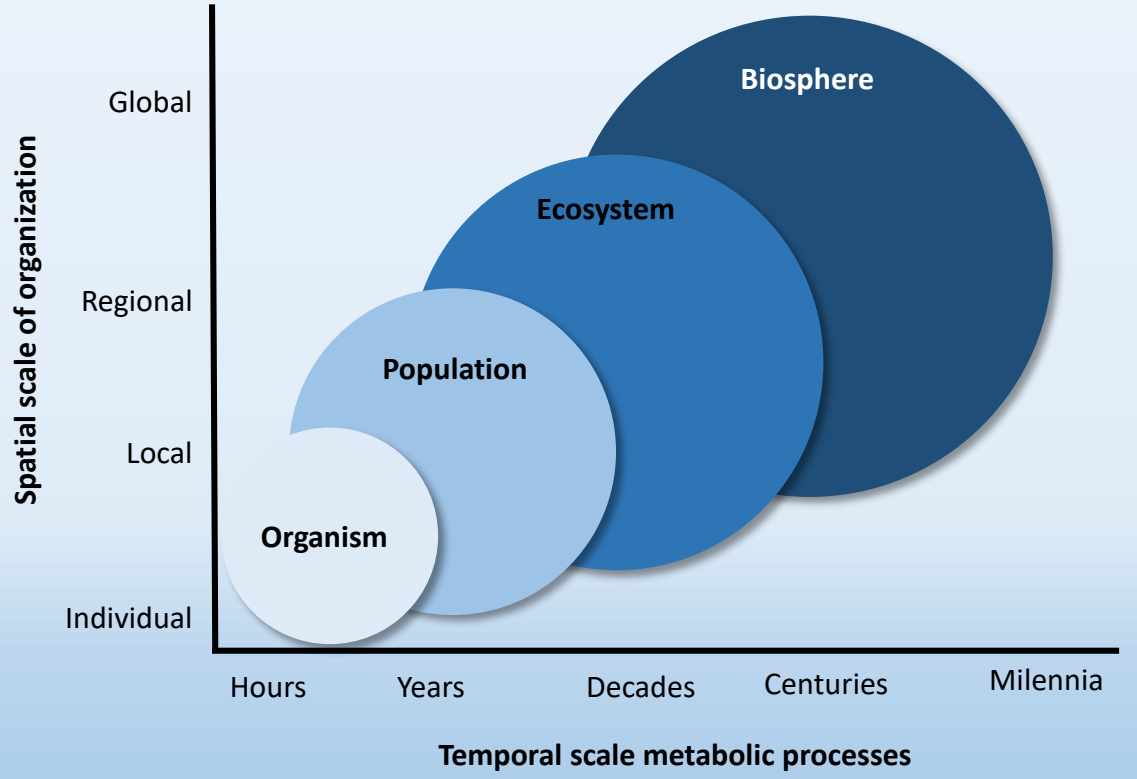
Scaling in biological systems: application in terrestrial ecology and formation of artificial ecological systems

Josip Juraj Strossmayer University of Osijek
Department of Biology
Subdepartment of Quantitative Ecology

Scales of ecological organization



Ecotoxicology

- Pesticides
- New materials – nanoparticles
- Abiotic parameters – climate change

Ecotoxicology and Environmental Safety
Volume 148, February 2018, Pages 480-489

Influence of soil temperature and moisture on biochemical biomarkers in earthworm and microbial activity after exposure to propiconazole and chlorantraniliprole

Davorka K. Hackenberger, Goran Palijan, Željka Lončarić, Olga Jovanović Glavaš, Branimir K. Hackenberger

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https://doi.org/10.1016/j.ecoenv.2017.10.072

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Chemosphere
Volume 224, June 2019, Pages 572-579

Effects of single and combined exposure to nano and bulk zinc-oxide and propiconazole on *Enchytraeus albidus*

Davorka K. Hackenberger, Nikolina Stjepanović, Željka Lončarić, Branimir K. Hackenberger

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https://doi.org/10.1016/j.chemosphere.2019.02.189

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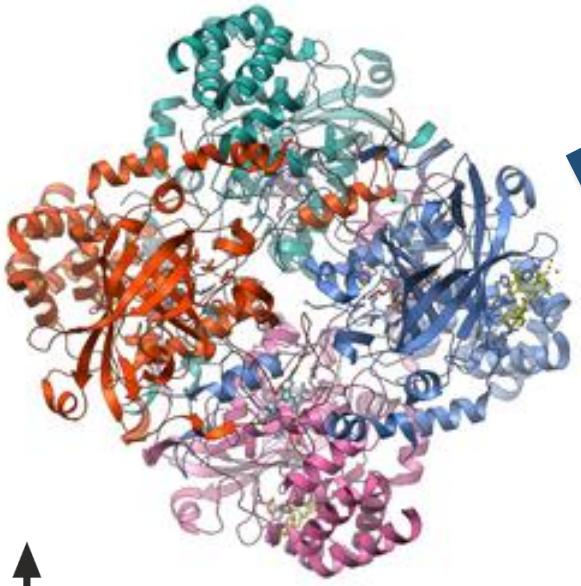
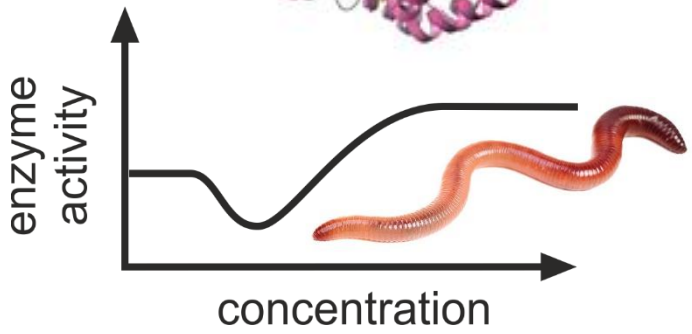
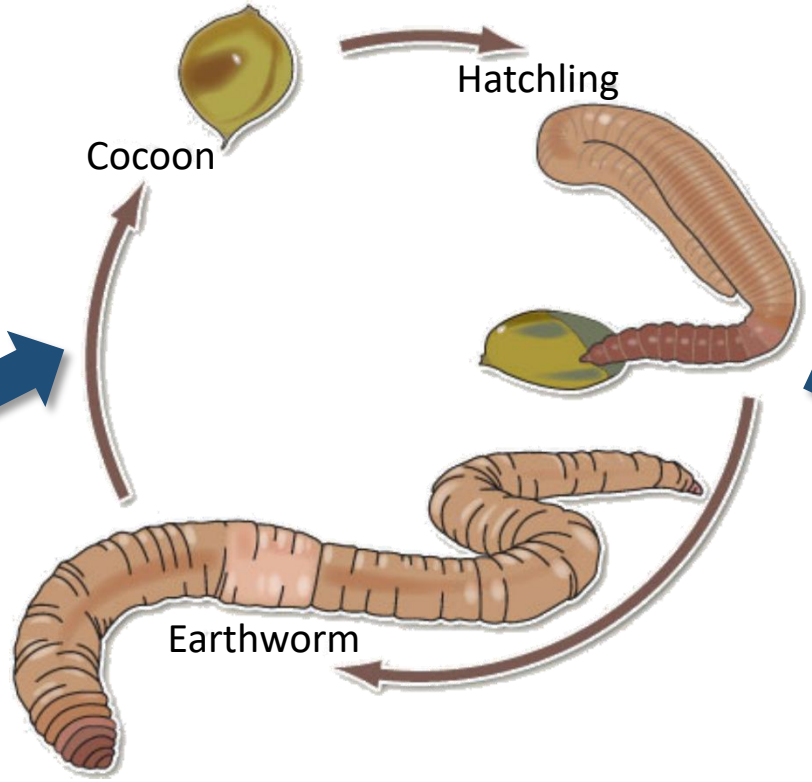
REPRODUCTION SUCCESS
MORTALITY

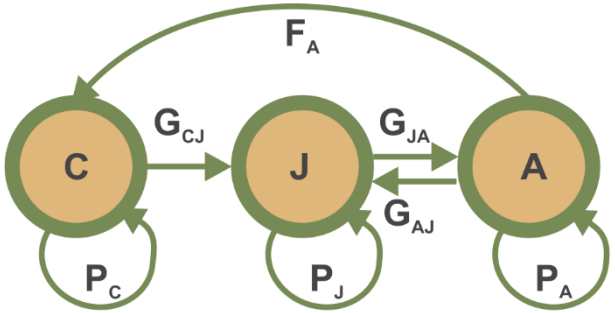
MOLECULAR BIOMARKERS

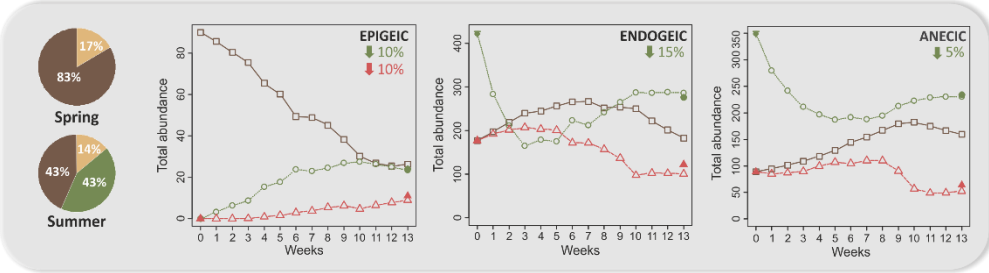






POPULATION MODELS
***IN SILICO* EXPERIMENTS**





Experimental organisms

Earthworms

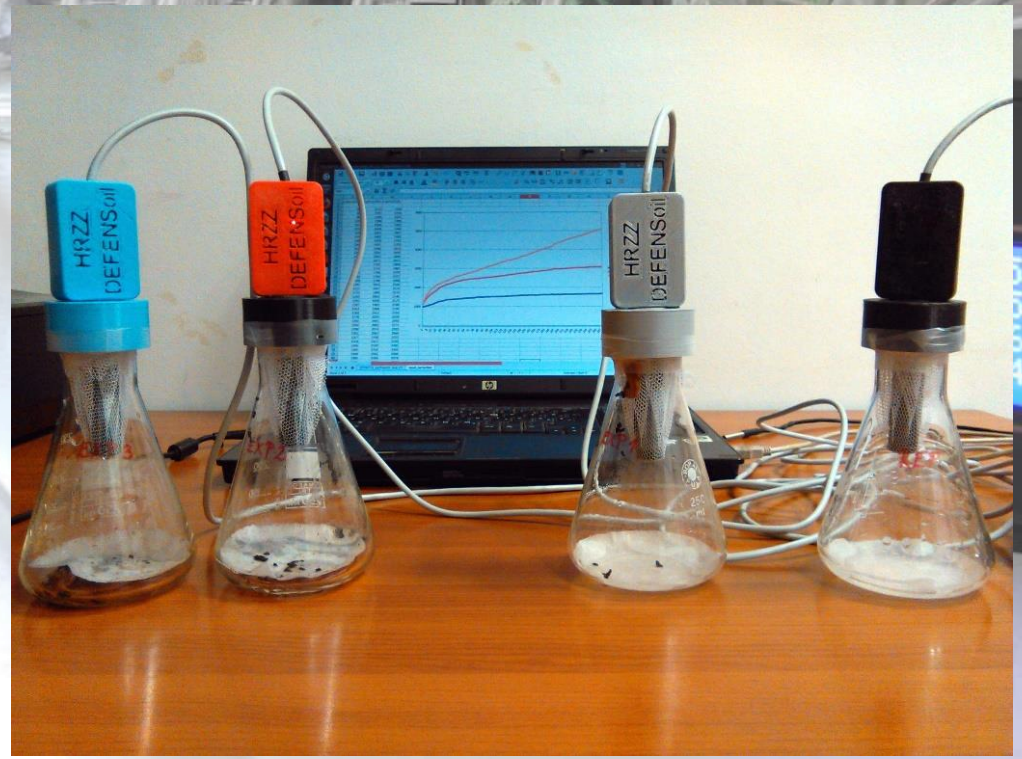
Enchytraeids

Collembola

Folsomia candida

Ecotoxicology

- Sensor systems



ELSEVIER

Aquatic Toxicology

Volume 206, January 2019, Pages 154-163

Real-time CO_2 uptake/emission measurements as a tool for early indication of toxicity in Lemna-tests

Vesna Peršić, Tamara Đerđ, Martina Varga, Branimir K. Hackenberger

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https://doi.org/10.1016/j.aquatox.2018.11.013

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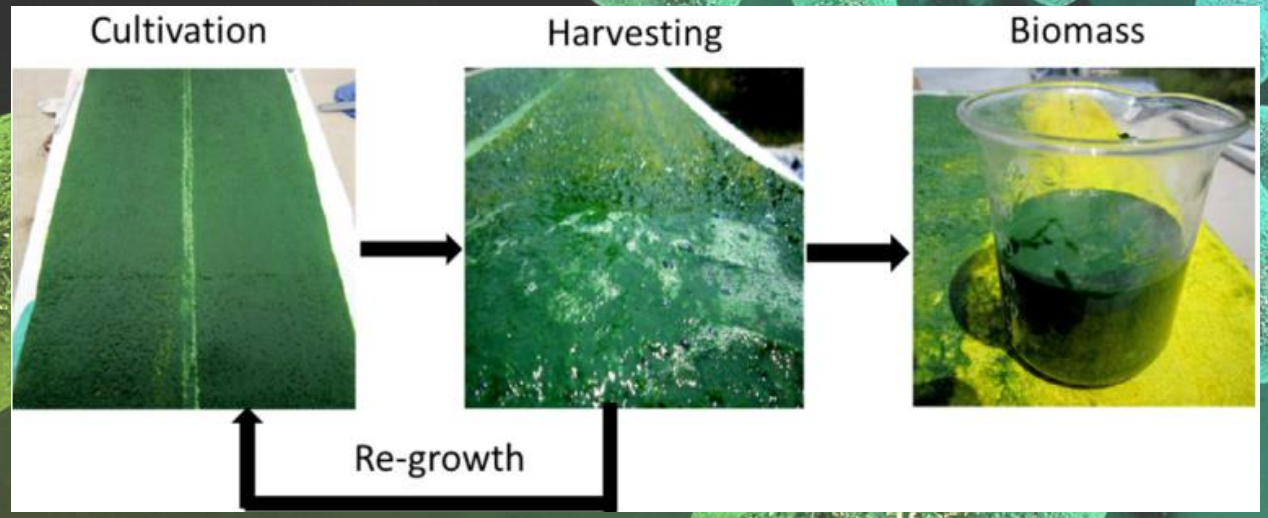
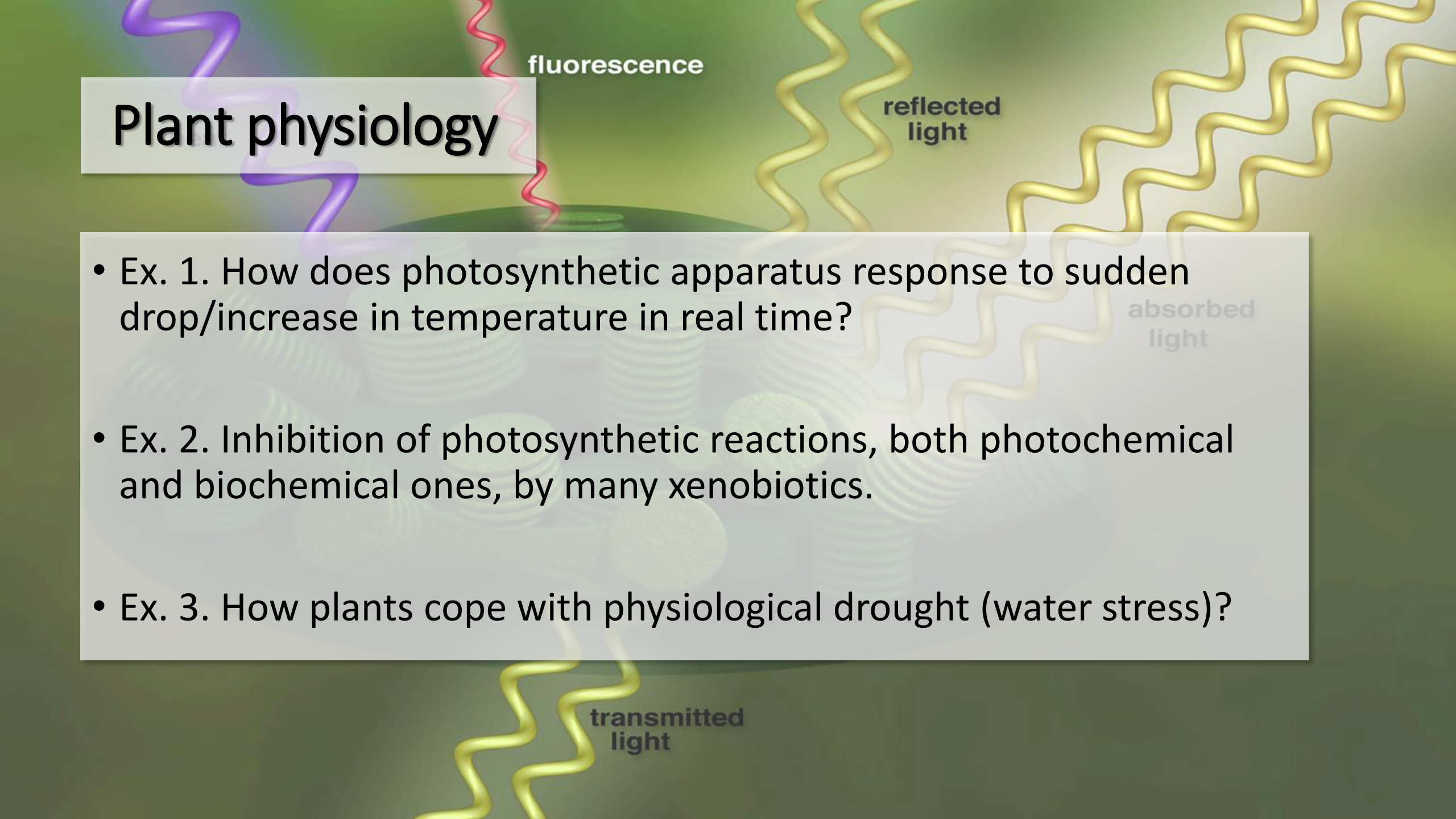
Microbiology

- MELISSA (Micro-Ecological Life-Support System Alternative)
- PGPB (Plant Growth Promoting Bacteria)
- Bacterial biofilms in simulated extraterrestrial soil



Lanlan i et al. 2015. Bioresource Technology 181: 136-142.



Plant physiology

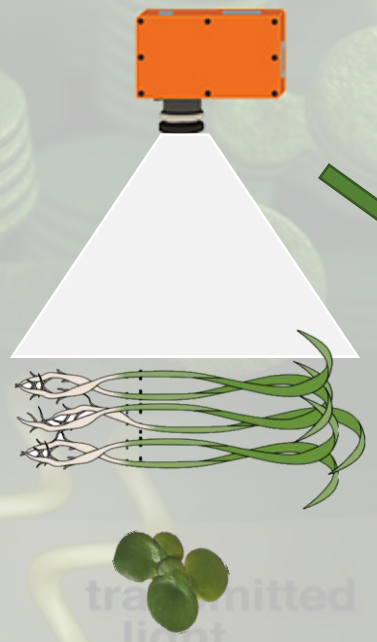
- Ex. 1. How does photosynthetic apparatus response to sudden drop/increase in temperature in real time?
- Ex. 2. Inhibition of photosynthetic reactions, both photochemical and biochemical ones, by many xenobiotics.
- Ex. 3. How plants cope with physiological drought (water stress)?

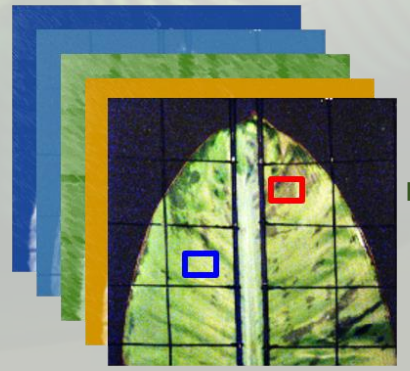
Plant physiology

- Hyperspectral imaging
- Biochemical, physiological, molecular analysis

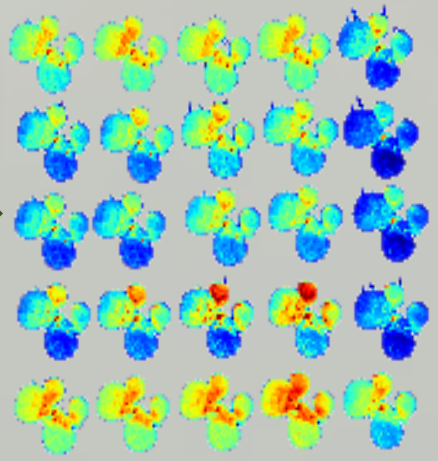
Ex. 1., 3.

Ex. 2.





HSI Cube

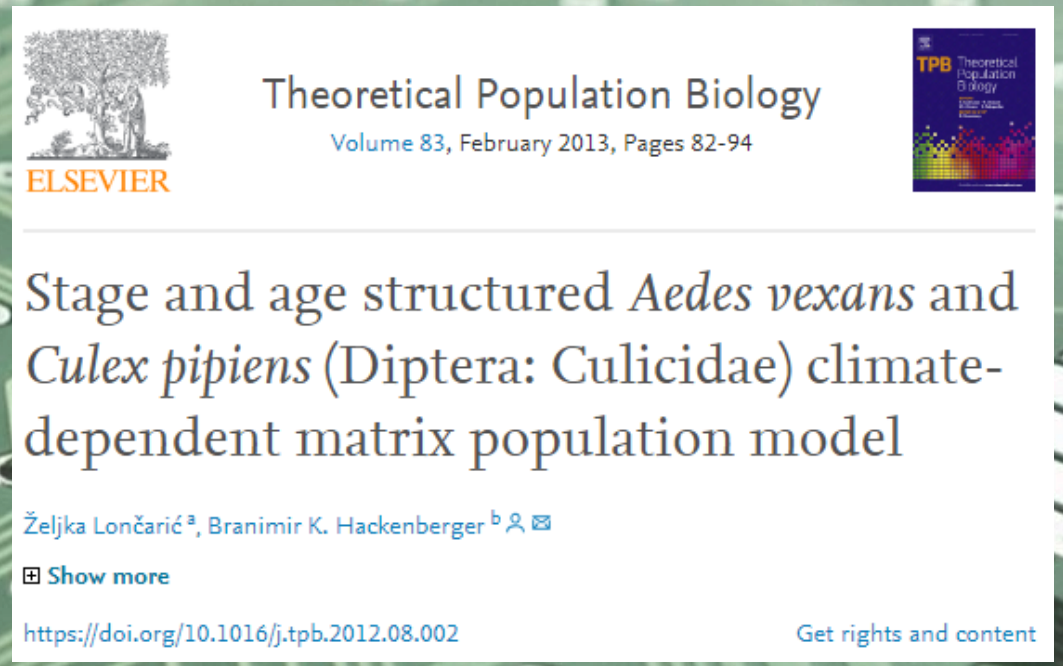


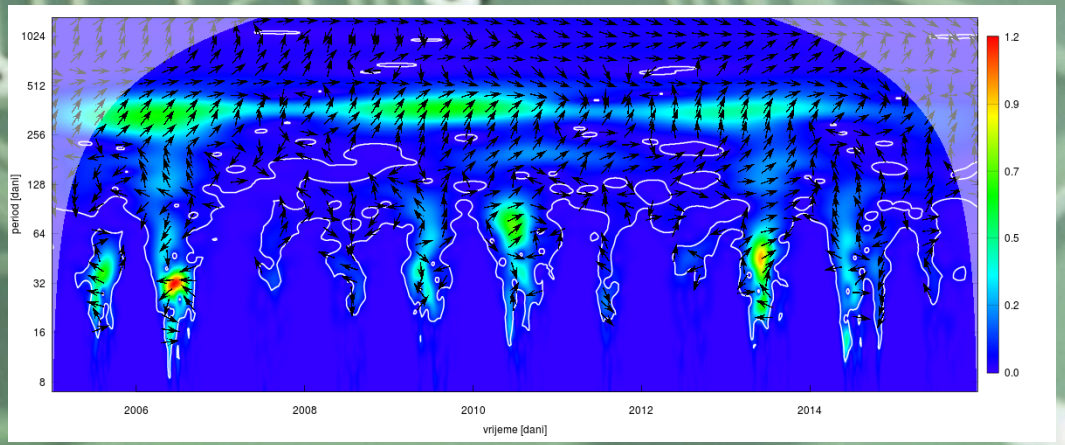
HSI Matrix

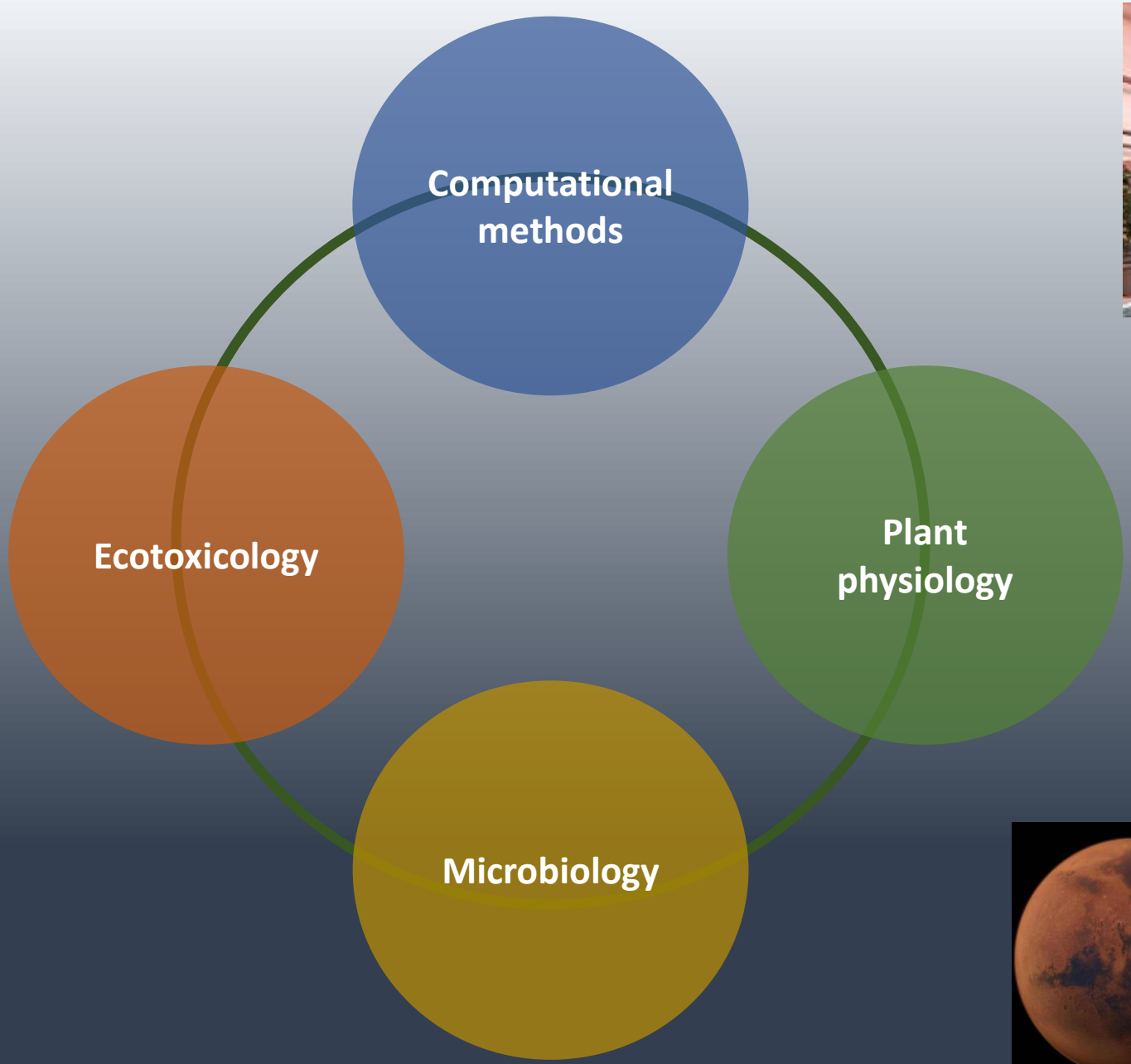
Fluorescence

Computational methods

- *In silico* experiments
  - Climate change scenarios
- Big data analytics






Computational methods
Ecotoxicology
Plant physiology
Microbiology