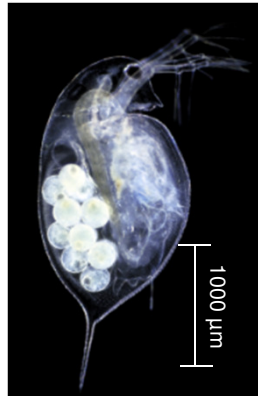# Integrating genomics into ecotoxicology.

## Challenges and opportunities: a case study with Daphnia.

Jana Asselman, Dieter De Coninck, Mike Pfrender, Joe Shaw, John Colbourne, Jackie Lopez, Stephen Glaholt, Colin Janssen, Karel De Schamphelaere

FACULTY OF **BIOSCIENCE ENGINEERING**

1000 μm

- Ecological importance:
  - Ubiquitous in freshwater
  - Central position in the food-web
  - Indicator of water quality
- Characteristics of a model organism
  - Short generation time
  - Easy to handle, easy to culture
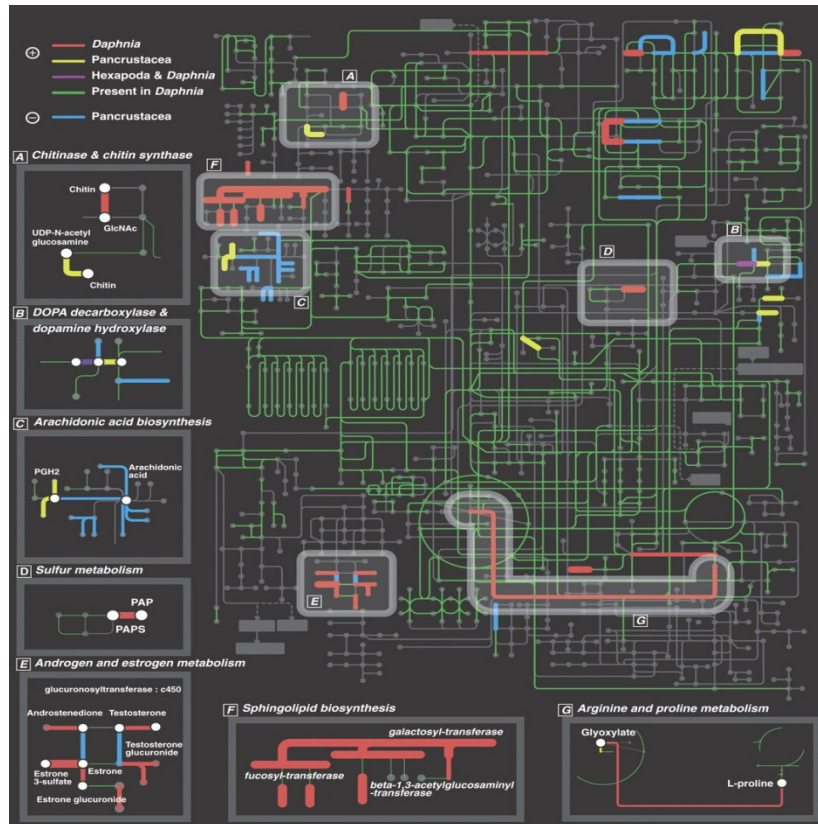 - Cyclic parthenogenesis
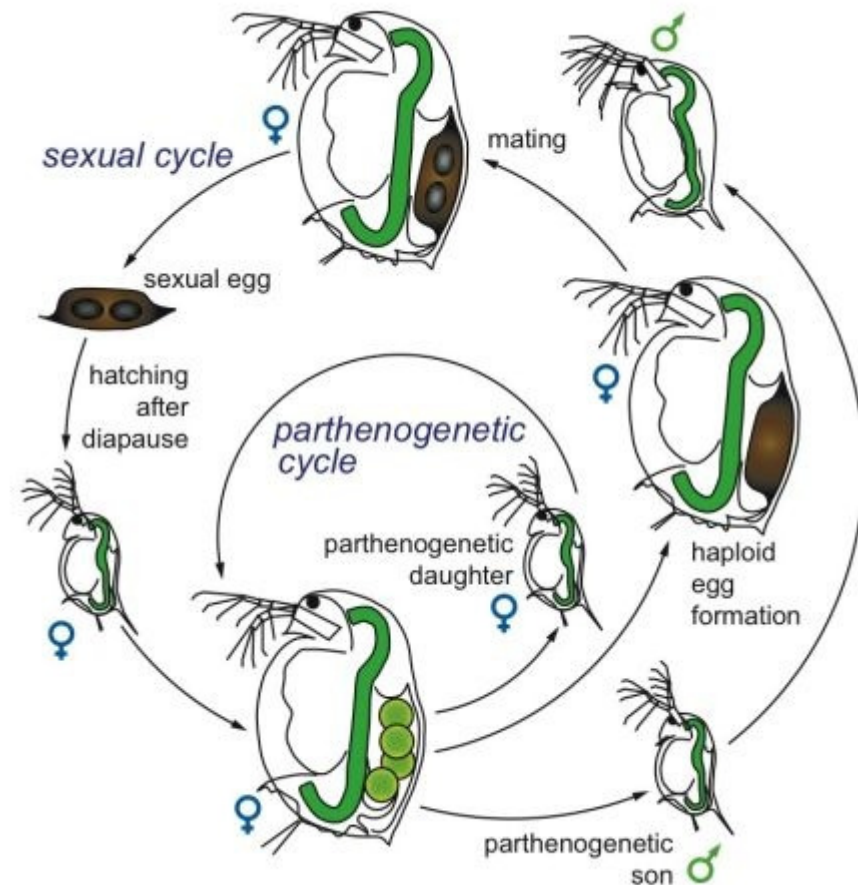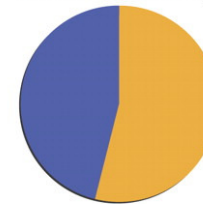
The Ecoresponsive Genome of *Daphnia pulex*
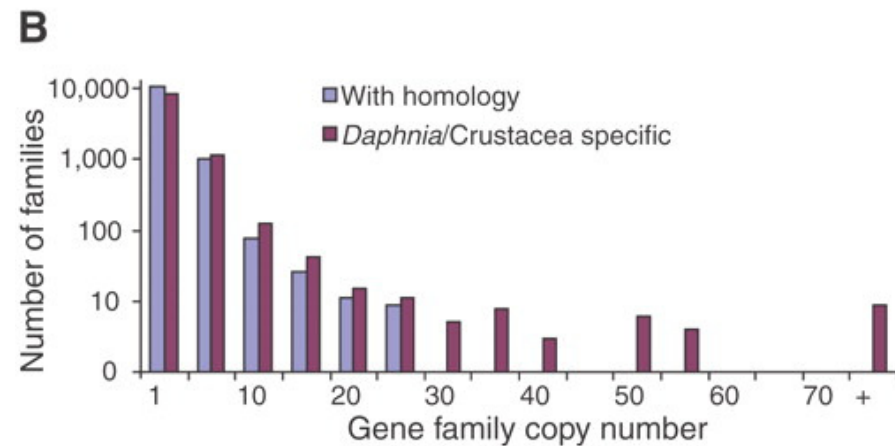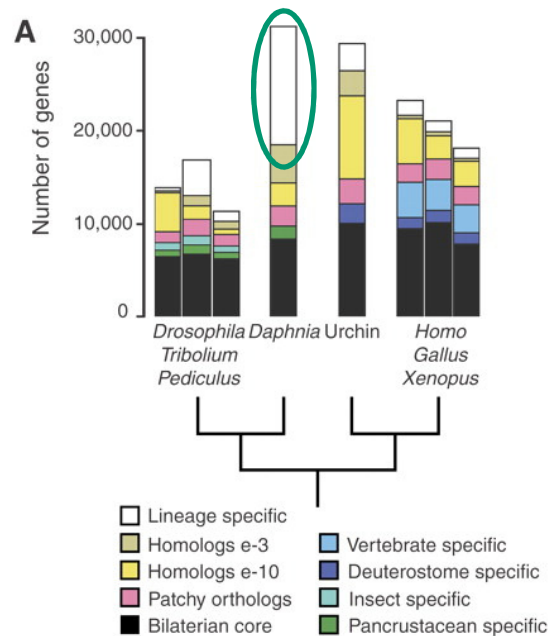
- High number of lineage specific genes
- High number of genes belonging to expanded-duplicated gene families with no homology

Colbourne et al. 2011 Science 331, 555.
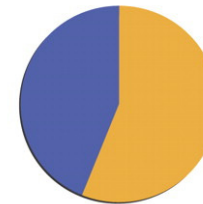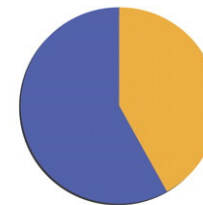
The Ecoresponsive Genome of *Daphnia pulex*

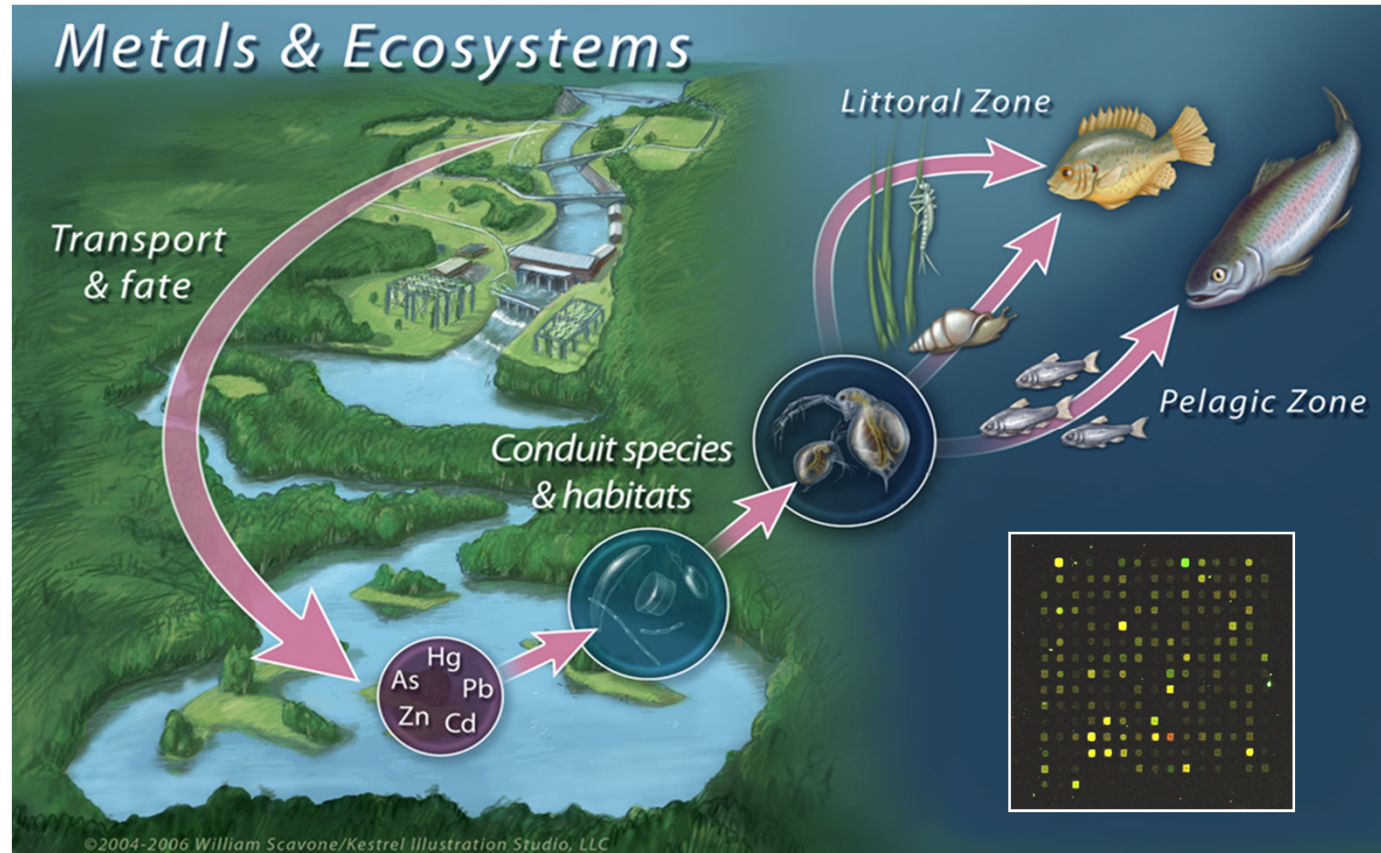Colbourne et al. 2011 Science 331, 555.

- High number of lineage specific genes
- High number of genes belonging to expanded-duplicated gene families

Most responsive to environmental conditions

Ecotoxicogenomics with *Daphnia pulex*

Metals & Ecosystems

Transport & fate

Littoral Zone

Conduit species & habitats

Hg
As   Pb
Zn   Cd

Pelagic Zone

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CONFIDENTIAL

Ecotoxicogenomics with *Daphnia pulex*

Laboratory of Environmental Toxicology and Aquatic Ecology
Jana.Asselman@UGent.be

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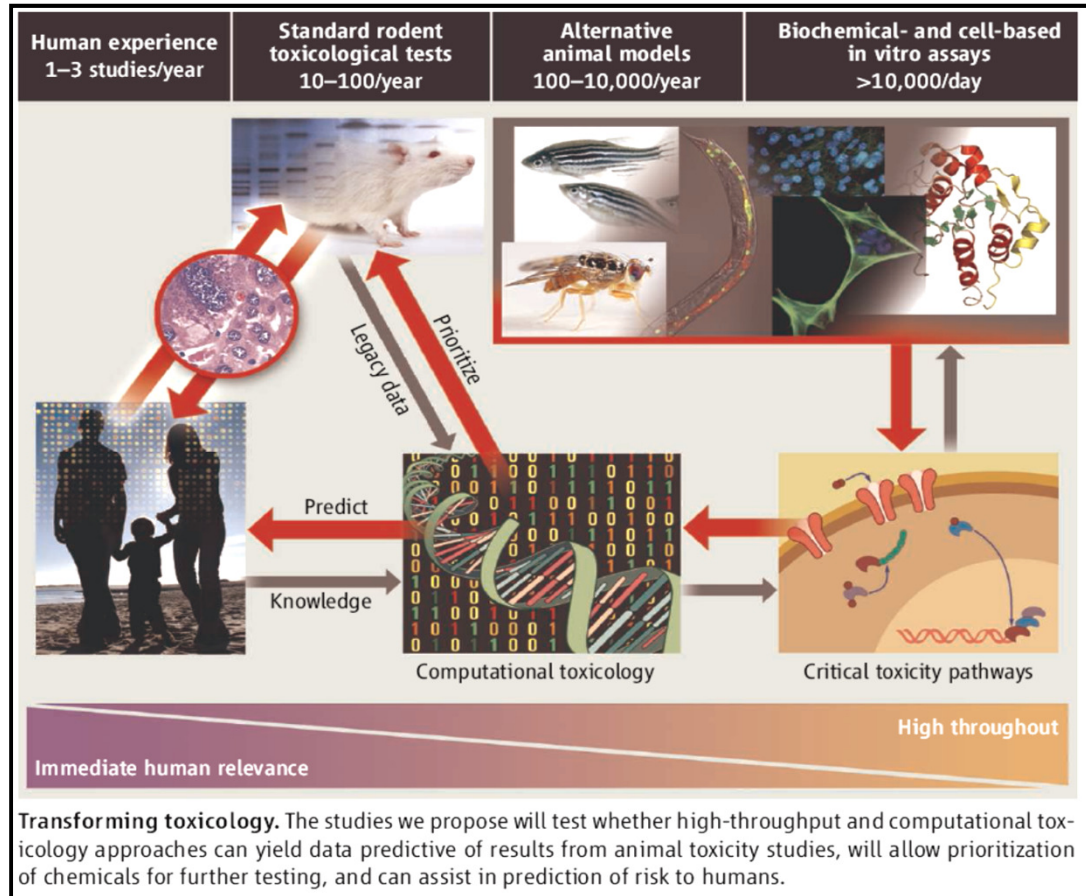
Ecotoxicogenomics with *Daphnia pulex*
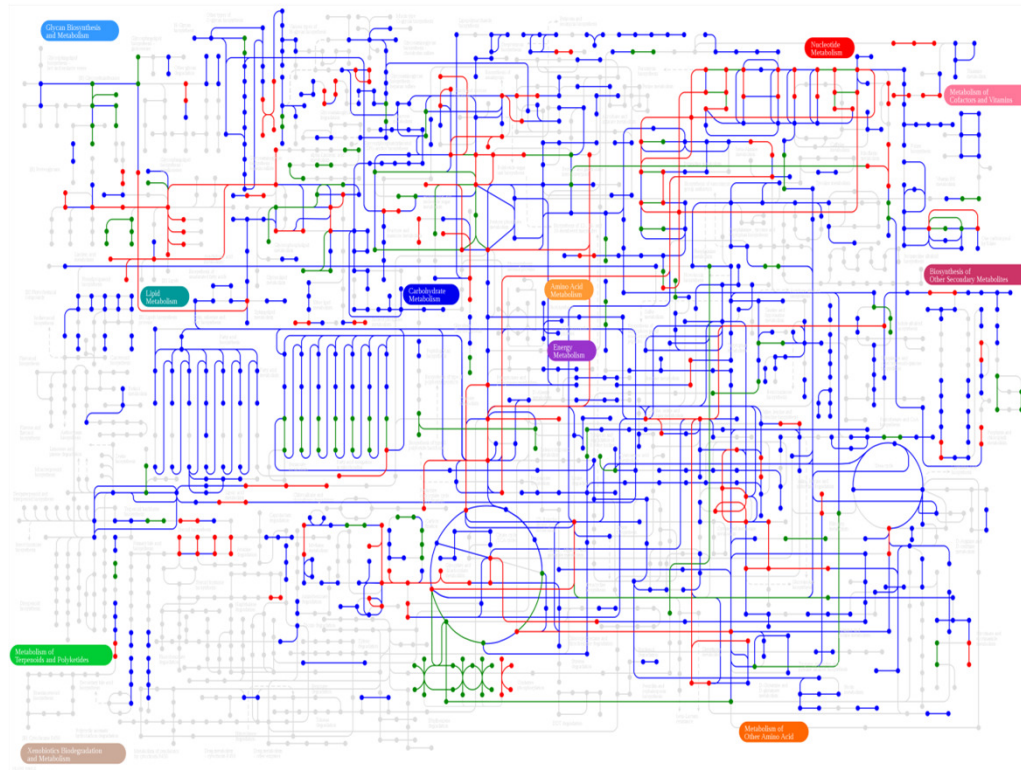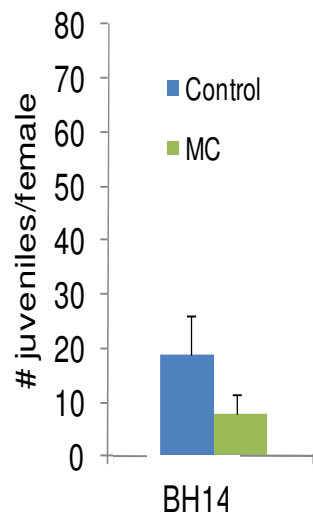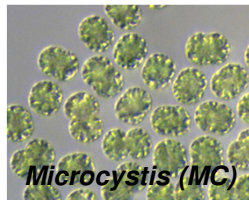
Microcystis (MC)

Three pathways involved in *Microcystis* stress:
- Oxidative Phosphorylation
- Ribosome
- Digestive System (trypsins)

Asselman et al. 2012 Environ Sci Technol 46, 8448-8457

Remaining challenges:

- High number of lineage specific genes

Environmental annotation, potential homology with newly sequenced genomes such as Artemia

- Functional diversification of duplicated genes

Environmental annotation, specific studies targeting these clusters

- High througput data processing & data storage, data access

Daphnia genome in KEGG, data available in GEO

- Linking molecular effects to organismal effects

Thank you for your attention.