



Metabolic and toxicological networks

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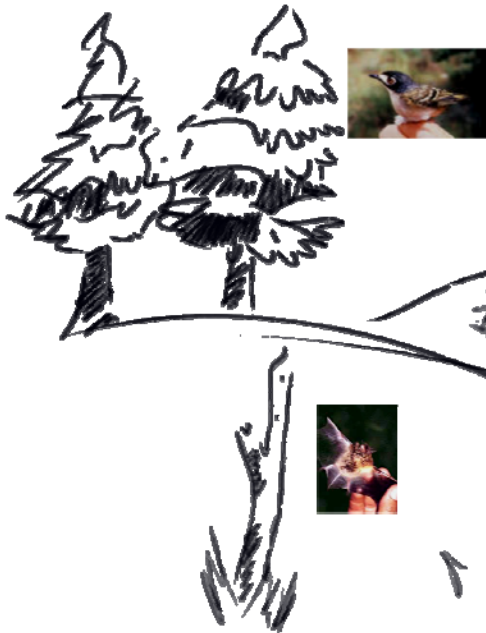


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What is the Army impact on animals in the environment?

Threatened & endangered Populations



Military chemicals
(explosives,
propellants, and
metals)



Fate

Microbial populations



Sediment and aquatic
contaminants:
PCBs, Metals, PAHs,
Pesticides

Effect

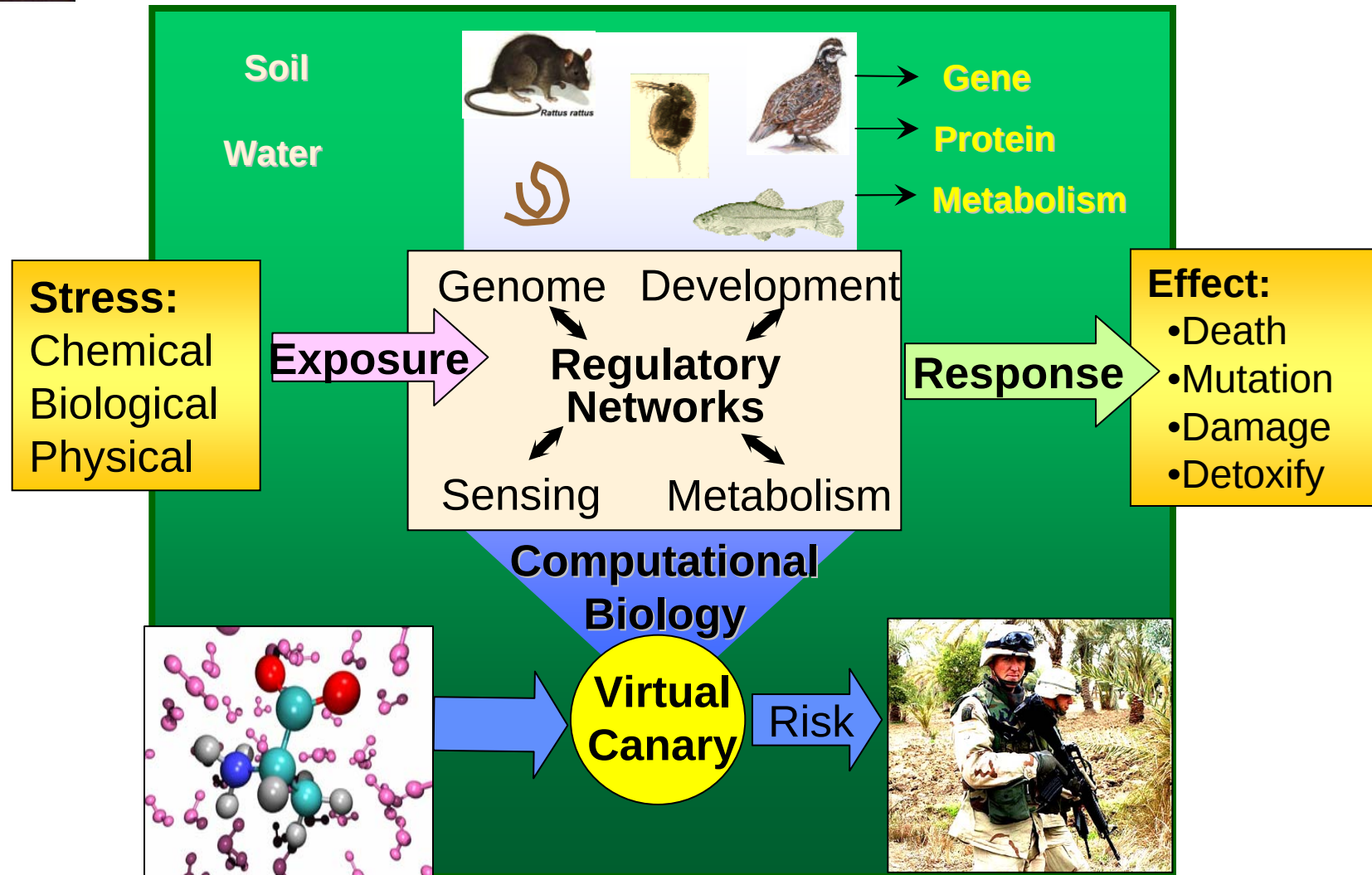


Toxicity to individuals



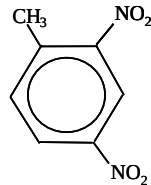


Goal: Predict bad effects

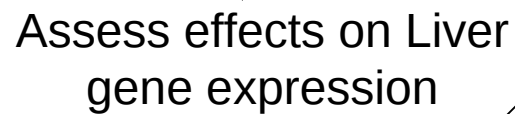


Rapid/Accurate Assessment and Prediction of Risk

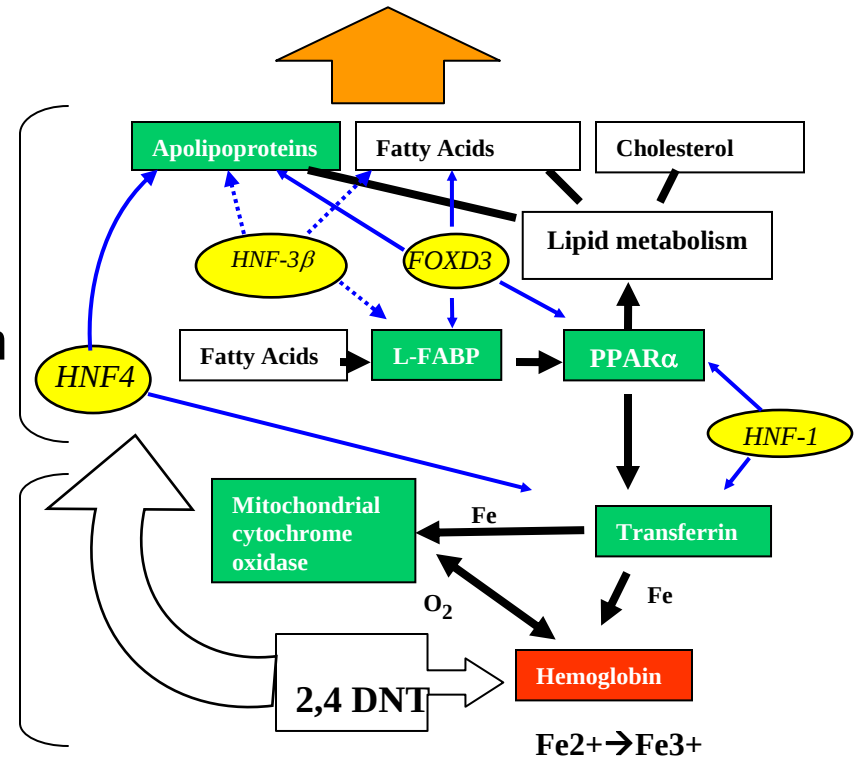




Fathead minnow exposed to 2,4-dinitrotoluene



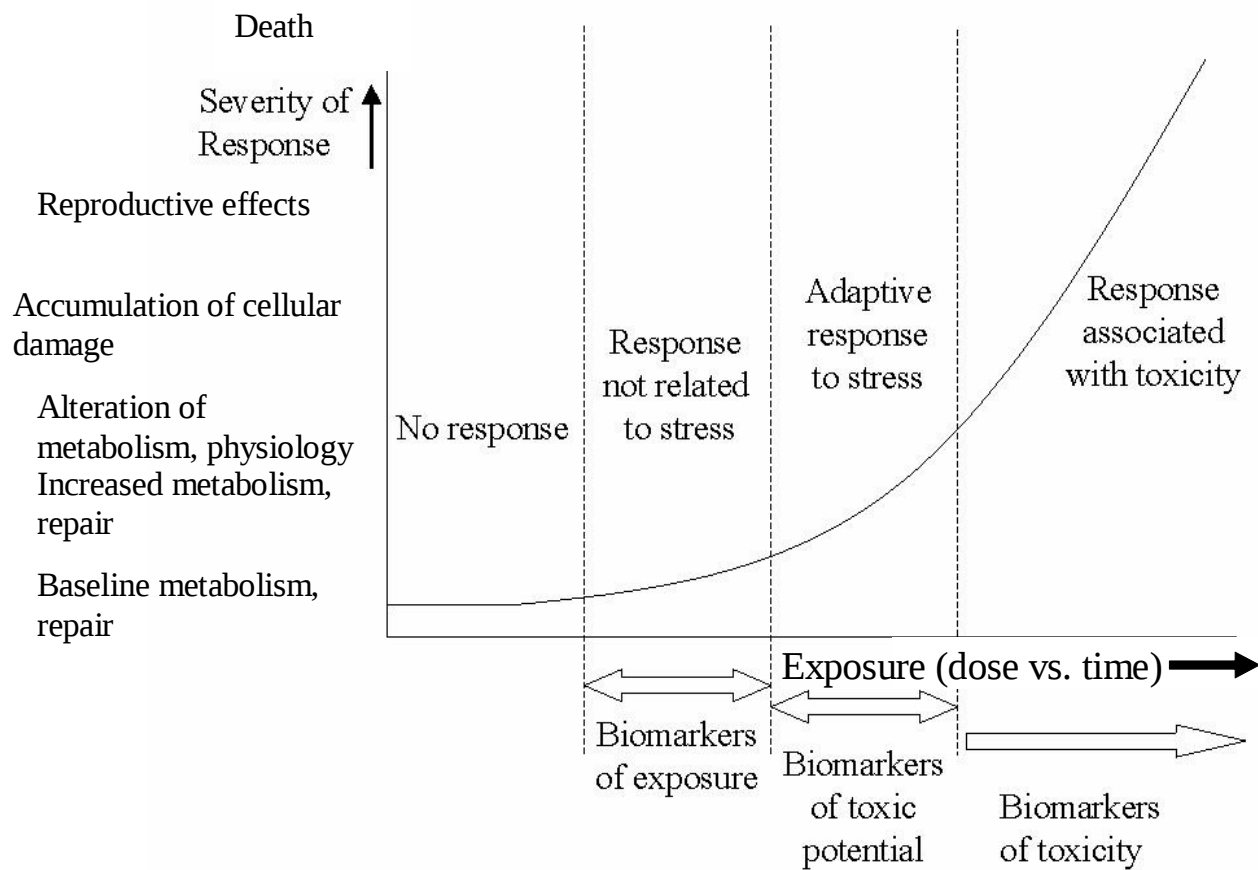
Respiration





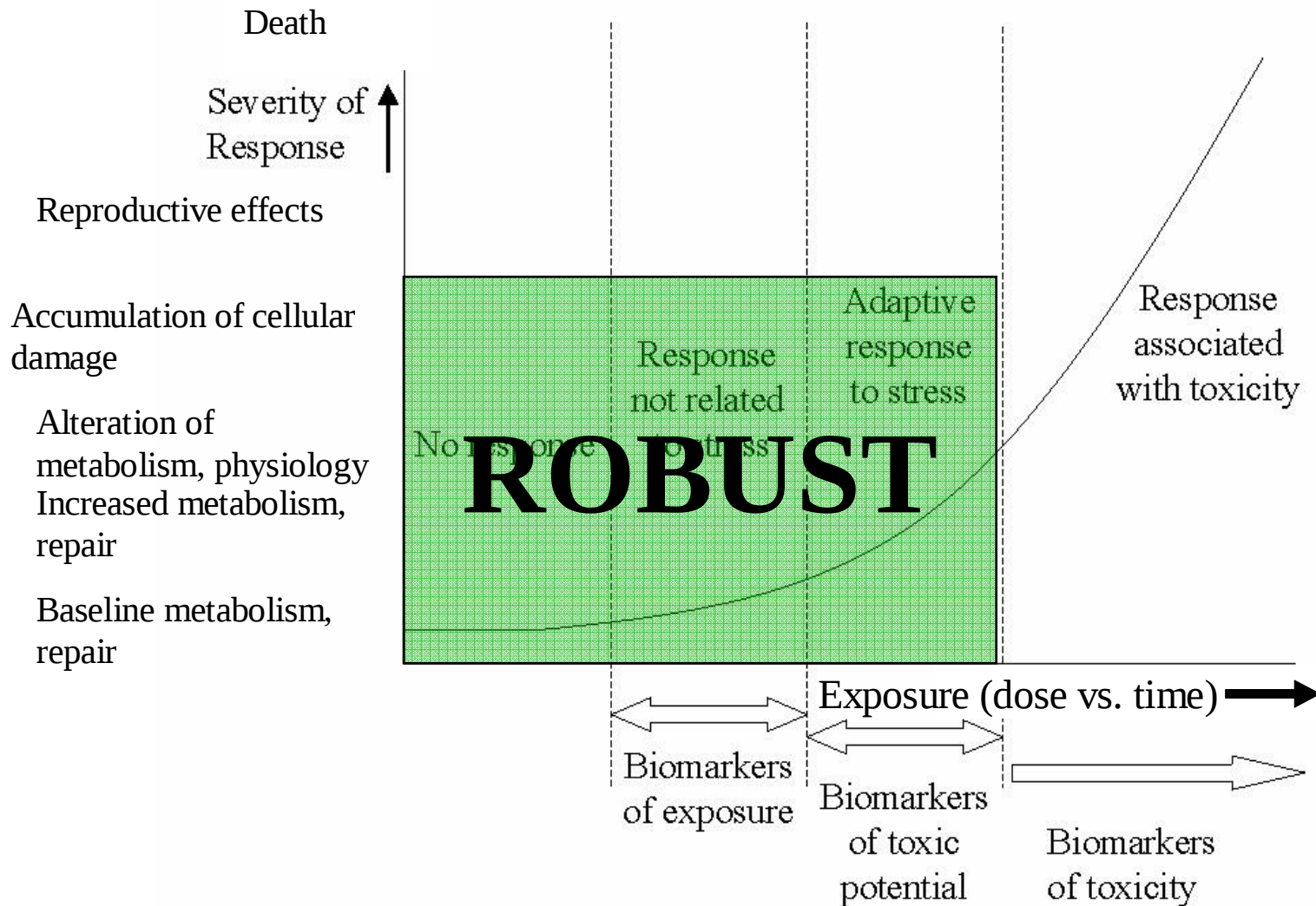
Biological networks and fundamental network properties

As in engineered systems, there is a trade off between Robustness and Fragility



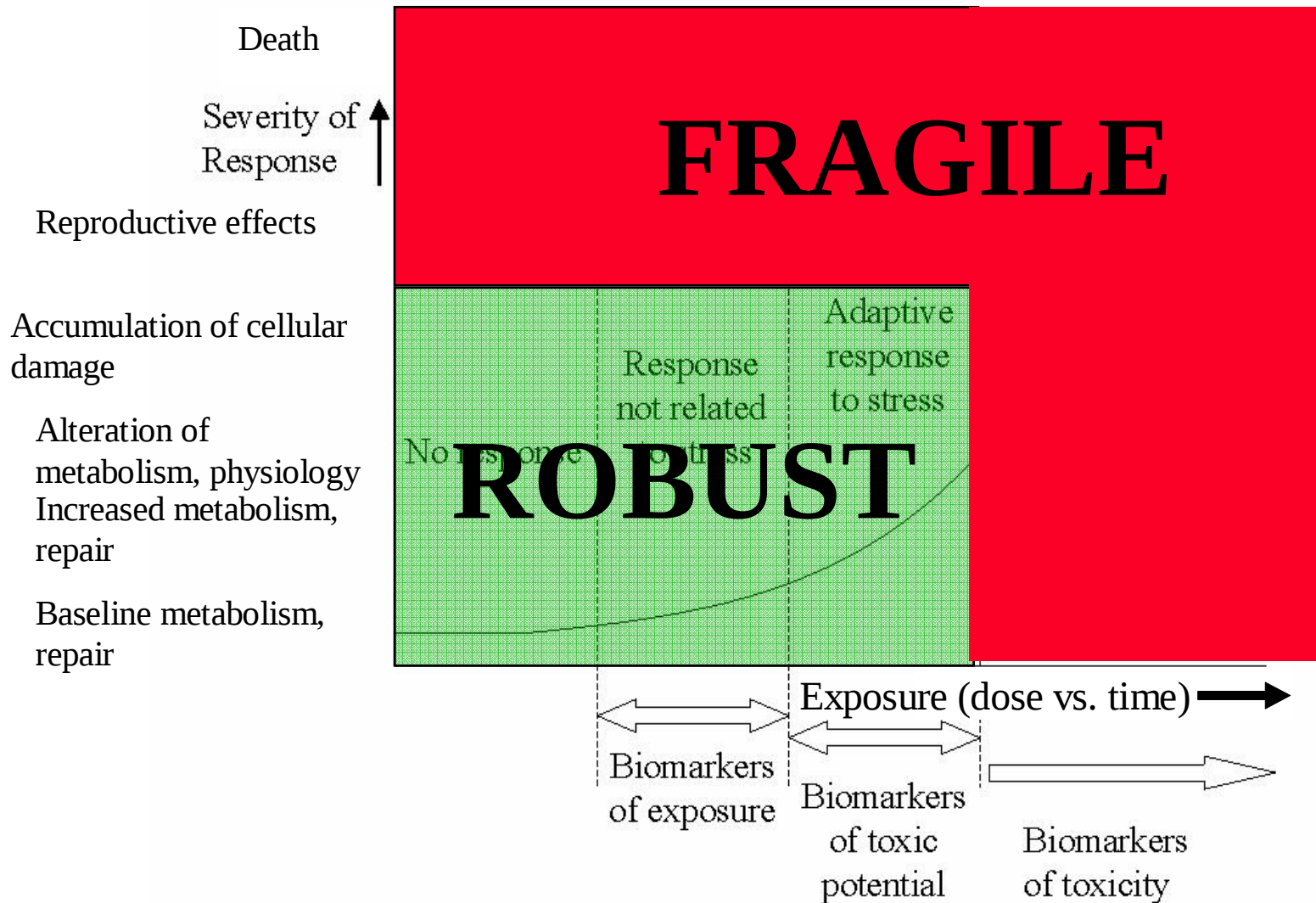


Toxicity Due to Fragility





Toxicity / Fragility



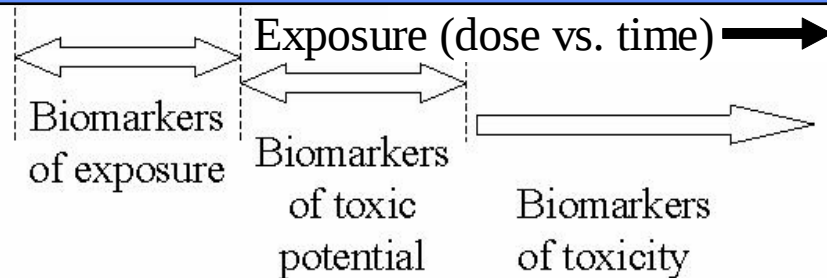


Toxicity / Fragility

Death



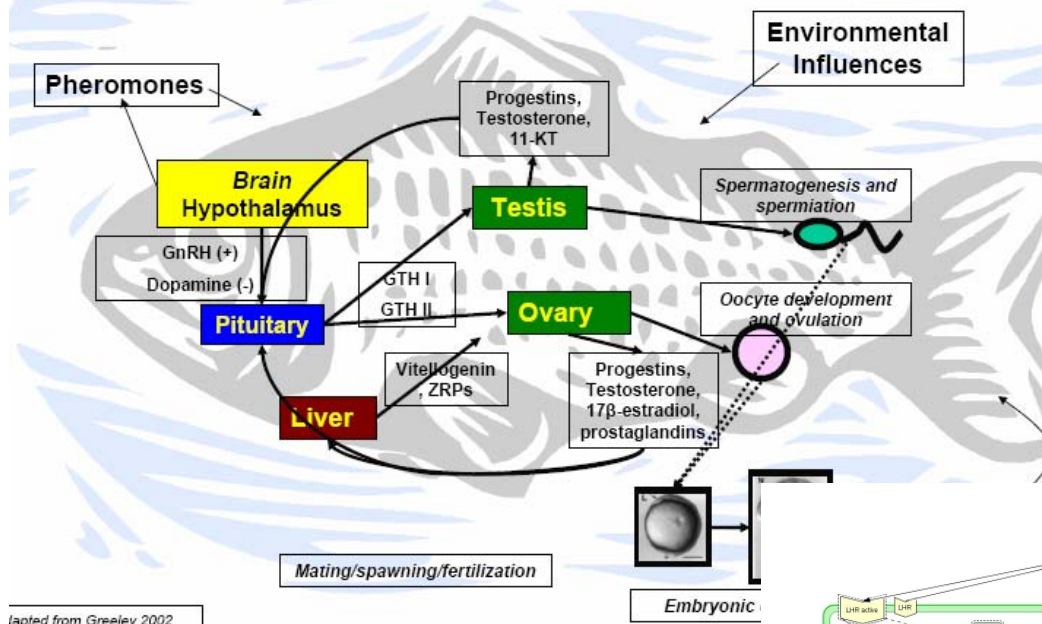
Prediction of toxicity
=
Prediction of network failure





Endocrine pathway in fish as model

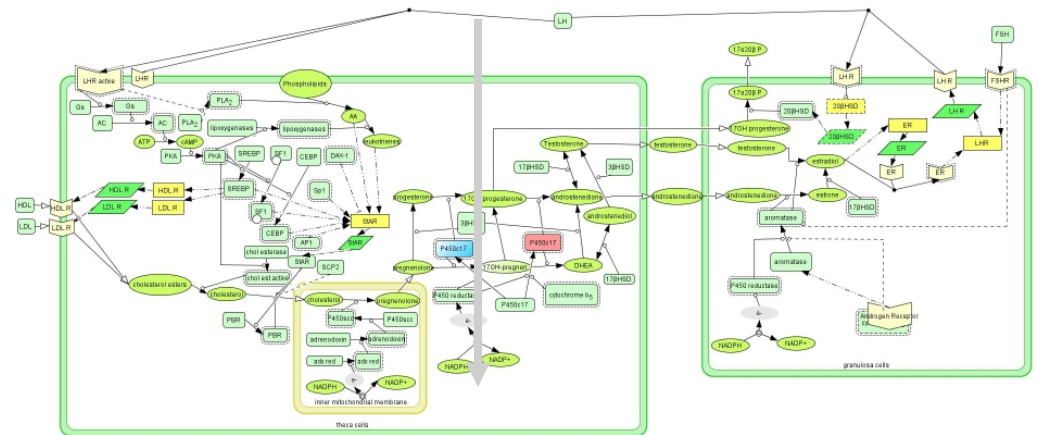
Overview of Fish Reproduction



Adapted from Greeley 2002

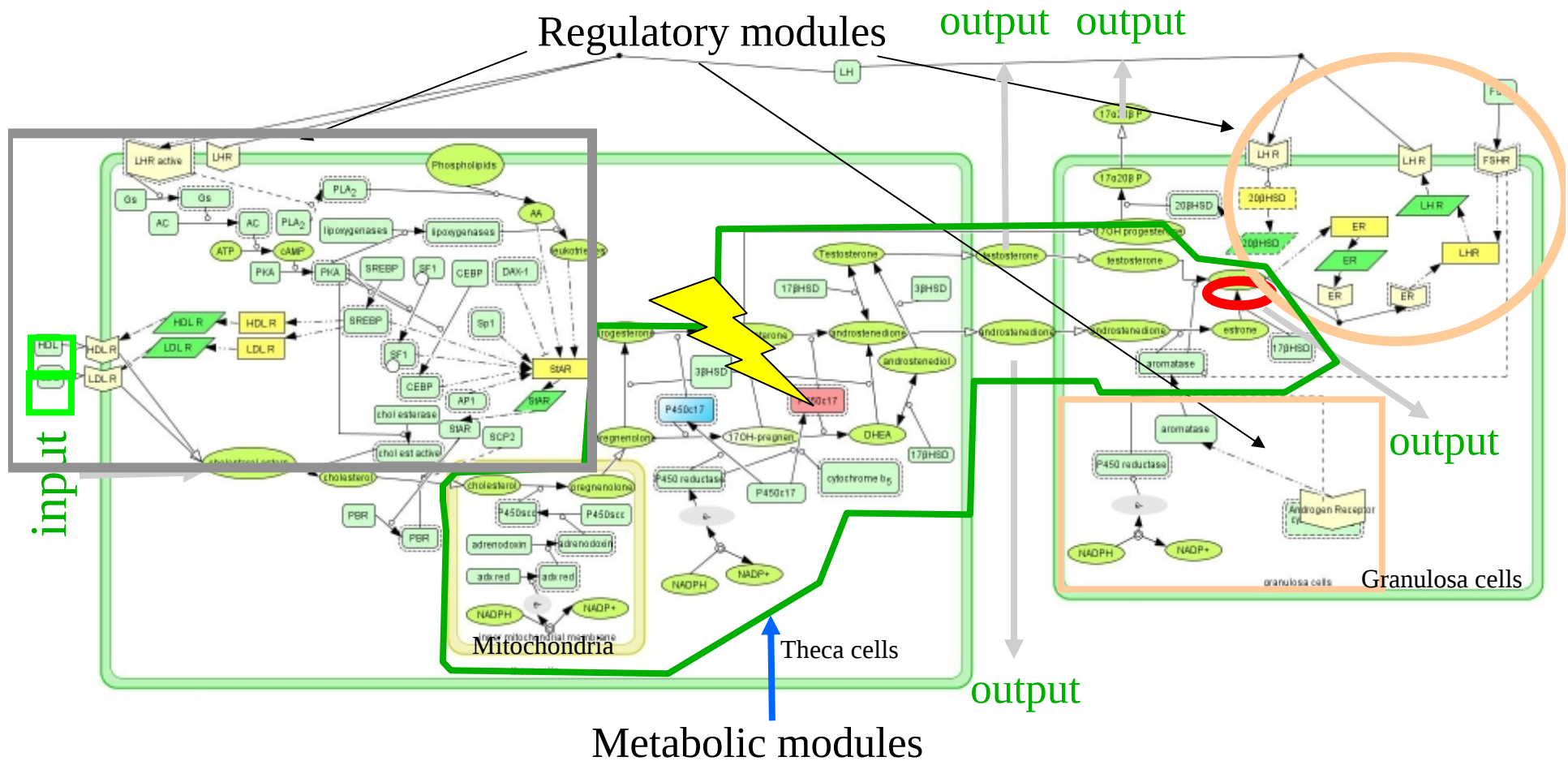
Production of testosterone & estradiol from cholesterol

Steroidogenesis





Endocrine pathway in fish as model





Network issues

- **What is relationship of architecture to function?**
 - **Robustness and Fragility**
- **How are different levels of control integrated?**
- **Can we predict when network will fail once architecture is defined?**

