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Introduction to neuroscience The regulatory role of nervous system

Contact

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Department of Pathological Physiology (A18)

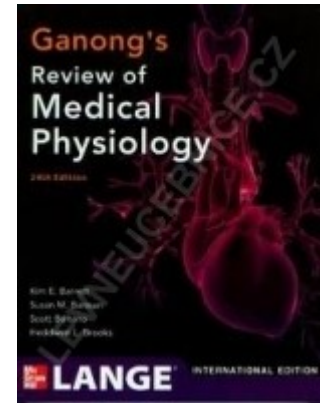
kduris@med.muni.cz

The objectives

Basic understanding of the role and function of nervous system

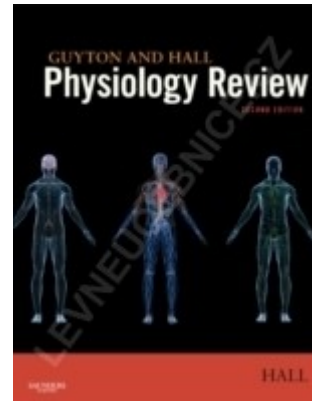
Literature

- Ganong's Review of Medical Physiology



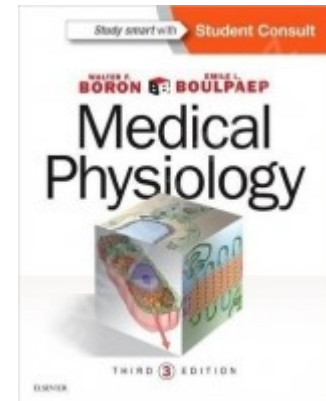
<https://www.levneucebnice.cz/p/ganong-s-review-of-medical-physiology-9781259009624/>

- Guyton - Physiology Review



<https://www.levneucebnice.cz/p/guyton-and-hall-physiology-review/>

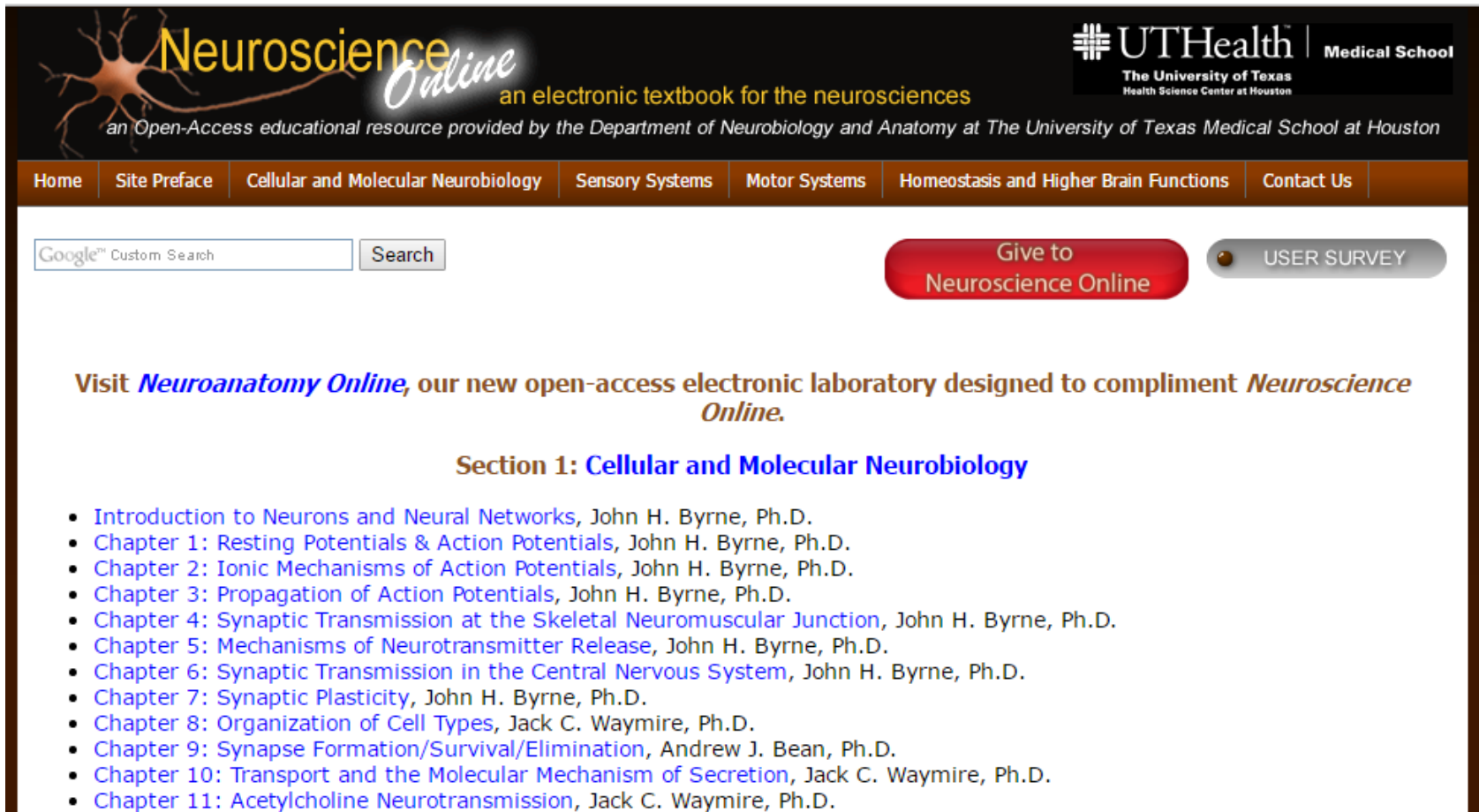
- Boron - Medical Physiology



<https://www.levneucebnice.cz/p/medical-physiology-3rd-ed/>

The other sources

- Neuroscience Online
- <http://neuroscience.uth.tmc.edu/toc.htm>



The screenshot shows the Neuroscience Online website. At the top left is a logo featuring a neuron and the text "Neuroscience Online" in a stylized font, with the subtitle "an electronic textbook for the neurosciences" and a note that it is an open-access resource from the University of Texas Medical School at Houston. To the right is the UTHealth Medical School logo. Below the header is a navigation menu with links for Home, Site Preface, Cellular and Molecular Neurobiology, Sensory Systems, Motor Systems, Homeostasis and Higher Brain Functions, and Contact Us. A search bar with a "Search" button and a "Give to Neuroscience Online" button are also present. The main content area features a promotional message for "Neuroanatomy Online" and a section titled "Section 1: Cellular and Molecular Neurobiology" with a list of 11 chapters and their authors.

Neuroscience Online
an electronic textbook for the neurosciences
an Open-Access educational resource provided by the Department of Neurobiology and Anatomy at The University of Texas Medical School at Houston

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Google™ Custom Search Search

Give to Neuroscience Online

USER SURVEY

Visit **Neuroanatomy Online**, our new open-access electronic laboratory designed to compliment *Neuroscience Online*.

Section 1: Cellular and Molecular Neurobiology

- [Introduction to Neurons and Neural Networks](#), John H. Byrne, Ph.D.
- [Chapter 1: Resting Potentials & Action Potentials](#), John H. Byrne, Ph.D.
- [Chapter 2: Ionic Mechanisms of Action Potentials](#), John H. Byrne, Ph.D.
- [Chapter 3: Propagation of Action Potentials](#), John H. Byrne, Ph.D.
- [Chapter 4: Synaptic Transmission at the Skeletal Neuromuscular Junction](#), John H. Byrne, Ph.D.
- [Chapter 5: Mechanisms of Neurotransmitter Release](#), John H. Byrne, Ph.D.
- [Chapter 6: Synaptic Transmission in the Central Nervous System](#), John H. Byrne, Ph.D.
- [Chapter 7: Synaptic Plasticity](#), John H. Byrne, Ph.D.
- [Chapter 8: Organization of Cell Types](#), Jack C. Waymire, Ph.D.
- [Chapter 9: Synapse Formation/Survival/Elimination](#), Andrew J. Bean, Ph.D.
- [Chapter 10: Transport and the Molecular Mechanism of Secretion](#), Jack C. Waymire, Ph.D.
- [Chapter 11: Acetylcholine Neurotransmission](#), Jack C. Waymire, Ph.D.

The other sources

- CNS online
- <http://www.cnsonline.cz/>



ÚVOD DO CENTRÁLNÍ
NERVOVÉ SOUSTAVY

Online kurz

1. ZÁKLADY
2. NERVOVÁ TKÁŇ
3. DRÁHY A STRUKTURY CNS
4. KOMORY, CÉVY A PLENY
5. ZÁKLADY PERIFERNÍHO NERVOVÉHO SYSTÉMU
6. SMYSLY
7. MOTORIKA
8. INTEGRACE I – EMOCE A

ÚVOD DO CENTRÁLNÍ NERVOVÉ SOUSTAVY



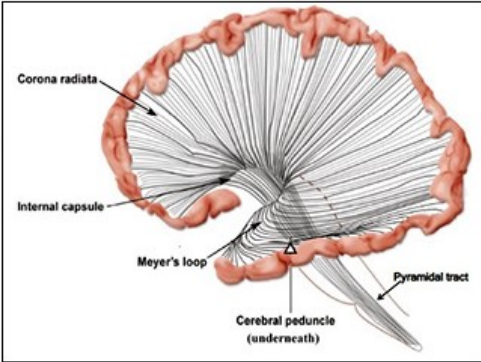
The other sources

- MIT - Brain Structure and Its Origins
- <http://ocw.mit.edu/courses/brain-and-cognitive-sciences/9-14-brain-structure-and-its-origins-spring-2014/#>

[Home](#) » [Courses](#) » [Brain and Cognitive Sciences](#) » Brain Structure and Its Origins

Brain Structure and Its Origins

- [COURSE HOME](#) <
- [SYLLABUS](#)
- [THIS COURSE AT MIT](#)
- [READINGS AND STUDY QUESTIONS](#)
- [LECTURE NOTES](#)
- [AUDIO LECTURES](#)
- [ASSIGNMENTS](#)
- [EXAMS](#)
- [STUDY MATERIALS](#)



Drawing of the left hemisphere of the human brain together with the brainstem, dissected to reveal the course of axons that descend to the brainstem and spinal cord. (Courtesy of MIT Press. Used with permission. Figure 22.8 from Schneider, G. E. [Brain Structure and its Origins: In the Development and in Evolution of Behavior and the Mind](#). MIT Press, 2014.)

Instructor(s)
Prof. Gerald E. Schneider

MIT Course Number
9.14

As Taught In
Spring 2014

Level
Undergraduate

[CITE THIS COURSE](#)

Course Features

> Audio lectures	> Subtitles/transcript
> Lecture notes	> Assignments (no solutions)
> Exams and solutions	> Instructor insights
> This Course at MIT	

Why and how to **STUDY** neuroscience



Neuroscience: Brain

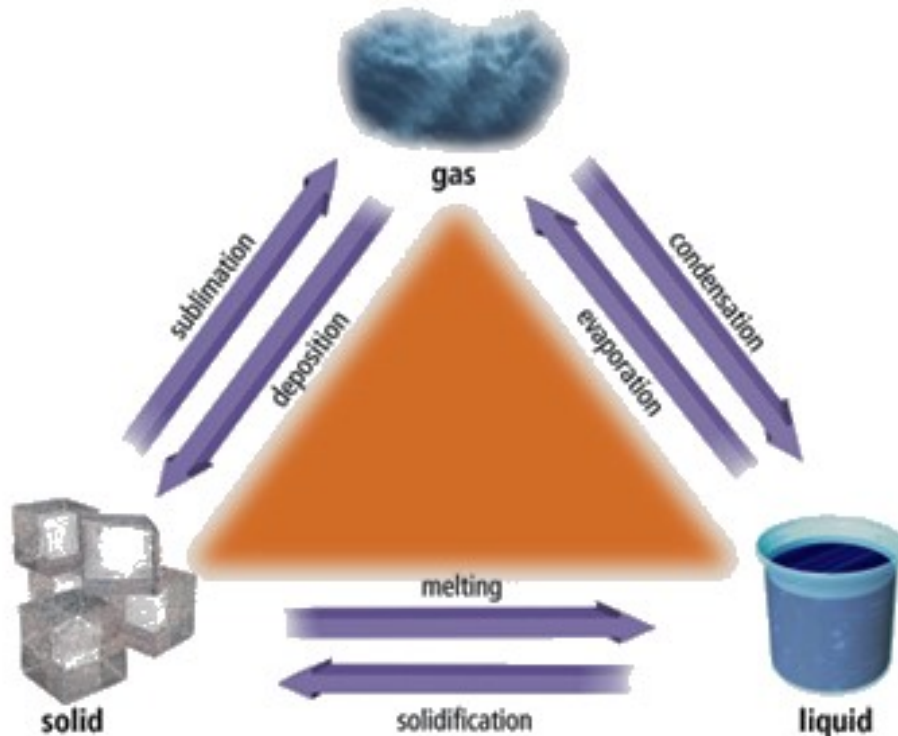
Why and how to **STUDY** neuroscience

Three States of Cognition

Philosophy : Mind behind Mind



PS Deb



Neuroscience: Brain

Psychology : Mind

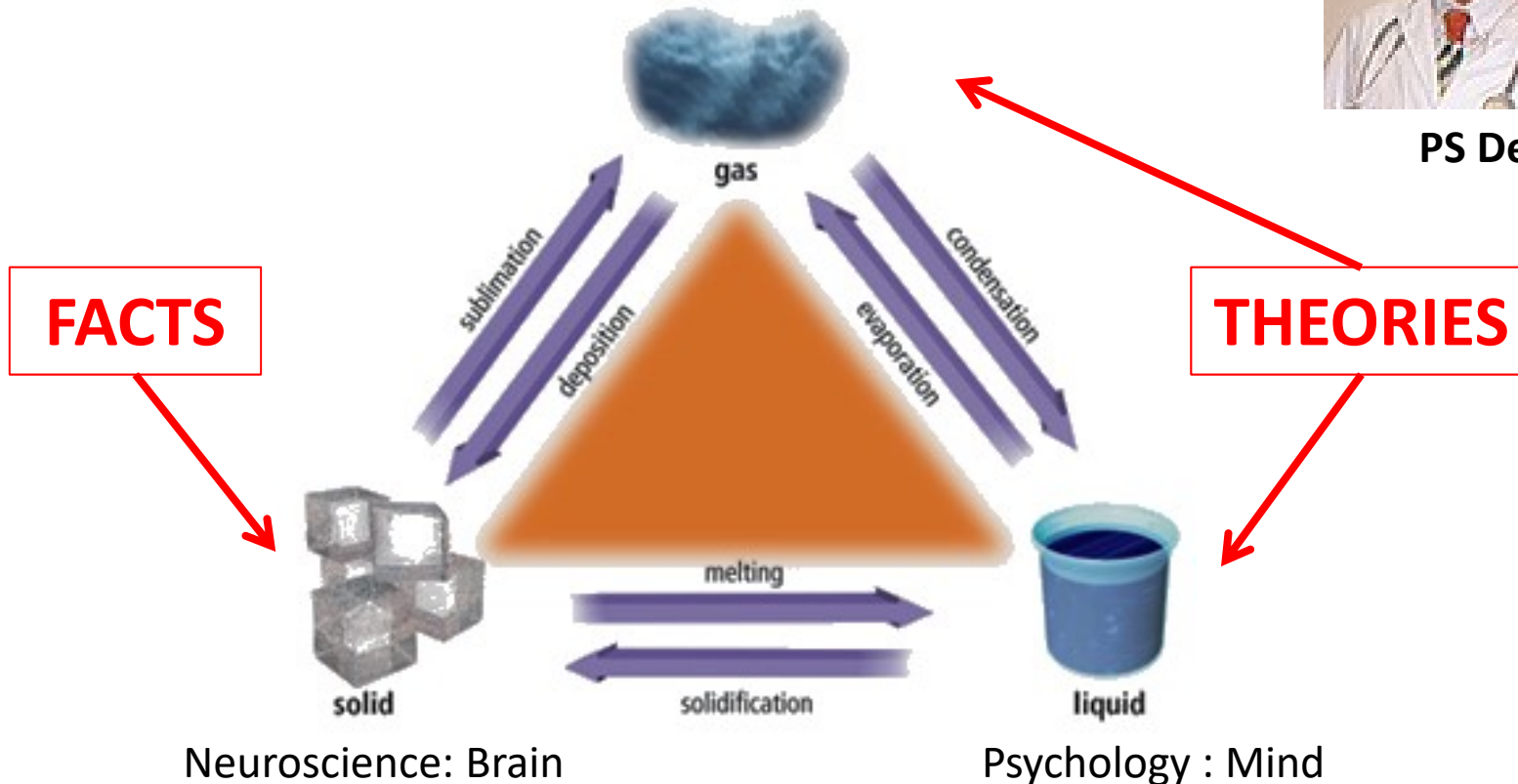
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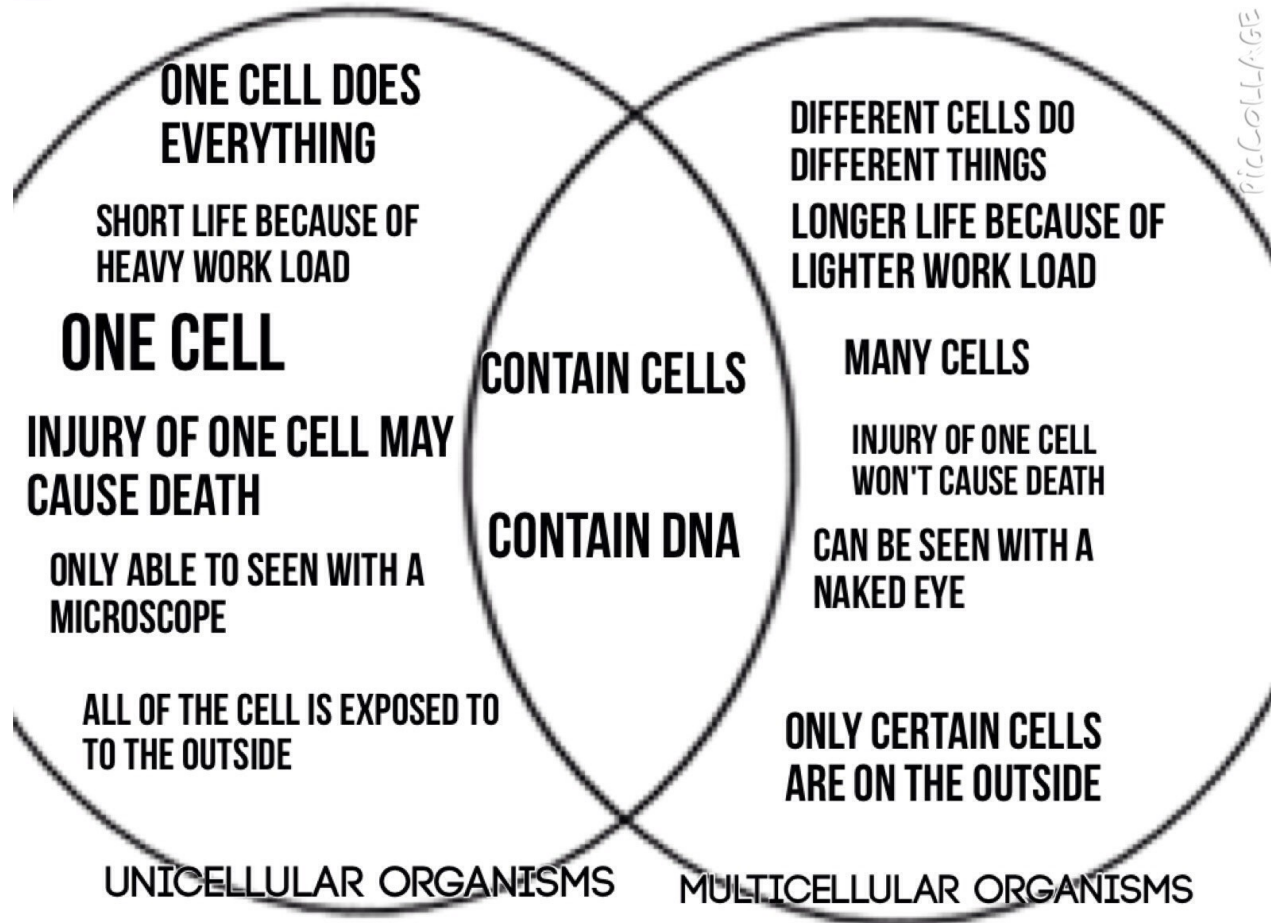


PS Deb



What is nervous system good for?

The role of nervous system



Main points

Unicellular organism

- One cell has to do everything- lower effectivity
- Total dependence on environment
- High level of stress
- Short life time

Multicellular organism

- Functional specialization of particular cells – higher effectivity
- Inner environment – homeostasis
- Lower level of stress
- Longer life time

Compartmentalization

- Cellular specialization leads to compartmentalization on several levels
 - Tissue level
 - Organ level
 - Organ system level

Compartmentalization

- Cellular specialization leads to compartmentalization on several levels
 - Tissue level
 - Organ level
 - Organ system level
- There are barriers in between compartments
- Properties/content may vary among different compartments

The role of nervous system

- Essentials for survival of multicellular organism
 - To maintain homeostatis
 - To coordinate bodily functions

The role of nervous system

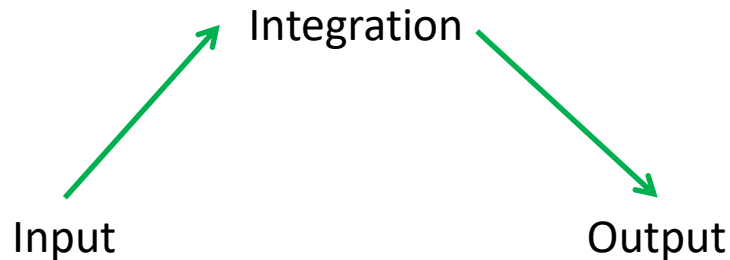
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- Essentials for survival of multicellular organism
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- Maintaining homeostasis
 - The composition of inner environment
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- Coordination of bodily functions
 - To receive signals from outer and inner environment
 - To process this information
 - To respond in a coordinate manner to these stimuli

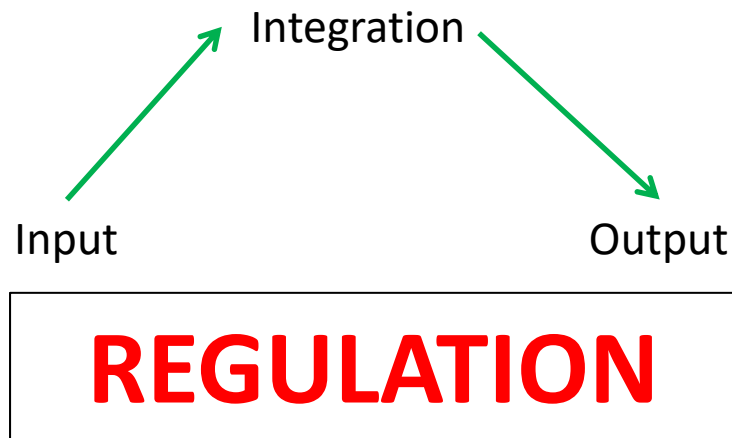
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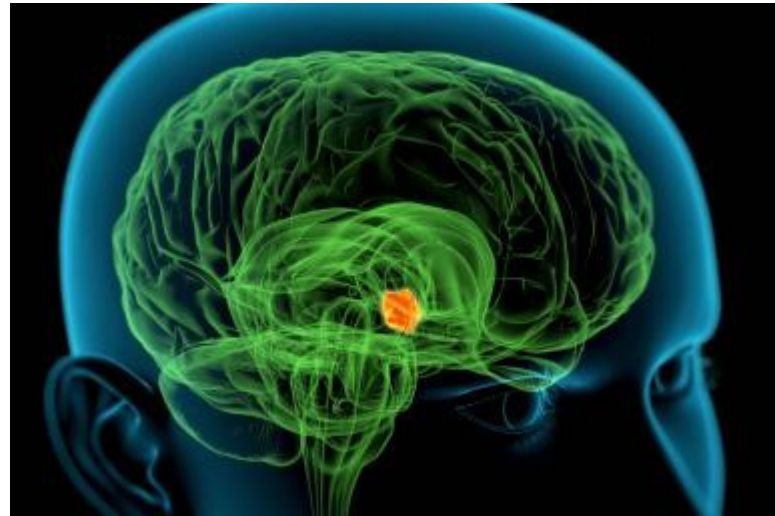


The role of nervous system

- Regulation
 - Nervous
 - Humoral

The role of nervous system

- Regulation
 - Nervous
 - Humoral



<http://biology.about.com/od/anatomy/p/Hypothalamus.htm>

Central nervous system control/influence all the types of regulations

The role of nervous system

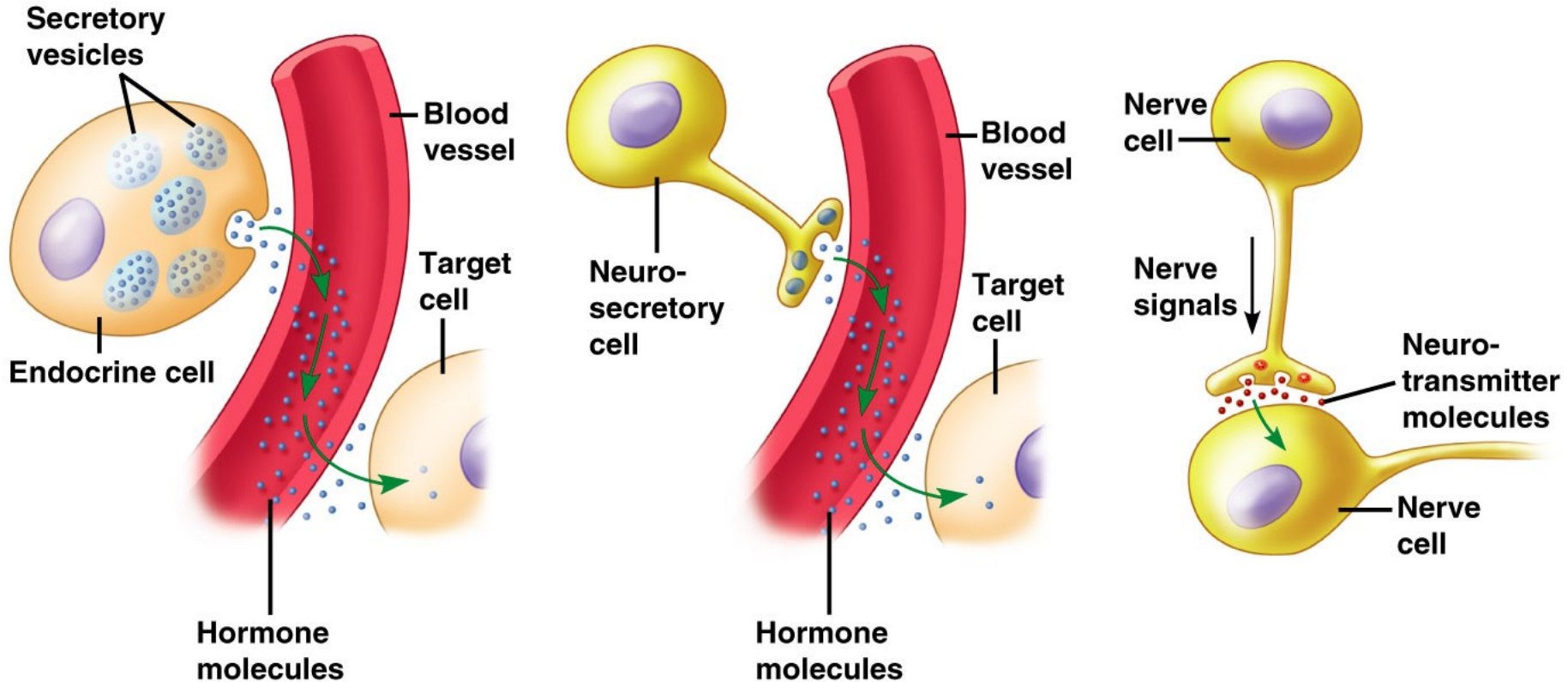
Humoral regulations

- Hormone
- Non-specific channel of conduction (blood stream)
- Target site defined by specific receptor
- Low energetical demands
 - Slow speed
 - Long duration

Nervous regulations

- Neurtransmitters
- Specific channel of conduction
- Target site defined by infrastructure
- High energetical demands
 - Fast speed
 - Short duration

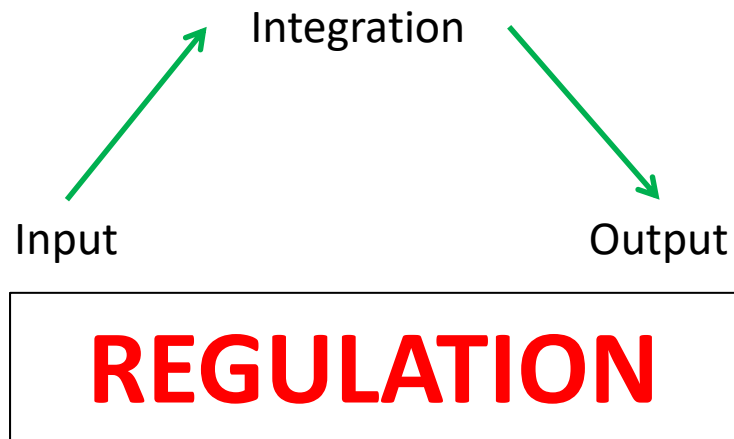
Hormonal and nervous regulations



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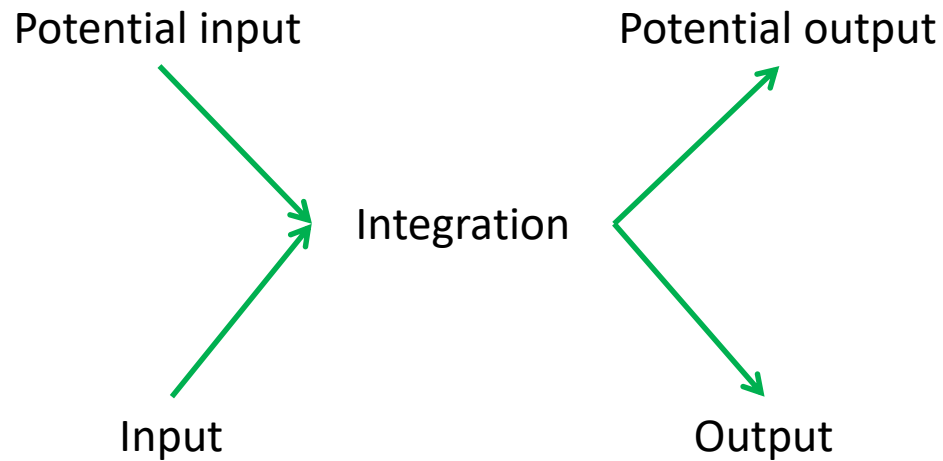
<http://www.austincc.edu/>

The role of nervous system



The role of nervous system

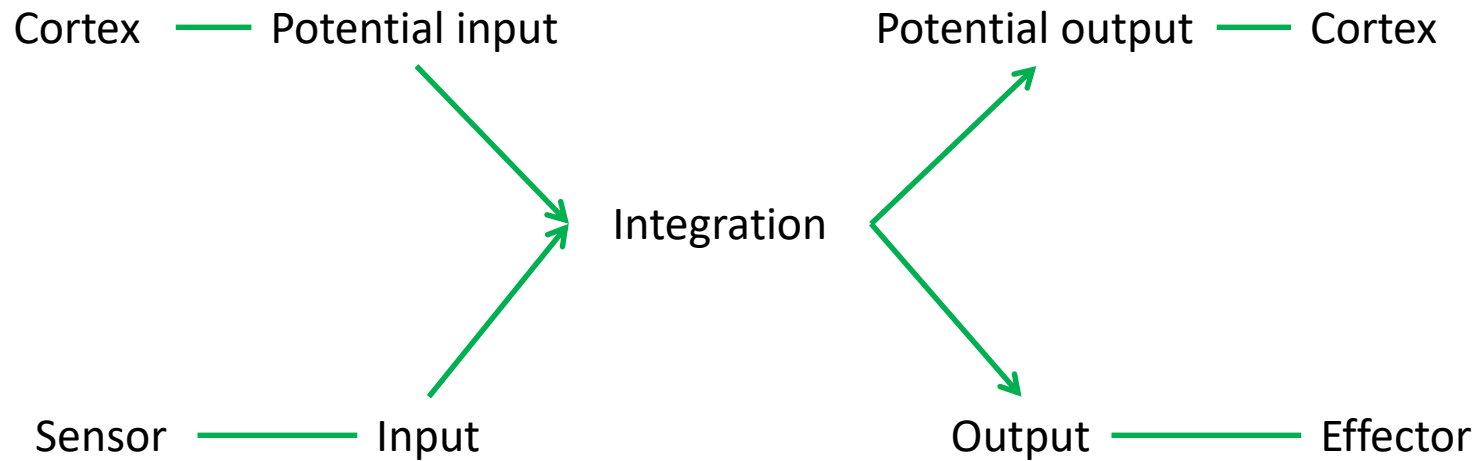
ANTICIPATION



REGULATION

The role of nervous system

ANTICIPATION



REGULATION

Evolutionary approach

Evolution is not revolution



Evolutionary approach

- Evolutionary old structures have not been replaced by new ones during evolution, but the old has been kept and the new added

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- Evolutionary younger structures were associated with new functions or with the improvement in existing functions

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- Evolutionary old structures have not been replaced by new ones during evolution, but the old has been kept and the new added
- Evolutionary younger structures were associated with new functions or with the improvement in existing functions
- It is important to ask what is any particular function good for and how it has been improved in course of evolution