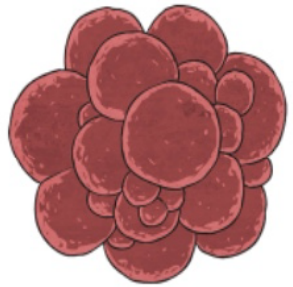
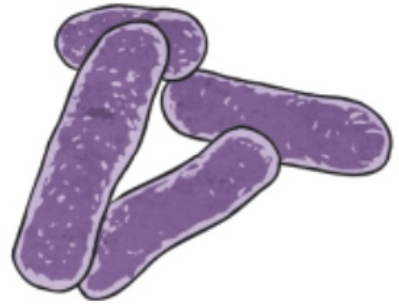
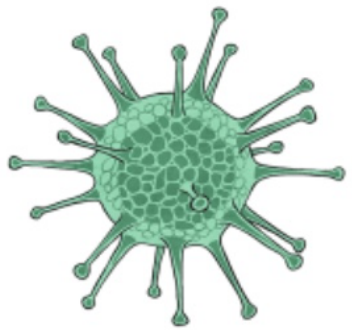
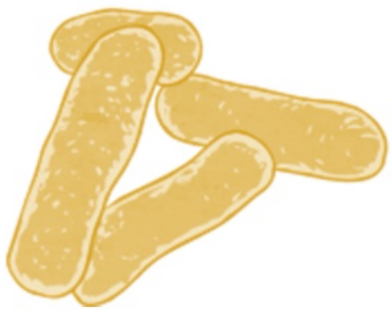




Microbial community genomics block course
Student projects

Project 1: Visualization of genomes with auxiliary data such as phylogenetic, metabolic, or environmental information

- **Goal:** Visualization of genomes with auxiliary data (such as phylogenetic, metabolic, environmental, etc…) to search for interesting cases.
- **Notes:**
  - Might well be just testing available tools (anvio, jbrowse, different R packages, iTol, etc.).
  - Might need quite some reading of current literature to find interesting cases.

Project 2: Diversity within a mOTU

- **Goal:** Explore the coherence of all MAGs assigned to a single mOTU (phylogenetic distance, functional variation, genome size variation, etc.).
- **Notes:**
  - Might need some time to compute genome-level features.

Project 3: Comparison of closely related MAGs with contrasting environmental patterns

- **Goal:** Comparison of closely related MAGs with contrasting environmental patterns: for example, what are the genome-level differences of SAR11 MAGs with contrasting temperature ranges (or other prevalent taxa).
- **Notes:**
  - Might need some reading of current literature to find interesting cases.

Project 4: Relation between genome-level features and environmental conditions

- **Goal:** Relate genome-level features (genome size, GC content, % of different aa) to the environment.
- **Notes:**
  - Might need some time to compute genome-level features
  - Can be data-driven or based on currently described relationships:
    - patterns in Zeldovich et al. 2007 (i.e. if the fraction of IVYWREL correlates to the temperature range).
    - GC% relationship to temperature
    - Genome size relationship to temperature

Project 5: Relation between genetic- and genome-level features with bacterial growth rate

- **Goal:** Explore the relationship between GC content and regulatory elements (promotors, ribosome binding site) with growth rate.
- **Notes:**
  - Growth rate needs to be computed (measured by codon adaptation index using tools such as gRodon2).
  - Might need some time to compute genome-level features.

Project 6: Relationship between optimal temperature with bacterial growth rate

- **Goal:** Explore the relationship between ‘optimal’ temperature with growth rate.
- **Notes:**
  - Based on a hypothesis from Jeff Gore’s papers. It will require reading these.
  - Optimal temperature will need to be computed (estimated with the mOTU abundances and environmental data).

Project 7: Auxotrophy from MAG exploration

- **Goal:** : identify presence/absence of amino acid synthesis pathways and their distribution across taxonomic groups / environment/ genome features (genome size, GC content, codon adaptation, etc…).
- **Notes:**
  - Might need some time to compute genome-level features.
  - Might need some reading on the topic (i.e. auxotrophy)

Project 8: Pathway reconstruction and niche estimation based on genome annotations

- **Goal:** Test available tools for pathway reconstruction or niche estimation based on the genome annotations.
- **Notes:**
  - Might be too complex? Indeed it is too complex!