

Integrative Environmental Physiology

of aquatic organisms

Integrative Environmental Physiology of aquatic organisms

study the function of organisms

Integrative Environmental **Physiology** of aquatic organisms

study the function of organisms

how life works

Integrative Environmental **Physiology** of aquatic organisms

study the function of organisms

how life works

metabolism
homeostasis
reproduce

Explanations of physiological processes

- mechanistic - *How does it work?*
- evolutionary - *How did it evolve this way?*

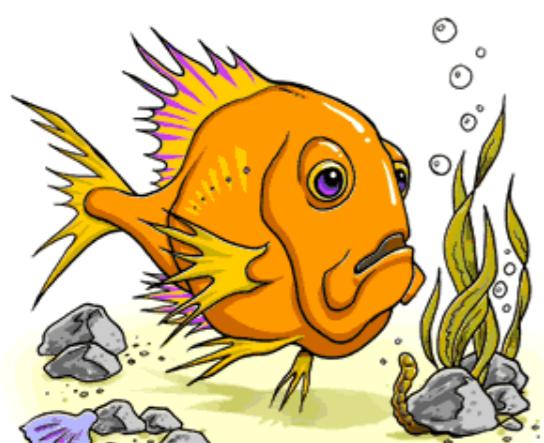
Explanations of physiological processes

- mechanistic - *How does it work?*
- evolutionary - *How did it evolve this way?*

selective pressure

Explanations of physiological processes

metabolism



<http://www.starfish.govt.nz/science/facts/fact-fish-chars.htm>

immune

reproduction

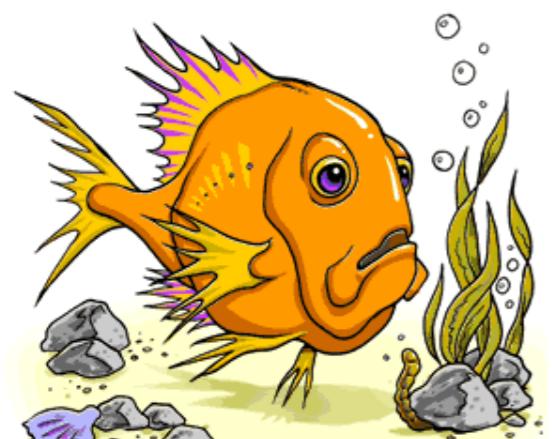


http://www.patagoniavolunteer.org/images/environment_volunteering_640.jpg



Explanations of physiological processes

Genotype



<http://www.starfish.govt.nz/science/facts/fact-fish-chars.htm>

Phenotype

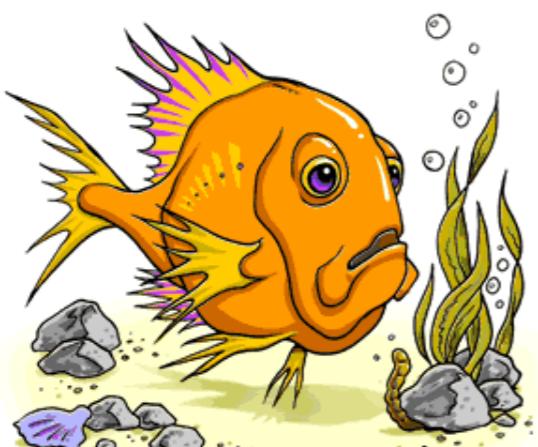
Natural Selection

Evolutionary Implications



http://www.patagoniavolunteer.org/images/environment_volunteering_640.jpg

Methods



<http://www.starfish.govt.nz/science/facts/fact-fish-chars.htm>



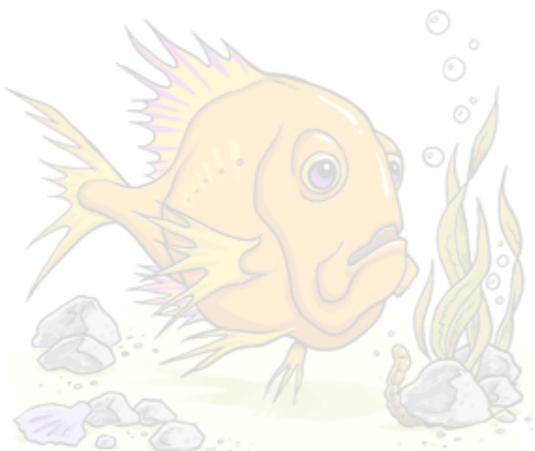
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Methods

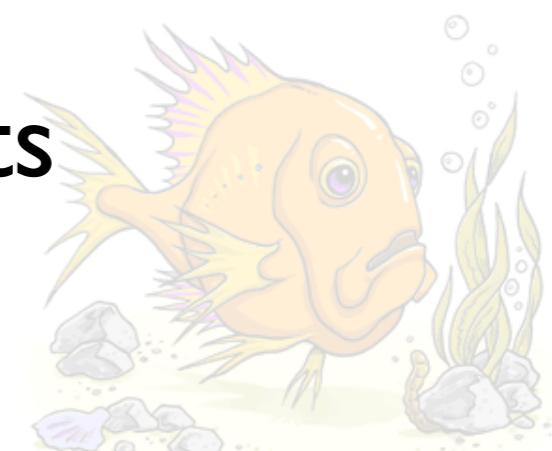
Ask question

Propose hypotheses

Design experiments



<http://www.starfish.govt.nz/science/facts/fact-fish-chars.htm>

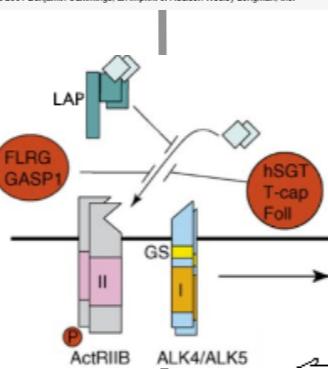
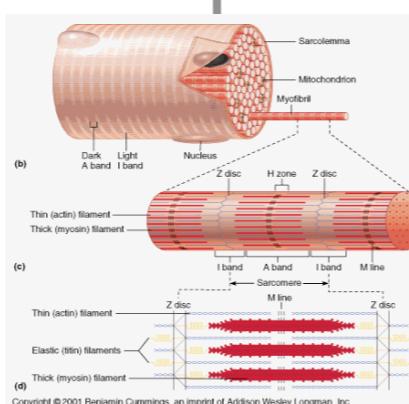


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Integrative Environmental Physiology

of aquatic organisms

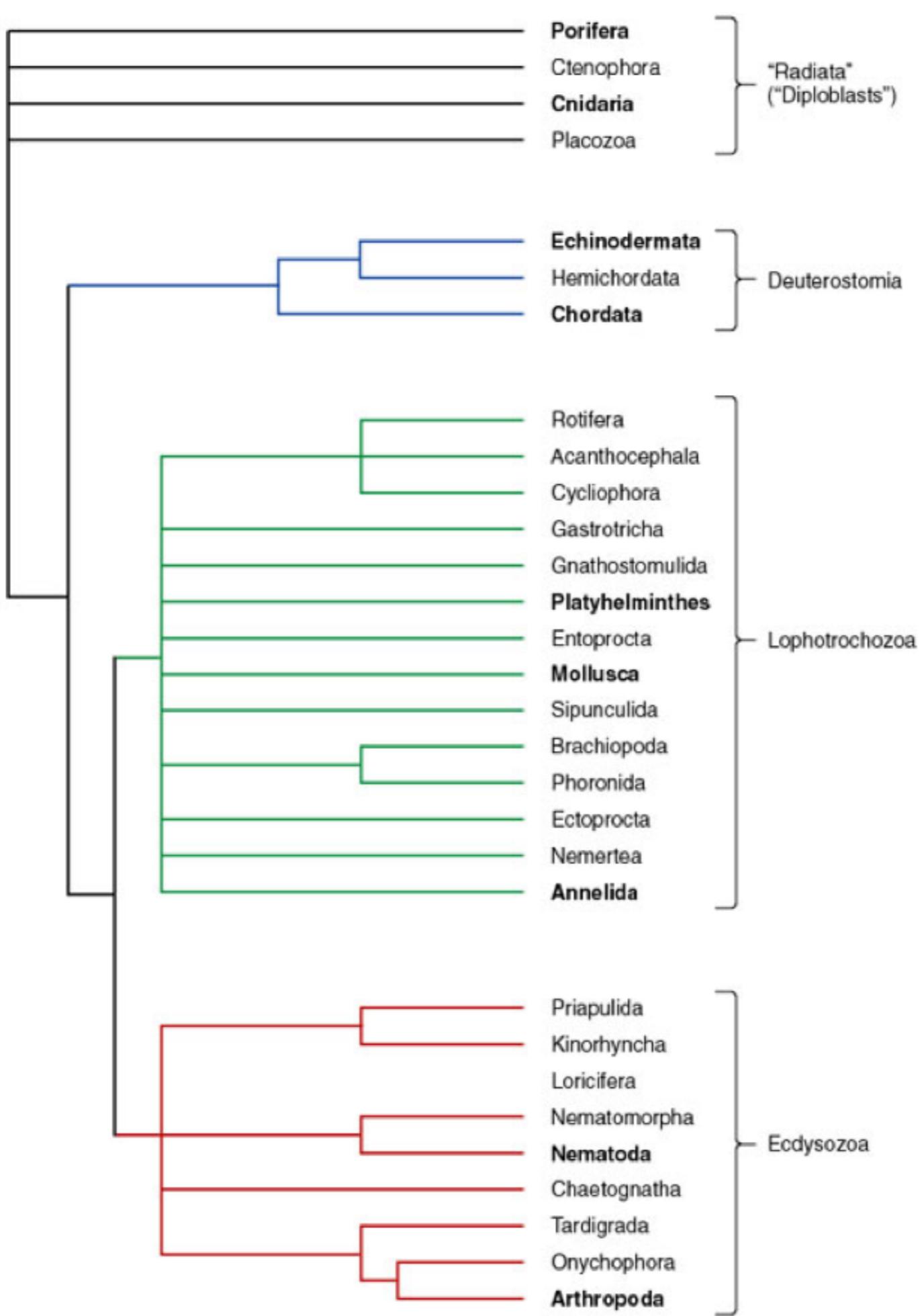
Integrative Environmental Physiology of aquatic organisms



Integrative (*Comparative*) Environmental Physiology of aquatic organisms



Why do we have to learn about salamanders?



To examine in evolutionary
sense
need to know....

Organisms

Environment

Homeostasis

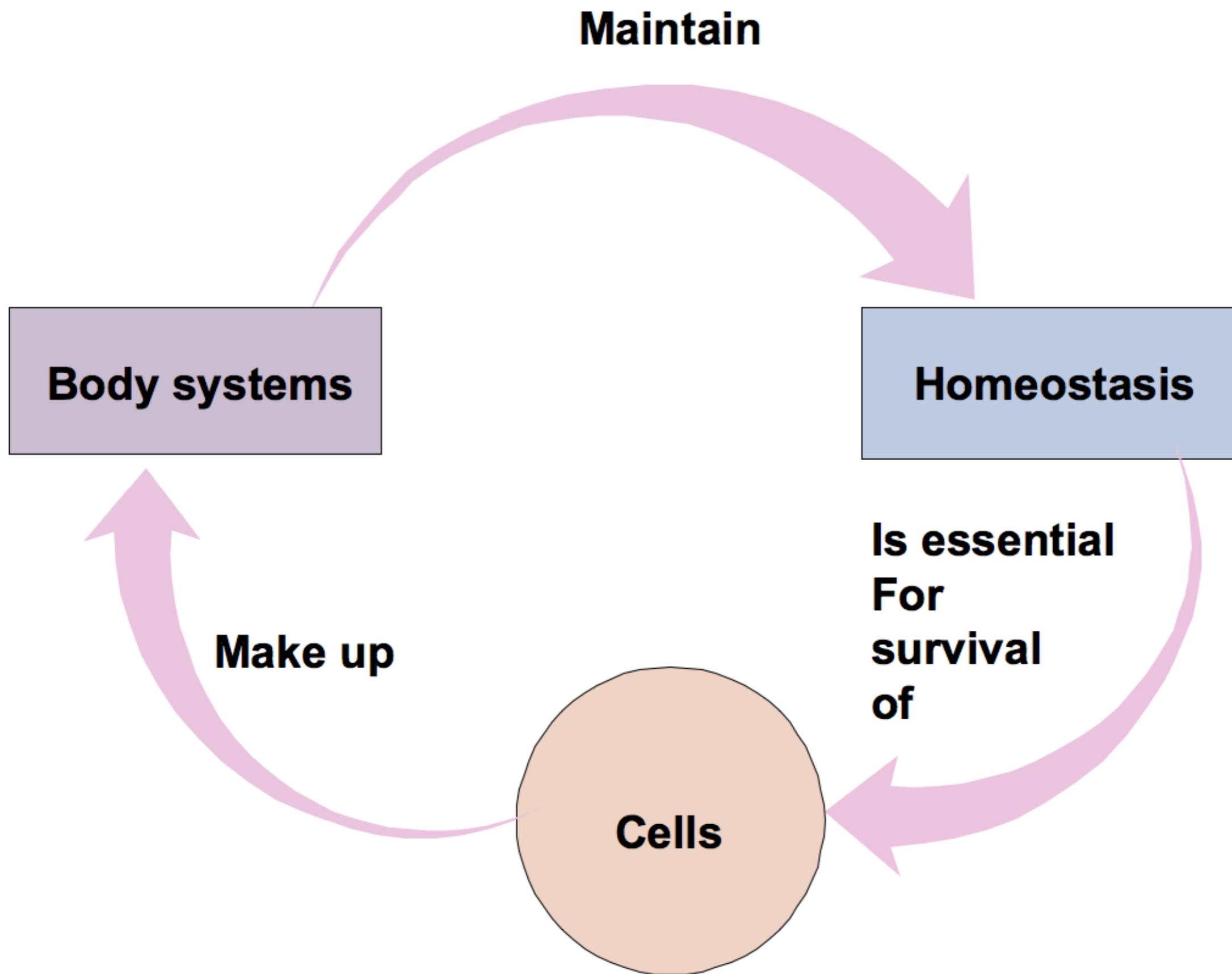


Fig. 1-6, p.11 32

Homeostasis

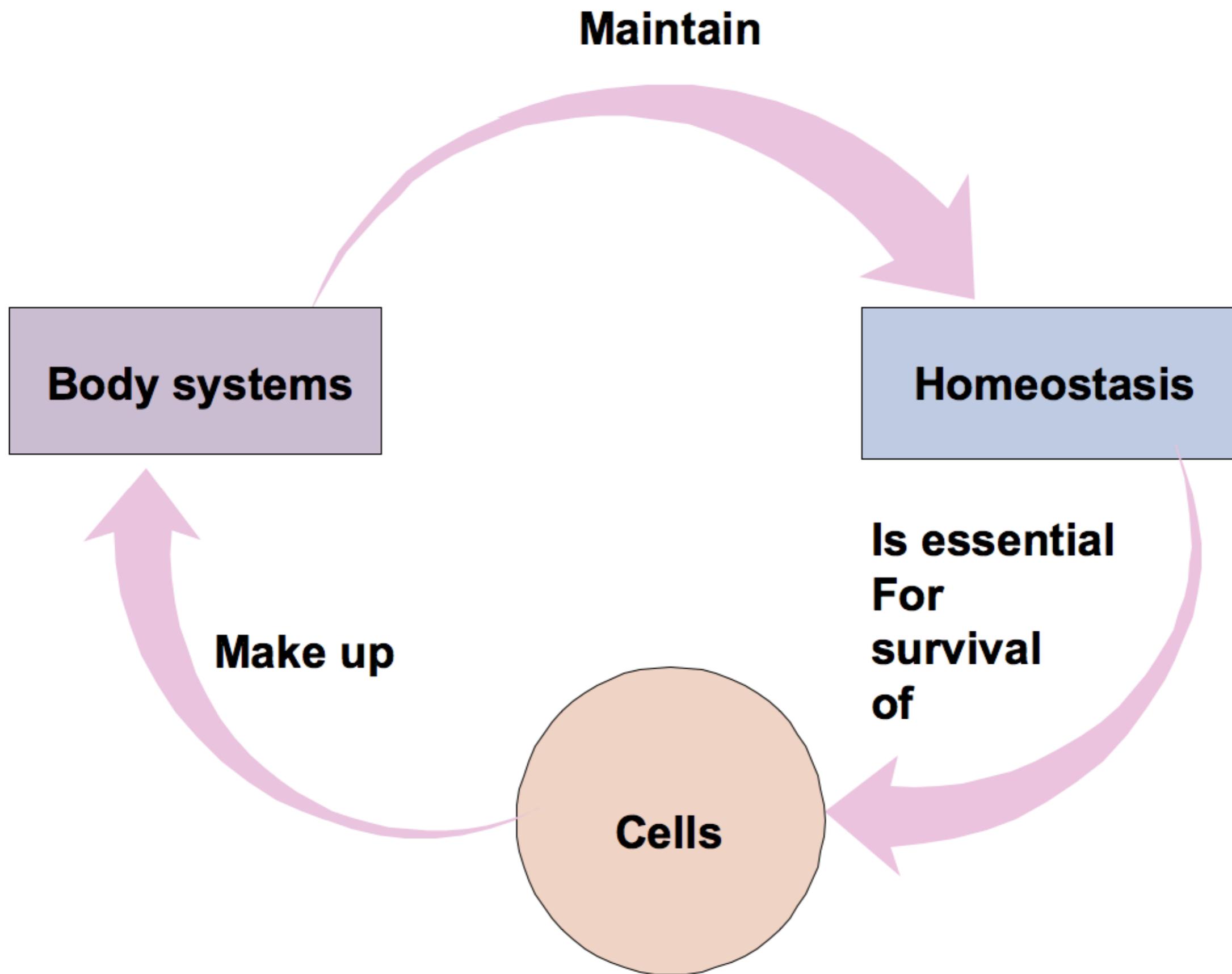


Fig. 1-6, p.11 33

Integrative Environmental Physiology of aquatic organisms

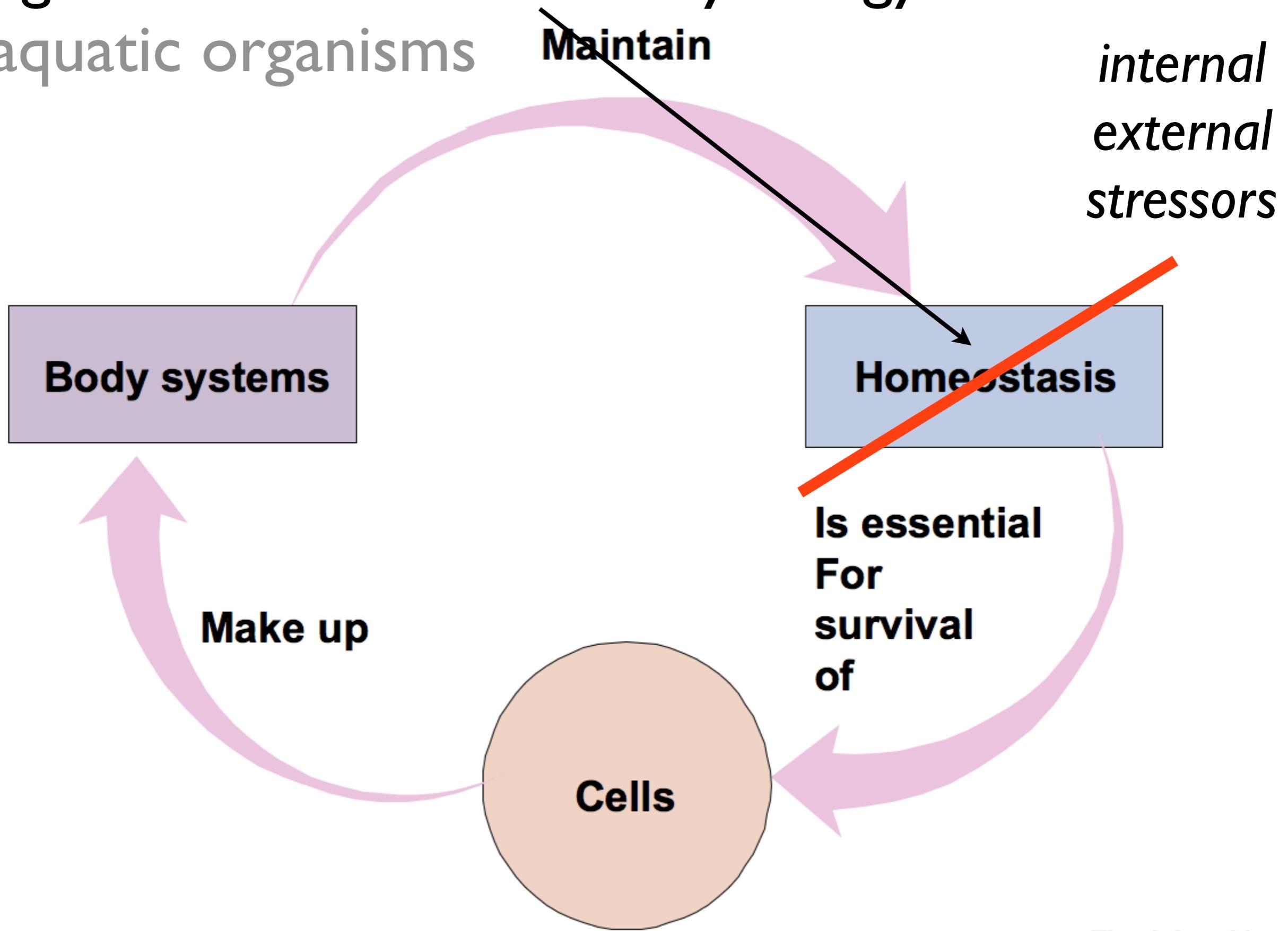


Fig. 1-6, p.11 34

Homeostasis

Factors of internal environment often regulated

Homeostasis

Factors of internal environment often regulated

- Concentration of energy rich molecules
 - Concentration of O₂ and CO₂
 - Concentration of waste products
 - pH
 - Concentration of water, salt, and other electrolytes
-
- Volume and pressure
 - Temperature
 - Social Parameters

Homeostasis

- Most intrinsic and extrinsic control systems generally operate on the principle of negative feedback
- Inadequacies in basic negative feedback systems can be improved with feedforward systems and acclimatization systems.
- Pathophysiological states ensue when one or more of organisms systems fail to function properly.

Homeostasis

- *Maintenance of a desired state in the face of disturbances*
- Can occur at cellular level
- Many processes occur at whole body level

- Not everything in organisms is homeostatic

Homeostasis

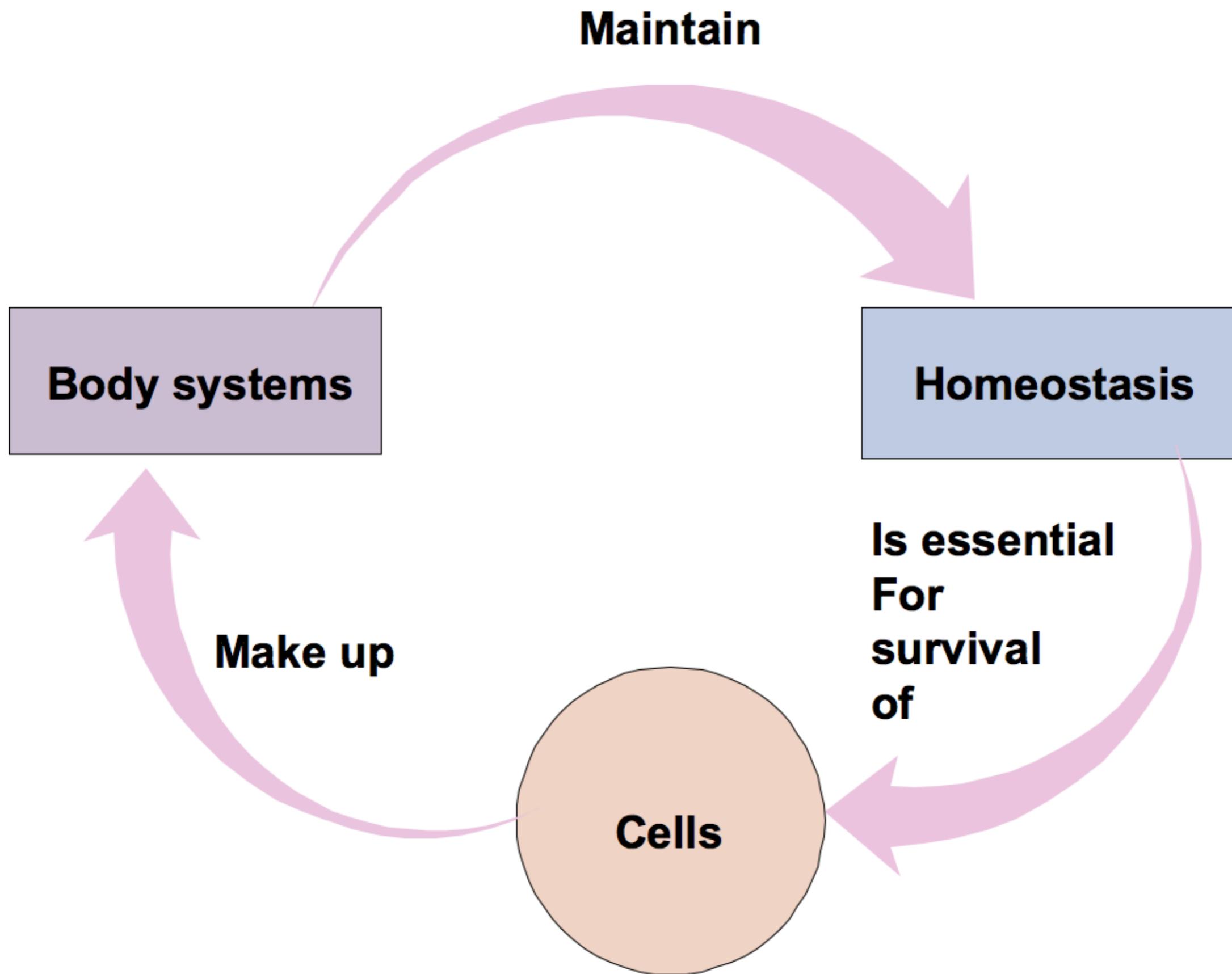
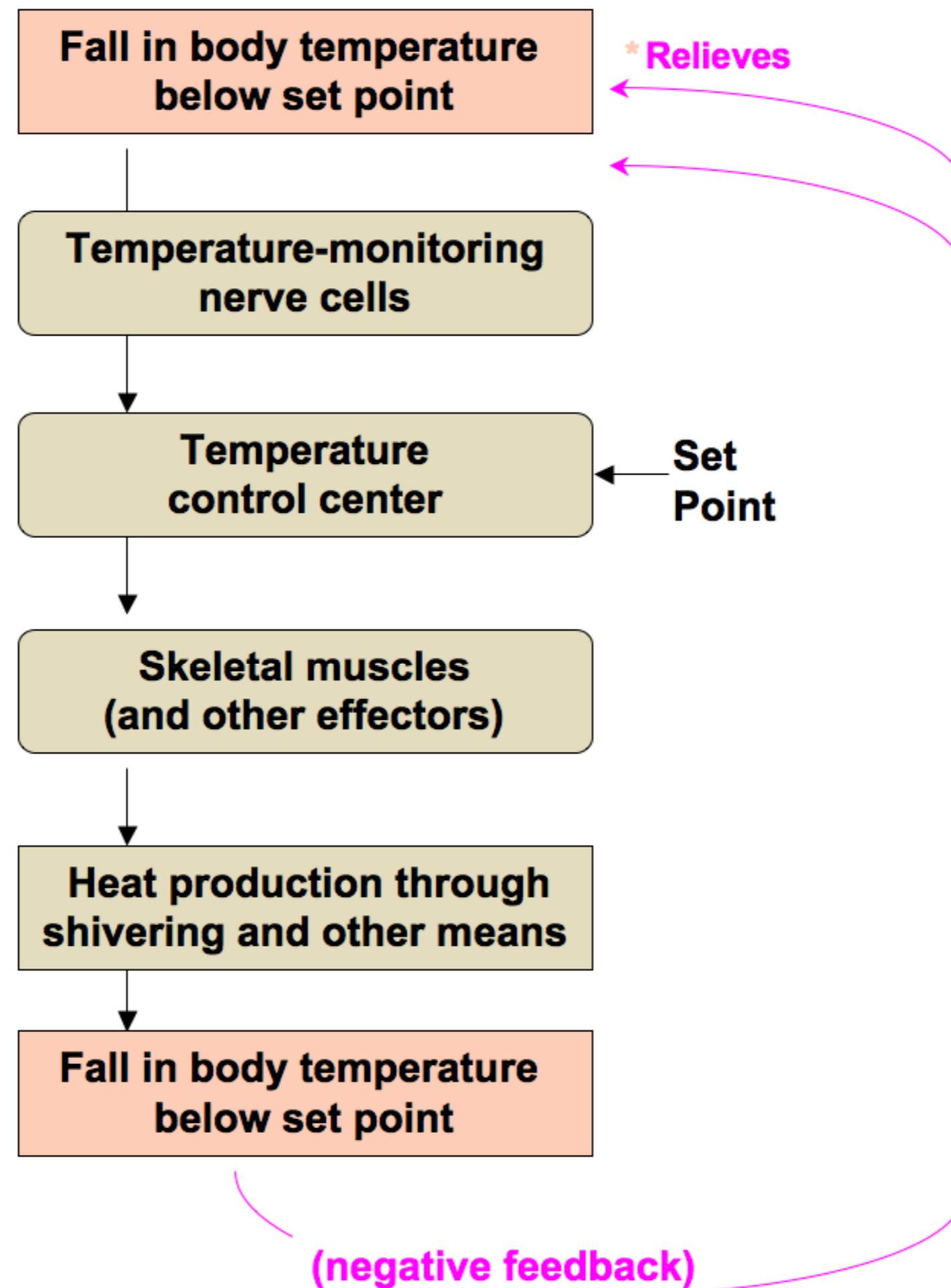


Fig. 1-6, p.11 38

Homeostasis

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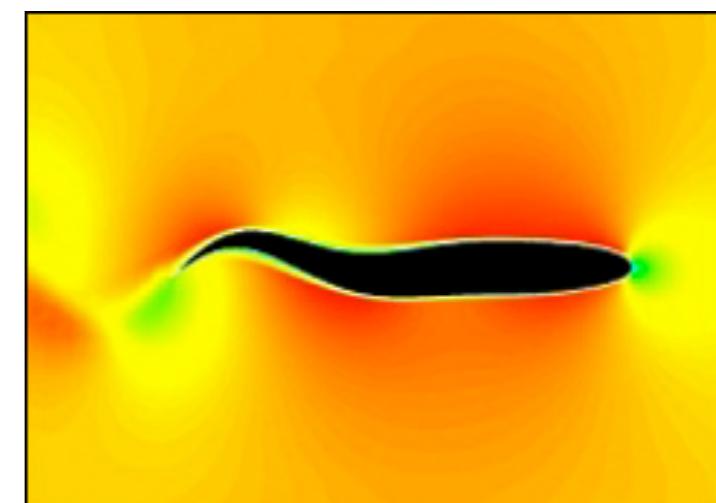
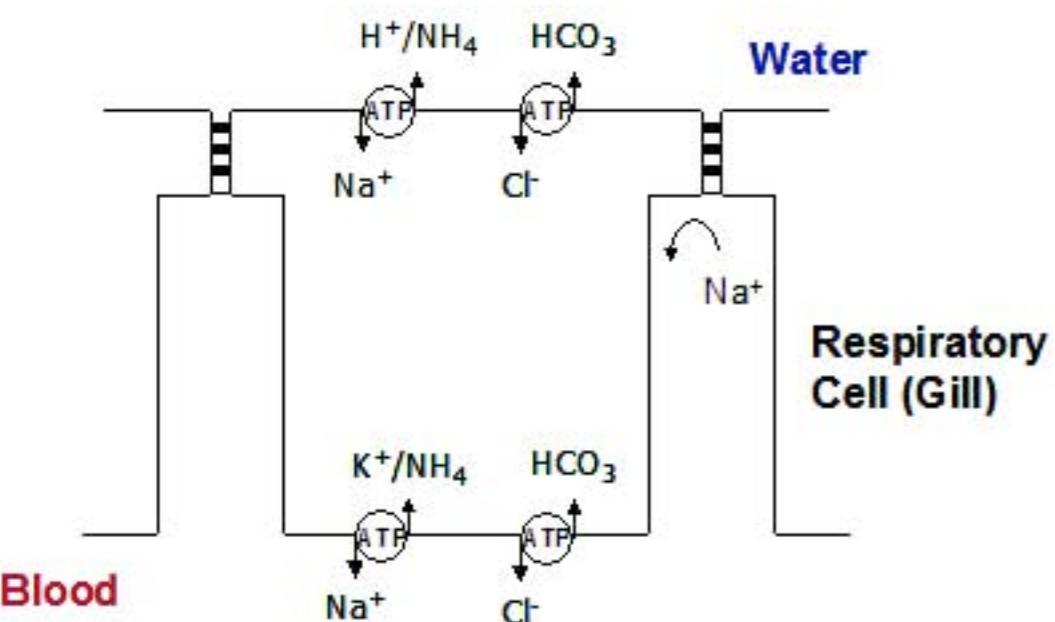
Maintenance



Effector Internal cells AND *Behavior* Killifish and salinity



by brian.gratwicke



http://www.oxyedge-chum.com/oxygen_or_salt.htm

Improving negative feedback

why?

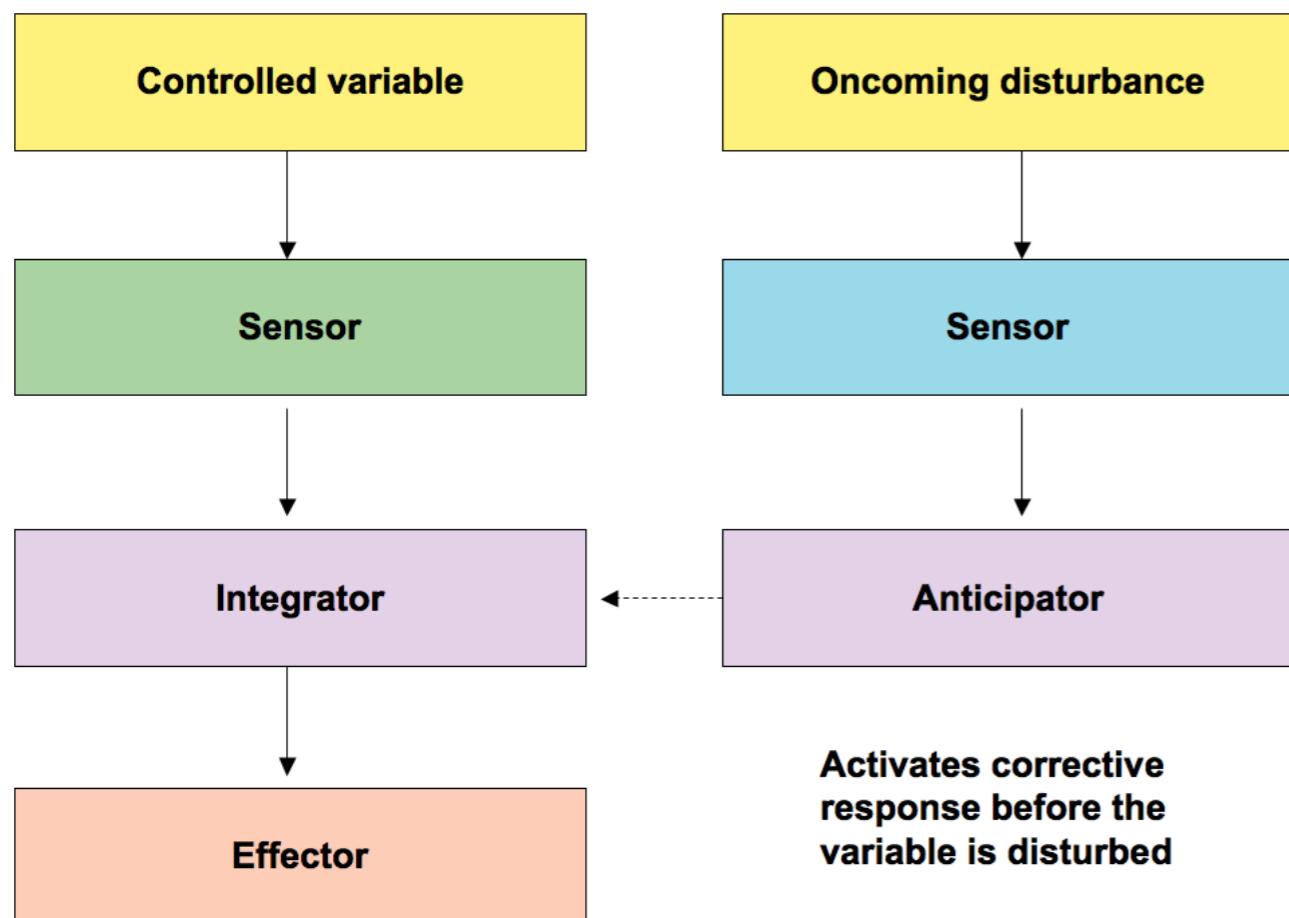
Improving negative feedback

Anticipation

Acclimatization

Improving negative feedback

Anticipation

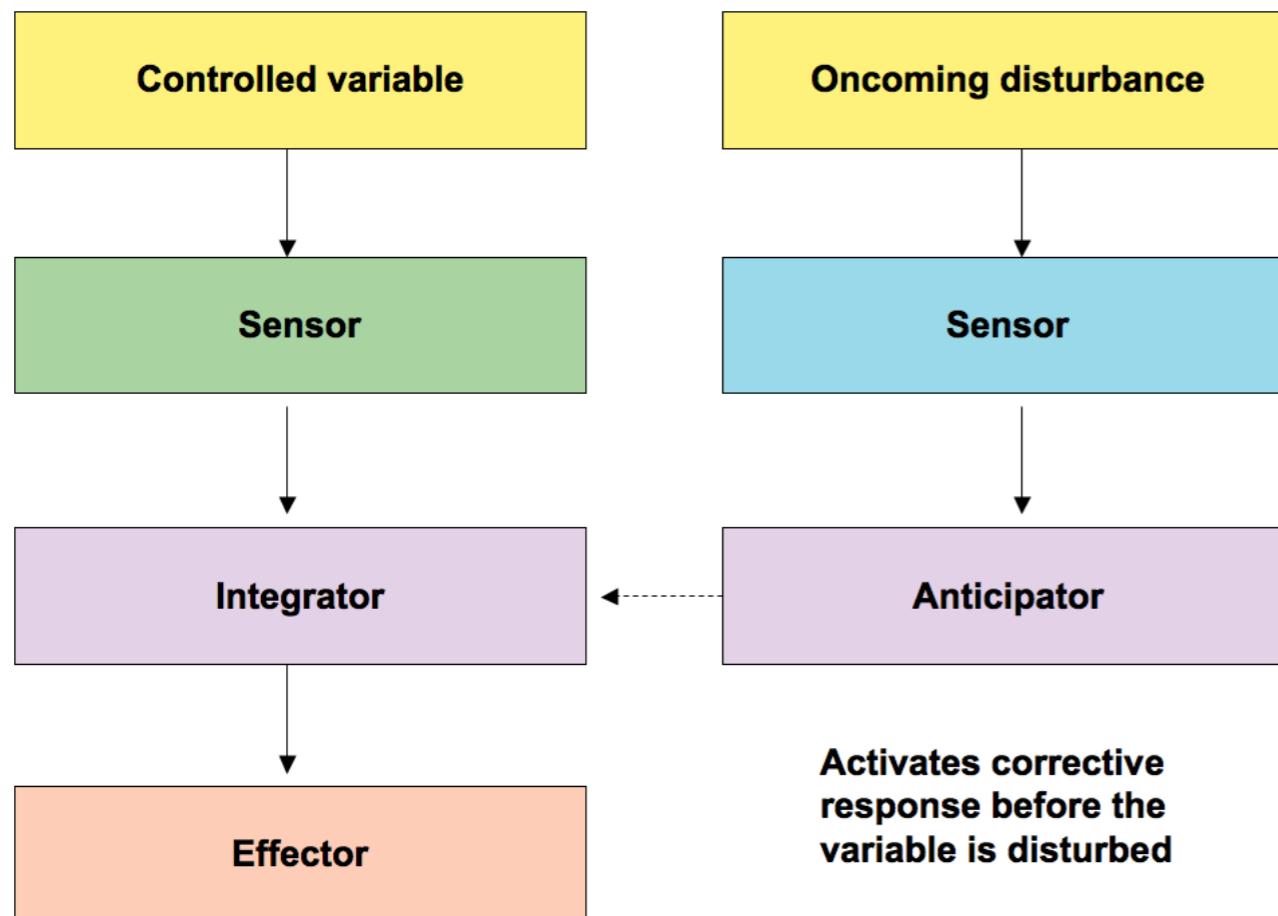


*temp
food*

Acclimatization

Improving negative feedback

Anticipation



Acclimatization



 Uploaded on August 20, 2008
by [papalars](#)

Acclimatization

acclimation

adaptation

when things are not homeostatic

Dormancy



acclimatization taken to non-homeostatic state
negative feedback will not do.

when things are not homeostatic

Dormancy



© 2002 Brooks/Cole - Thomson

Brine Shrimp

Class Crustacea

Subclass Malacostraca

Order Isopoda—pillbugs, woodlice

Order Amphipoda—sand fleas

Order Euphausiacea—euphausiids
(krill)

Order Stomatopoda—stomatopods

Order Decapoda—crabs, lobsters,
shrimp, hermit crabs

Subclass Branchiopoda—brine (fairy)
shrimp, clam shrimp, water fleas

Subclass Ostracoda—the ostracods

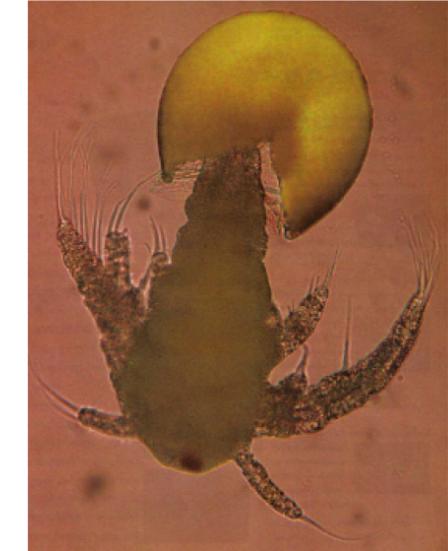
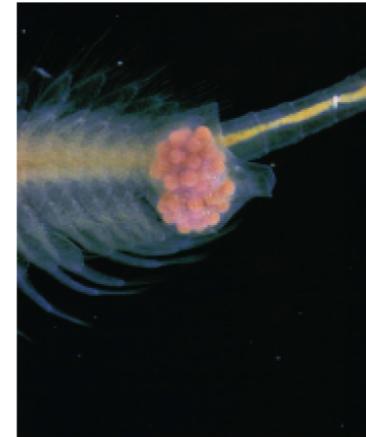
Subclass Copepoda—the copepods

Subclass Pentastomida

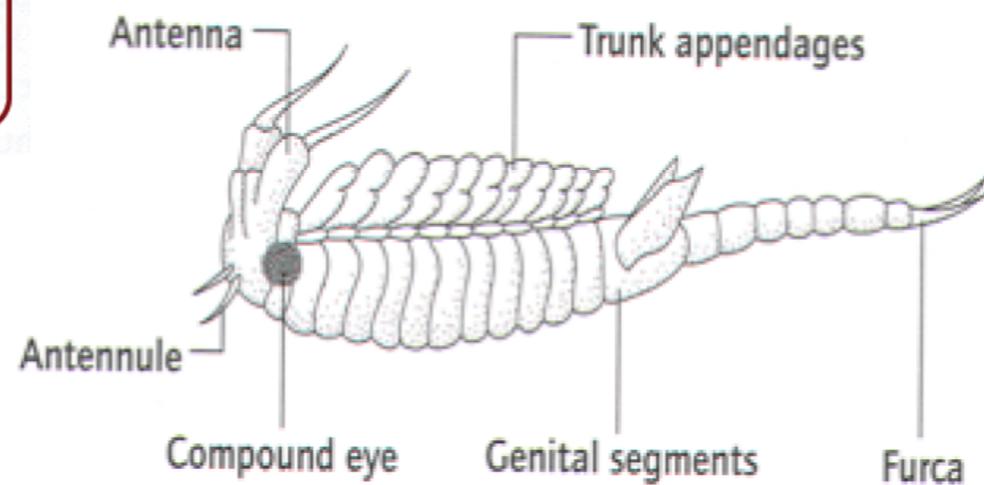
Subclass Cirripedia—the barnacles

Sex and the Single Brine Shrimp

Around the Mediterranean, female brine shrimp have been reproducing—without help from males—for millions of years
by Robert A. Browne



Anostraca



- Brine or Fairy Shrimps
- Lack carapace
- Brood chamber in body
- Harsh environments
- Extreme resting forms

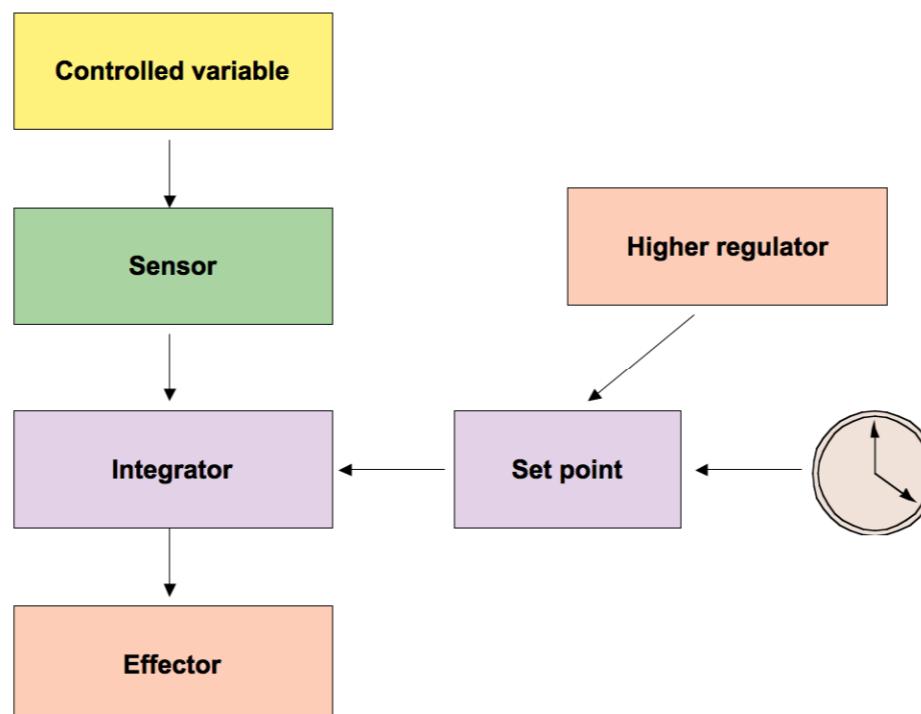
Can withstand drying, freezing, fish - birds - mammals

Regulated change

Dormancy



Reset System



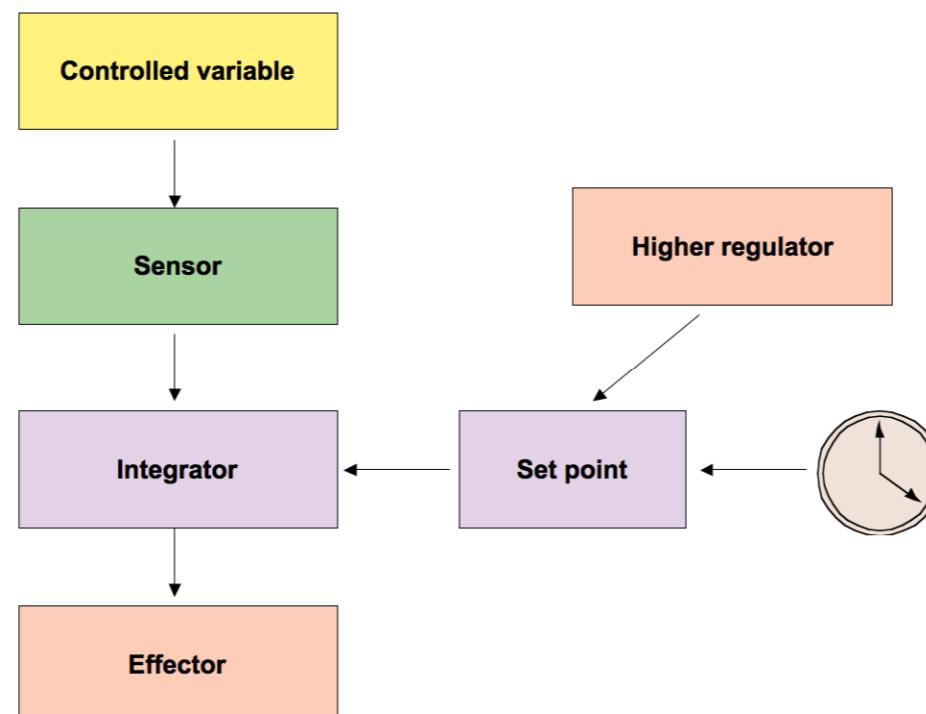
when things are not homeostatic

Regulated change

Dormancy



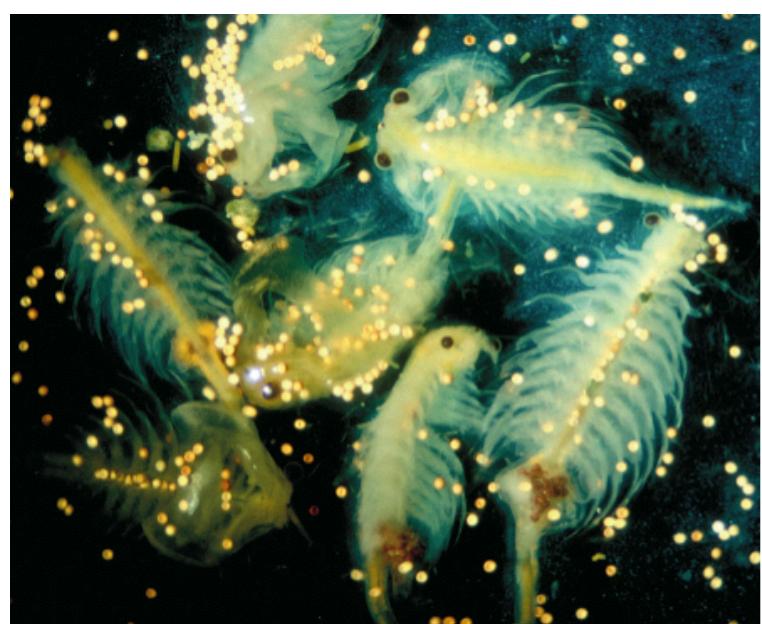
Reset System



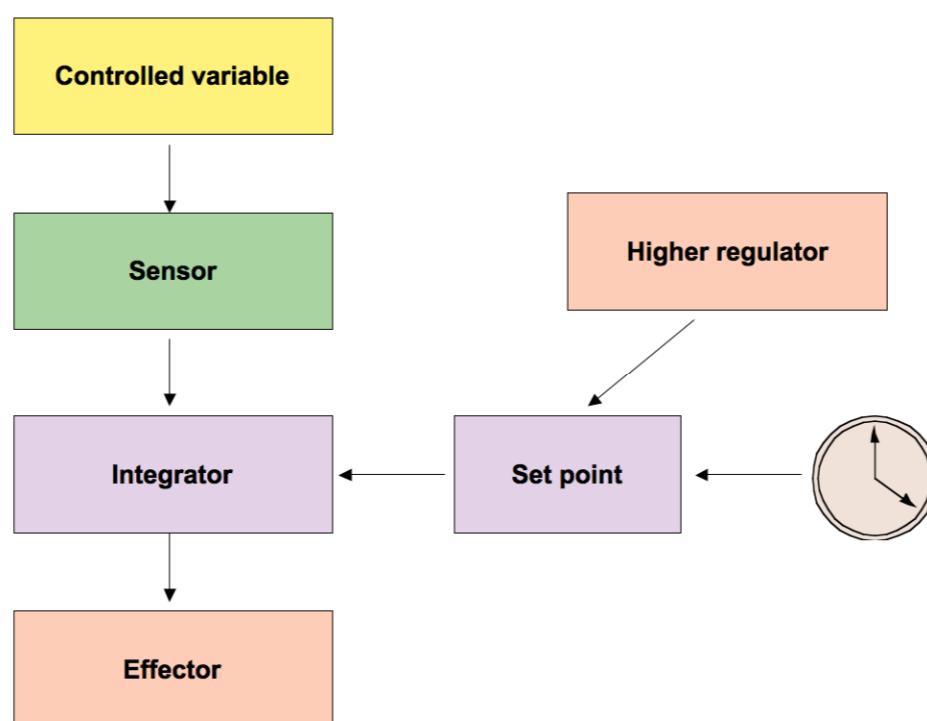
when things are not homeostatic

Regulated change

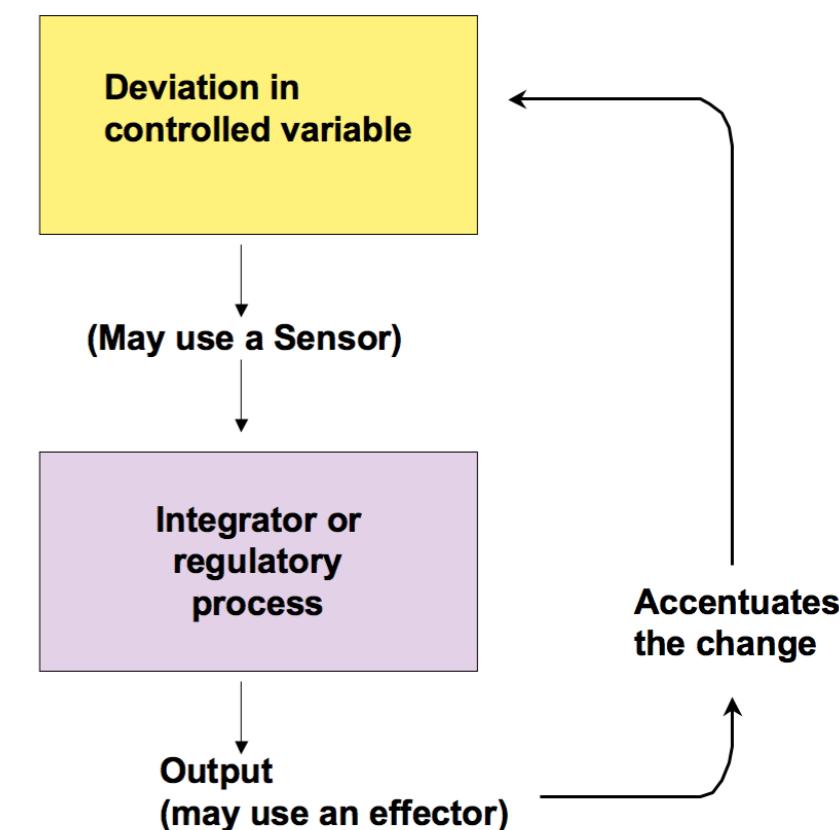
Dormancy



Reset System



Positive Feedback



when things are not homeostatic

Examples of positive feedback

when things are not homeostatic

Regulated change

Dormancy

Reset System

Positive Feedback

1

2

3

when things are not homeostatic