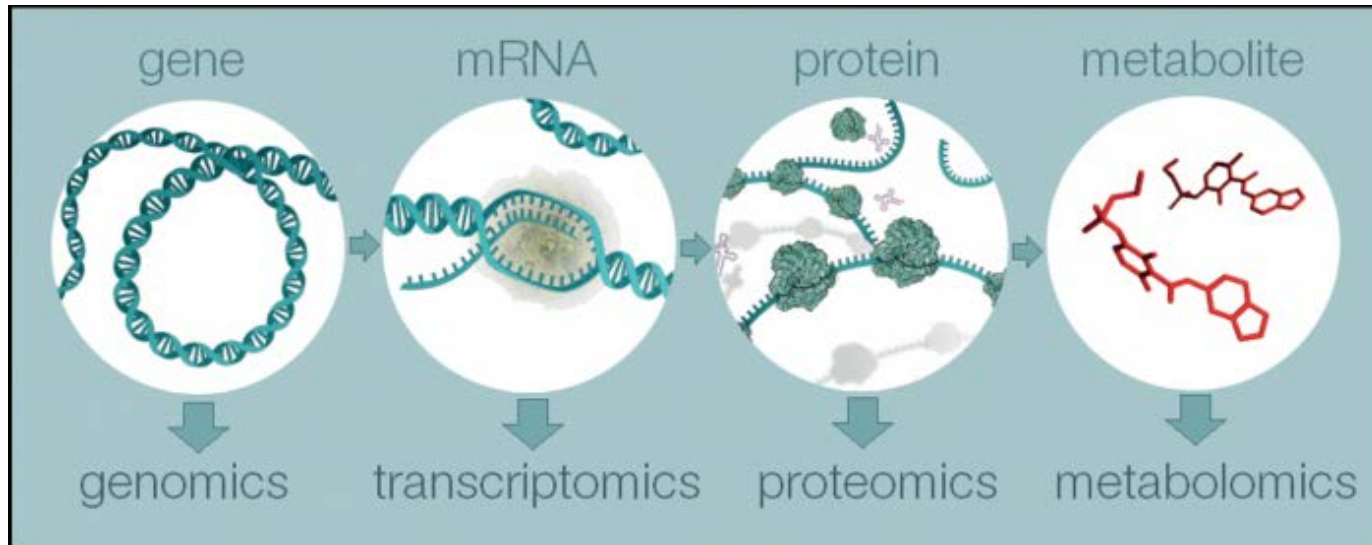




Omic

Ieva Roznere
The Ohio State University

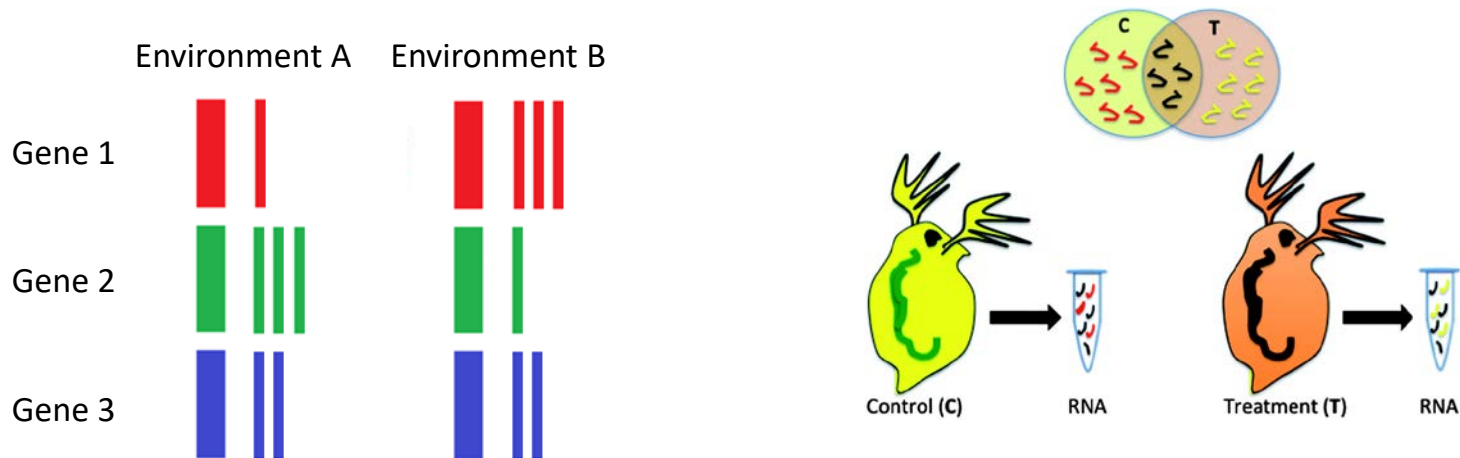
What is omics?



EMBL-EBI

Transcriptomics

- Transcriptome – the complete set of RNA molecules produced during gene expression



Examples

- Heat stress

- Wang et al. (2012) Rapid development of molecular resources for a freshwater mussel, *Villosa lienosa* (Bivalvia: Unionidae), using an RNA-seq-based approach. *Freshw Sci*.

- Drought

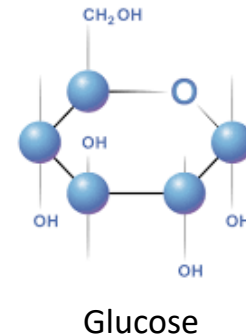
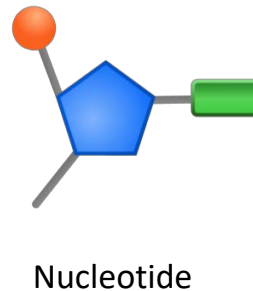
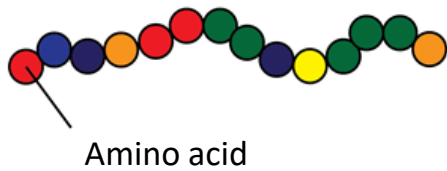
- Luo et al. (2014) Transcriptomic profiling of differential responses to drought in two freshwater mussel species, the giant floater *Pyganodon grandis* and the pondhorn *Unio merus tetralasmus*. *PLoS One*.

- NaCl

- Robertson et al. (2017) RNA sequencing analysis of transcriptional change in the freshwater mussel *Elliptio complanata* after environmentally relevant sodium chloride exposure. *Environ Toxicol Chem*.

Metabolomics

- Metabolome – the complete set of low molecular weight compounds produced during metabolism



Examples

- Toxic compounds

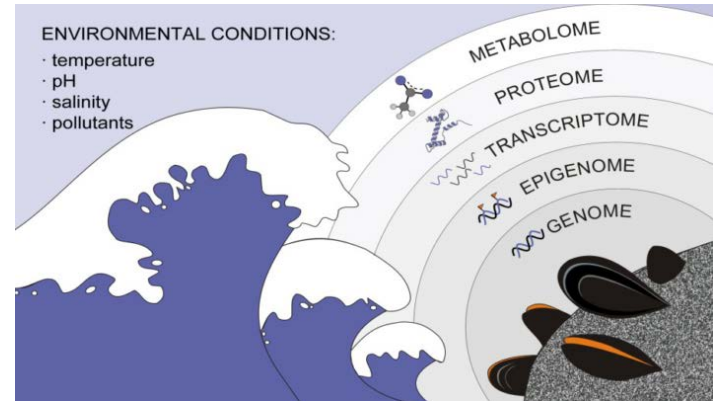
- Leonard et al. (2014) Metabolomic, behavioral, and reproductive effects of the synthetic estrogen 17 α -ethinylestradiol on the unionid mussel *Lampsilis fasciola*. *Aquat Toxicol*.
- Leonard et al. (2014) Metabolomic, behavioral, and reproductive effects of the aromatase inhibitor fadrozole hydrochloride on the unionid mussel *Lampsilis fasciola*. *Gen Comp Endocr*.

- Relocation and captivity

- Roznere et al. (2014) Nontargeted metabolomics reveals biochemical pathways altered in response to captivity and food limitation in the freshwater mussel *Amblema plicata*. *Comp Biochem Physiol*.
- Roznere et al. (2017) Effects of relocation on metabolic profiles of freshwater mussels: metabolomics as a tool for improving conservation techniques. *Aquat Conserv*.

Other applications

- Measuring stress
- Biomarker discovery
- Modes of action in toxicology
- Predicting relocation success
 - He et al. (2017)
- Integration of multiple omics datasets
- Adaptation to certain environmental conditions
 - Early stages of speciation
 - Taxonomic units of conservation interest



Suárez-Ulloa et al. (2013)

Concerns

- Cost
 - Cost of next generation sequencing (NGS) has decreased 5 orders of magnitude in 10 years
- Expertise
 - Transcriptomics – bioinformatics
 - Metabolomics – biochemistry
 - Broad applicability, so outsourcing is common



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