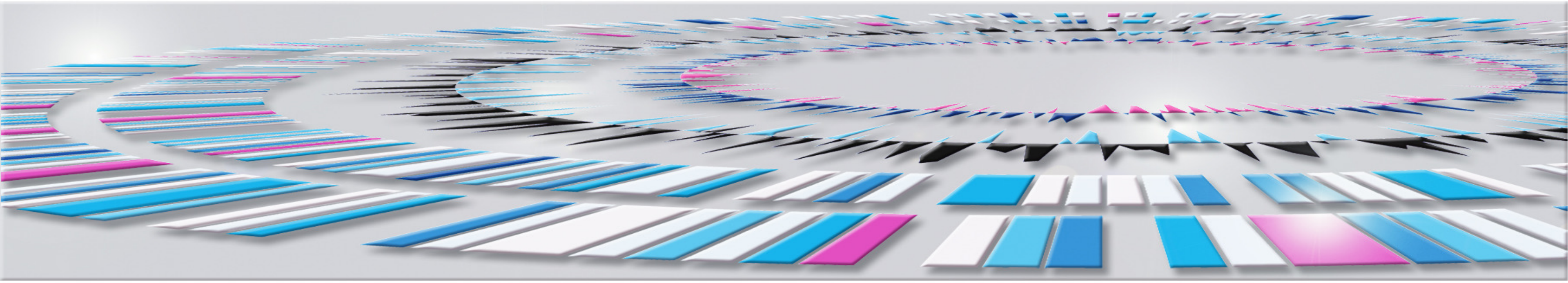
M.Bio.105

Applied bioinformatics in molecular biosciences

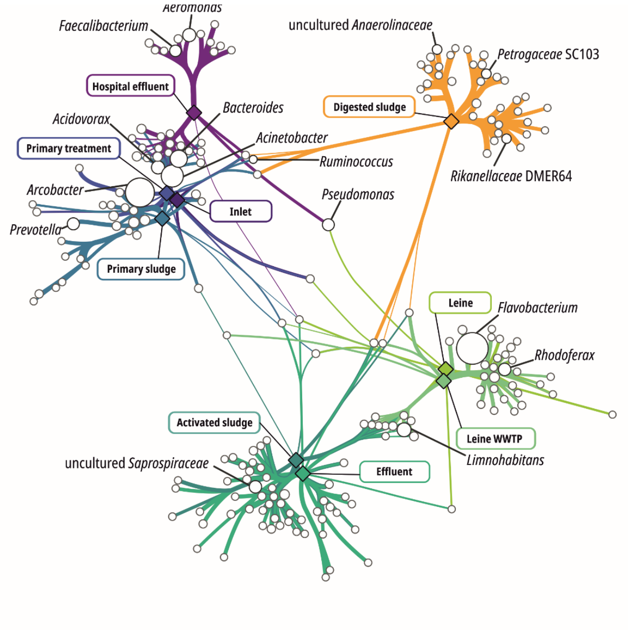


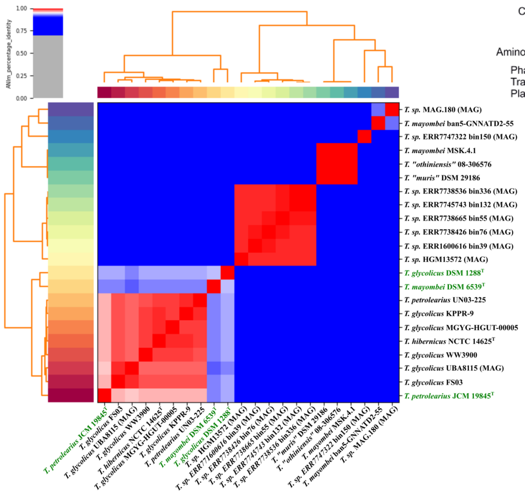
Rolf Daniel, Heiko Liesegang, Department of Genomic and Applied Microbiology
rdaniel@gwdg.de or hlieseg@gwdg.de

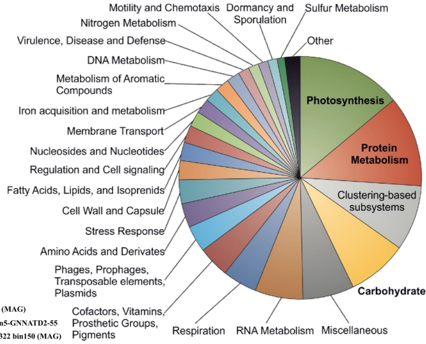
Start: 08.01.2024

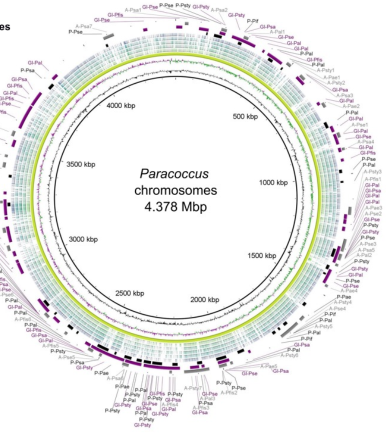
Module M.Bio.105

- M.Bio.105 addresses available software and databases of –omics driven biological data analysis
- Application of bioinformatic methods to investigate:
  - **Molecular phylogeny and sequence-based evolution**
  - **Genome dynamics and Meta(omics)**
  - **RNA and protein analysis**
  - **Identification and modelling of protein classes like enzymes and toxins**
  - **Construction of metabolic networks**









Module M.Bio.105

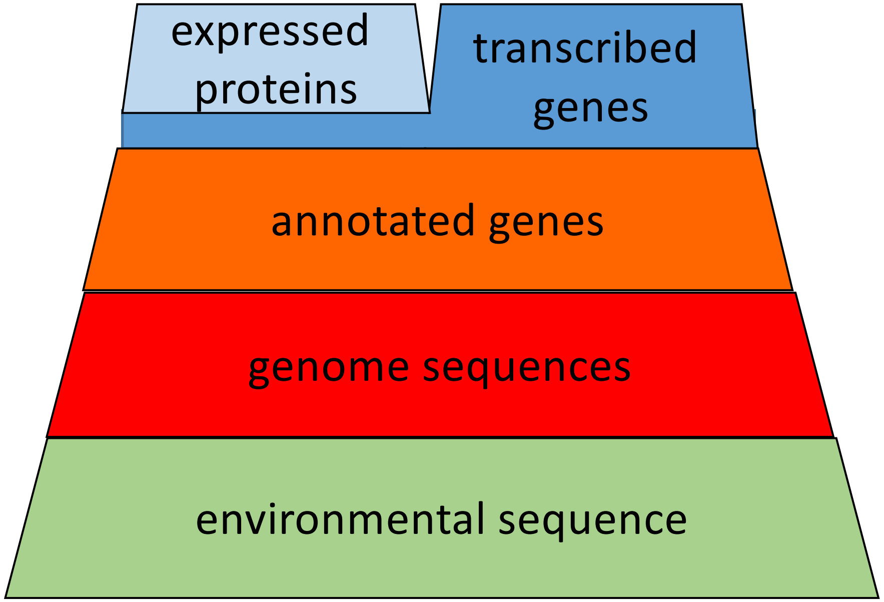
Core of the module is:

analysis, visualization and the integration of large data sets from – omics technologies.

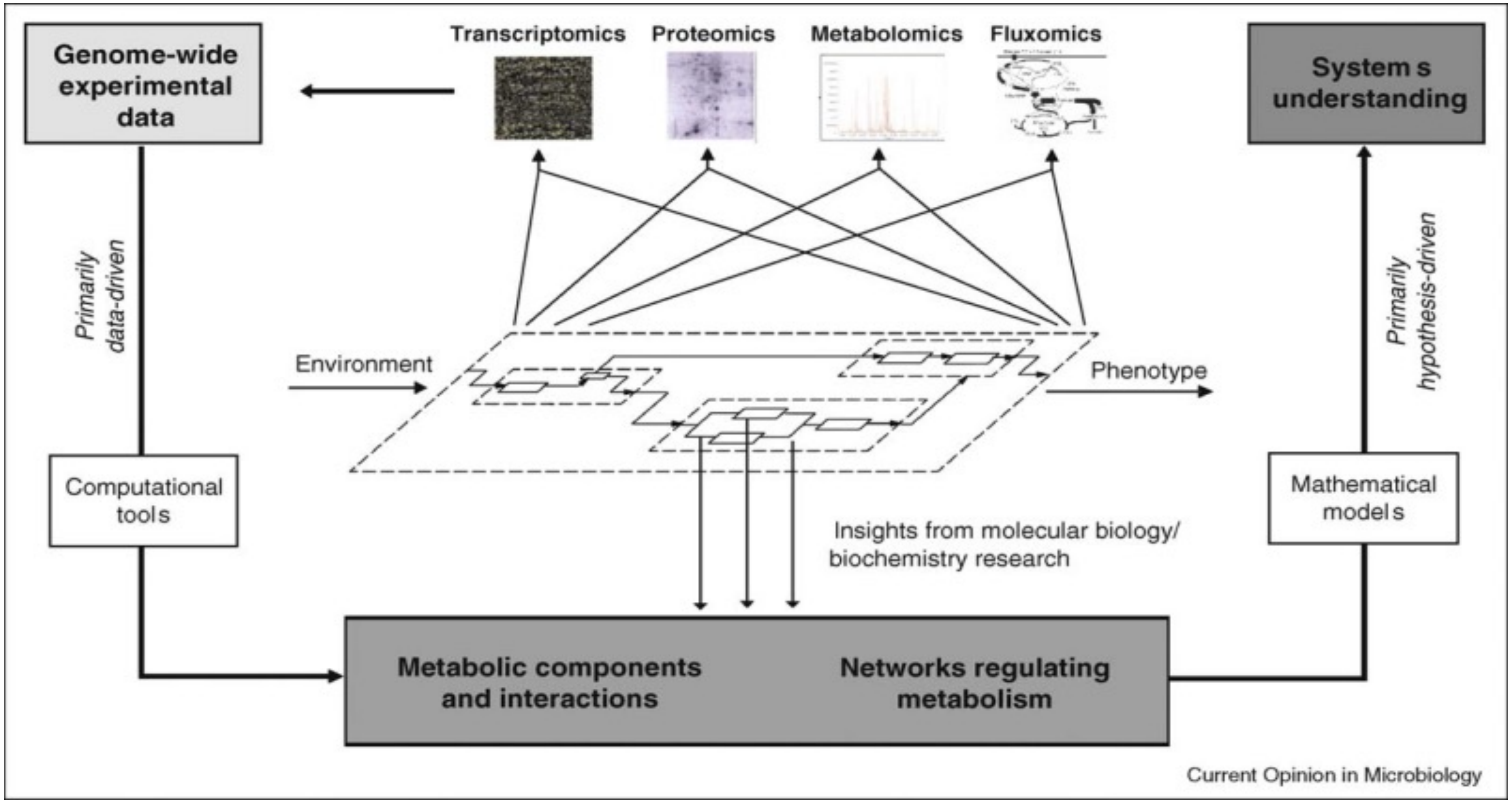
Goal: to acquire the data analysis abilities for the understanding of systems biology from single organisms to entire environmental communities.

-omics data describes the entire set of a biological entity:

- Metagenomics:
  all organisms present in a sample
- Genomics:
  - Replicons in a genome
  - genes (protein and sRNA) present in organisms
- Transciptomics:
  - All genes active at a given condition
- Proteomics:
  - All proteins expressed at a given condition



-omics data and systems biology



Current Opinion in Microbiology

M.Bio.105: summary

- Organized in:
    - Lectures (3 SWS)
    - Literature seminars (1 SWS)
    - Practical exercises (10 SWS)
    - Limited to 10 students
- Uses real data from current projects
- Bioinformatic background
    - Linux skills
    - B.Bio.117 genome analysis or equivalent
    - Recommended: Python- and R- scripting
    - Fits to Computational Biology (M.CoBi.501)
- Scheduled each winter term
- Language: English
- Exam requirements: knowledge on how to apply bioinformatic methods focused on (Meta)omics data. Ability to present and understand scientific literature
- Exam: oral presentation on methods and results applied on –omics data (80%) plus seminar talk (20%)
- Workload: 5 weeks block course, start 19.1.2026; 360h (196 presence/164 self-study)
- Supervisors: Prof. Jan de Vries, Dr. Oliver Valerius, PD Dr. Heiko Liesegang, Dr. Anja Poehlein, Prof. Rolf Daniel, Dr. Ines Friedrich

This is a module designed also as preparation for data-driven lab rotations or master thesis projects

In case of questions:
rdaniel@gwdg.de
hlieseg@gwdg.de