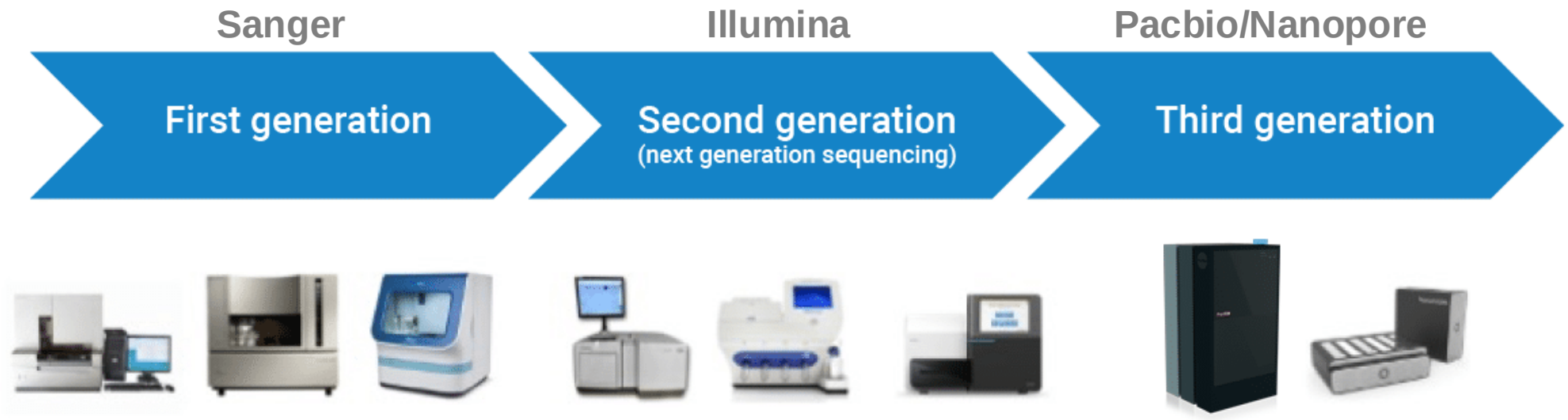
Why do we need metagenomics?

- The great plate count anomaly
- Taxonomy ≠ function



https://doi.org/10.1038/nmicrobiol.2016.48

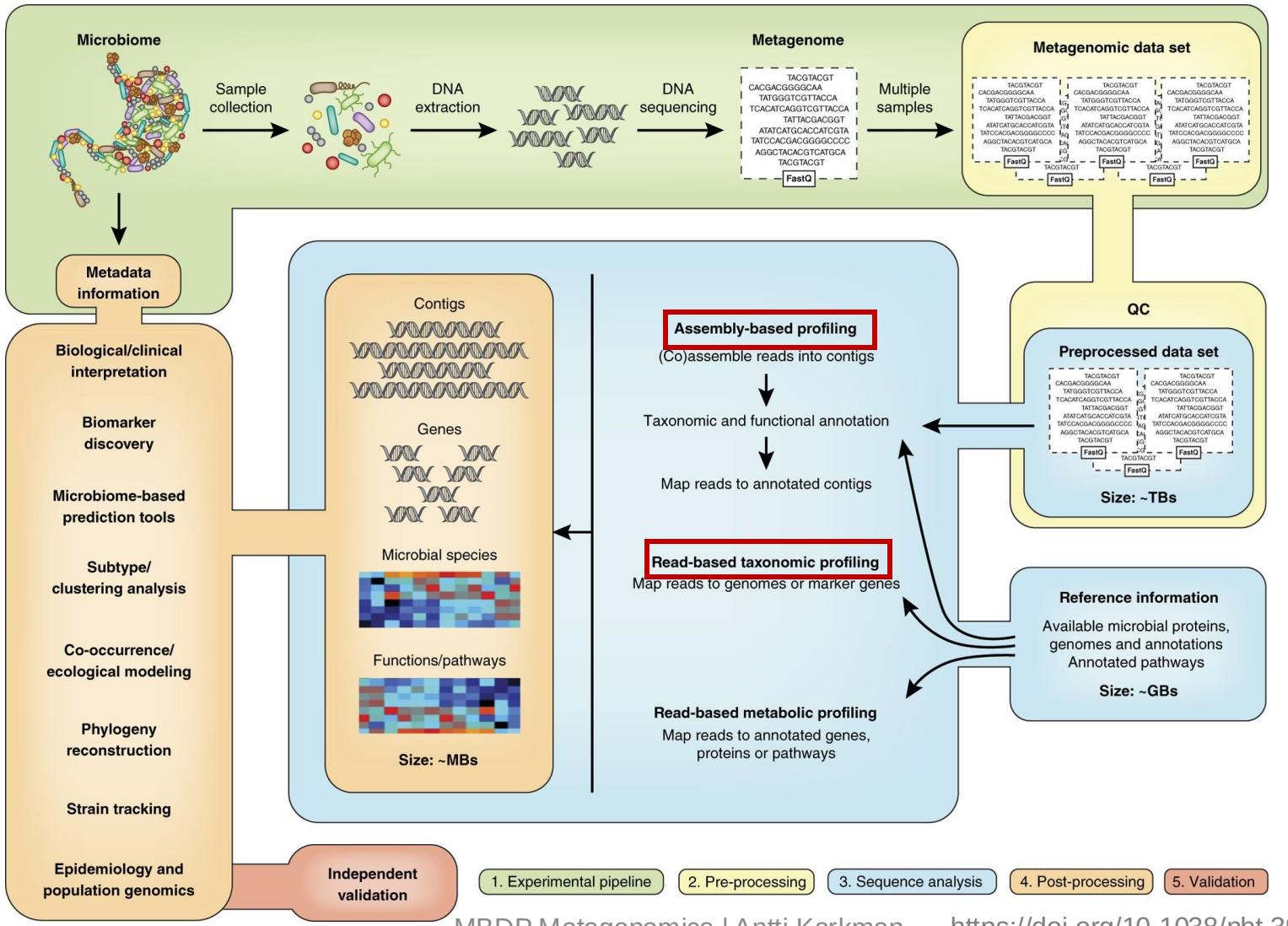
Metagenomic sequencing



Group work:

- 1-3 specific features for each technology
- Which one(s) is/are suitable for metagenomics

Metagenomic data analysis

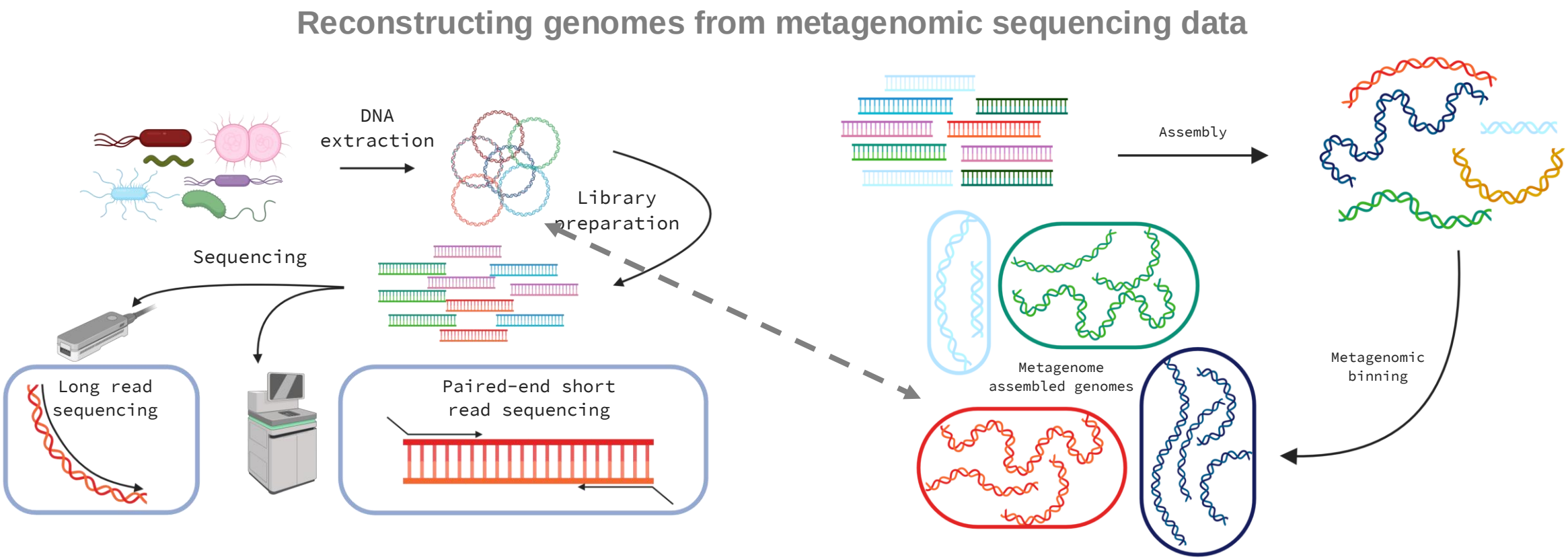


Read-based vs. Assembly-based

Read-based

Assembly-based

Genome-resolved metagenomics



Databases for (meta)genomics

Sequence Read Archive (SRA) European Nucleotice Archive (ENA)

- Publicly available repositories for high-throughput sequencing data
- All sequencing data should be deposited to repositories upon publication
- Sequencing data (Runs) organised under projects (BioProject) and linked to samples (BioSample)
- Various levels of metadata depending on the project
- Web and (several) command line access options

https://www.ncbi.nlm.nih.gov/sra https://www.ebi.ac.uk/ena

MGnify

- Website to browse, analyse, discover and compare microbiome data
- Data from ENA/SRA
- Includes analyses, assemblies and MAG collections

https://www.ebi.ac.uk/metagenomics

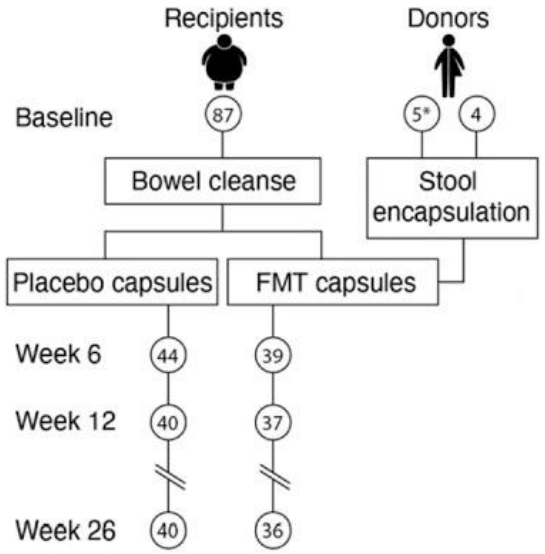
Branchwater & Sandpiper

- Annotation of sequencing experiments in SRA/ENA
- Web interface to search for sequences/taxonomy

https://sandpiper.qut.edu.au/ https://branchwater.sourmash.bio/

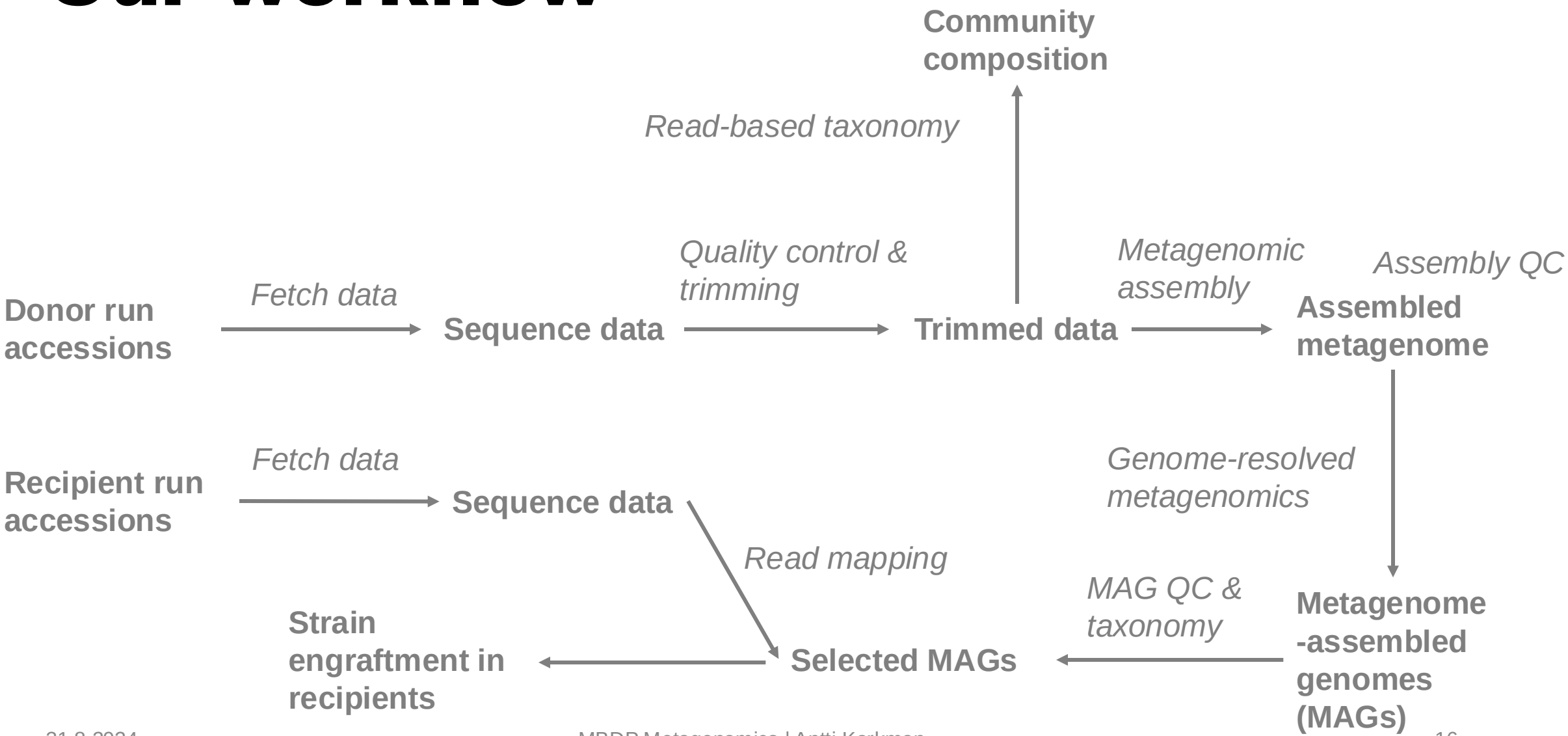
Dataset for this course

Fecal microbiota transplantation (FMT) experiment



In a new double-blind randomized control trial of FMT, researchers examined 87 adolescents with obesity receiving either multi-donor FMT or placebo

Our workflow



Let’s get to work

https://github.com/MBDP-bioinformatics-courses/MBDP_Metagenomics_2024