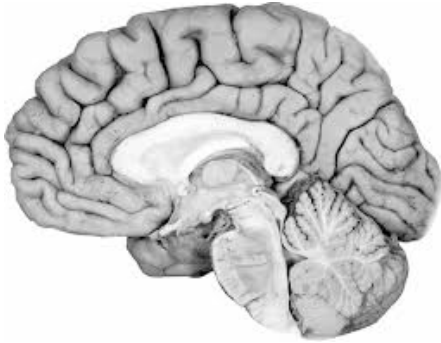


Neuroanatomy (Neuroscience 404)



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TEXTBOOKS:

The Human Brain: An Introduction to its

Functional Anatomy, John Nolte

The Sheep Brain: A Photographic Series,

C. H. Vanderwolf & R. K. Cooley

The Tale of the Dueling Neurosurgeons, Sam Kean

January 11 – May 6, 2016

Tuesdays/Thursdays, 12:00pm – 1:50pm

GOAL OF THE COURSE: Neuroanatomy is the study of the nervous system and its various parts, in terms of position, shape and size, connections, functions, pathology and clinical significance. This class will introduce you to the structure and function of the nervous system, and its constituent components, networks, and systems through lecture, discussion, video, internet resources and laboratory dissection...

GRADES: Grades will be assigned on a 90% (A), 80% (B), 70% (C) and 60% (D) scale. Points will be awarded on the basis of your understanding of, and ability to think critically about course material as assessed by a midterm and a final exam. Additional points can be earned by correctly answering questions about the material on six lab quizzes.

GRADUATE STUDENTS: Students taking the course for graduate credit will assist in running laboratory sessions and testing undergraduate students for their knowledge of structural and functional anatomy during labs.

LABORATORY: In the laboratory portion of this course, you will work in small groups to dissect and examine specimens and participate in discussions run by

our graduate TA, Megan Slaker. A \$35 per student laboratory fee covers the cost of dissection tools, specimens (sheep/human brains, etc.), and *use of a lab manual*. The lab manual must be returned at the end of the semester. **You are responsible for cleaning and maintaining your tools, manual and specimens.** *Quizzes will be administered during most of these laboratory sessions as well...*

QUIZZES (20 points; 4 points each): Five quizzes will test your ability to recall and identify structures and their functional significance. Quizzes will cover material covered in the most recent lectures and labs. ***Please note that it is extremely difficult, and unlikely, in a lab class, to reschedule any quizzes for personal reasons...*** But note that your lowest quiz grade will be converted into 4 full points!

STUDENT PRESENTATIONS (20 points): Select a chapter from “The Tale of the Dueling Neurosurgeons,” and identify the condition, describe the neuroanatomy that was affected, how it was altered, and any predictions for treatment..if applicable. Students will also summarize one related research article from a peer-reviewed scientific journal, and informally ***present and describe the aims, methods and findings of, with reference to the neuroanatomy involved.*** Your grade is based on a demonstrated grasp of the paper and the relevant anatomy. ***Please choose a paper with clear, neuroanatomical images.***

MIDTERM EXAM (30 points): The midterm will cover all the material presented in the class and labs up to and including the lab on the sensory systems. Questions may also be drawn from the reading assignments in the *Neuroanatomy* textbook.

FINAL EXAM (30 points): *The final exam will be comprehensive,* but will draw more from the lectures, labs and reading assignments presented *after* the midterm exam.

LECTURE AND LAB NOTES: This course requires you to gain familiarity with many brain structures, and remember names, connections, and the functional significance of these structures and of the distributed neural networks they form. ***In order to acquire***

this information during the course of this semester, it is essential that you attend lectures and labs, and take excellent, detailed notes on the material.

ACADEMIC INTEGRITY: Academic integrity is the cornerstone of the university and will be strongly enforced in this course. Any student found in violation of the academic integrity policy will be given an “F” for the course and will be referred to the Office of Student Conduct. For additional information about WSU’s Academic Integrity policy/procedures please contact (360) 546-9573.

DISABILITY ACCOMMODATION: Accommodations may be available if you need them in order to fully participate in this class because of a disability. Accommodations may take some time to implement *so it is critical that you contact Disability Services as soon as possible*. All accommodations must be approved through Disability Services (in Student Resource Center, (360) 546-9138).

EMERGENCY NOTIFICATION SYSTEM: WSU has made an **emergency notification system** available for faculty, students and staff. Please register at myWSU with emergency contact information (cell, email, text, etc). You may have been prompted to complete emergency contact information when registering for classes on ROnet.

In the event of a **Building Evacuation**, a map at each classroom entrance shows the evacuation point for each building. Please refer to it. Finally, in case of **class cancellation campus-wide**, please check local media, the WSU Vancouver web page and/or <http://www.flashalert.net/>. Individual class cancellations may be made at the discretion of the instructor. *Each individual is expected to make the best decision for their personal circumstances, taking safety into account*. Safety plan website - <http://safetyplan.vancouver.wsu.edu/>

THE CLASSES:

Introduction to the nervous system:

1. **Introduction to the course** (1/12): course information, syllabus, laboratory expectations; what is neuroanatomy, structural versus functional neuroanatomy, the nervous system (brain, spinal cord, CNS vs. PNS, autonomic ganglia), development
 - *READ Nolte, Chapter 1*
2. **General organization of the nervous system** (1/14): more on gross structures, neuroanatomical terminology, gray matter vs. white matter, reference terms (rostral, caudal, dorsal ventral, anterior, posterior, superior, inferior, medial, lateral, sagittal, horizontal, transverse, etc...), regional anatomy of spinal cord, gray matter (dorsal versus ventral horns) and white matter (afferent and efferent pathways)
 - *READ Nolte, Chapter 3*
 - *Lab Manual; pages 11 - 22*
3. **Gross and internal CNS** (1/19): Review of structures and terminology; tracing pathways in the nervous system, brainstem, surface features of the brainstem, cerebellum, diencephalon, telencephalon, cortex (sulci, gyri, lobes, etc.)...

LAB INTRO: tools, buckets, specimens, introduction to websites
(**Digital Anatomist**, <http://www9.biostr.washington.edu/da.html>)

 - *Lab Manual; pages 23 - 36*
4. **LAB 1: Gross and internal CNS continued** (1/21): brainstem, surface features of the brainstem, cerebellum, diencephalon, telencephalon, cortex (sulci, gyri, lobes, etc.)...
 - *READ Nolte, Chapters 5 & 6*
 - *Lab Manual; pages 37 - 46*

QUIZ

5. **LAB 2: Blood supply, ventricles (1/26):** arterial supply to spinal cord and brain, venous return from spinal cord, arterial supply to brainstem, Circle of Willis, cranial and spinal meninges, choroid plexus, ventricles, glymphatic system...
- * **QUIZ 1:** directional terms, surface features of brainstem, diencephalon, cortex

Sensory systems

- *READ Nolte, Chapter 9*
6. **SOMATOSENSORY systems - PNS/CNS (1/28):** sensory receptors for touch, pressure, vibration, proprioception, pain, temperature, deep touch, dorsal root ganglia; afferent spinal pathways (e.g., dorsal columns, anterolateral (and spinothalamic) tracts), and cortical target maps (primary somatosensory cortex (S1) and insula)...

- *READ Nolte, Chapter 12*
7. **CRANIAL NERVES I - VI (2/2):** Introduction, and olfactory (I), optic (II), oculomotor (III), trochlear (IV), trigeminal (V), and abducens (VI)...
8. **CRANIAL NERVES VII - XII (2/4):** Facial (VII), vestibulocochlear (VIII), glossopharyngeal (IX), vagus (X), spinal accessory (XI), hypoglossal (XII)...
9. **Summary of cranial nerves, and review day (2/9):** Review of neuroanatomy, both structural and functional; also, time for catch up and questions...

- *Lab Manual; pages 47 - 61*
10. **LAB 3: Somatosensory systems, cranial nerves (2/11):** dorsal column/medial lemniscal system, anterolateral/spinothalamic system, cranial nerves I - XII...



QUIZ

11. **STUDENT PRESENTATIONS/DISCUSSION (2/16):** Journal articles (with neuroanatomy images) that focus on blood supply, ventricular system, spinal cord, somatosensory tracts/maps/networks, and/or the cranial nerves...
- * **QUIZ 2:** arteries, ventricles, sinuses, somatosensory tracts

- *READ Nolte, Chapter 17*

12. **VISUAL SYSTEM (2/18)**: “old” versus “new” pathways, visual reflexes vs. visual consciousness/perception, retinal physiology, optic nerves/chiasm/tracts, lateral geniculate nucleus, primary visual cortex (V1), etc...

COMPUTER LAB: Visual perceptual experiments (TA-led)

13. **More on the visual system (2/23)**: Magnocellular and parvocellular pathways, “what” vs. “where/how” pathways, clinical tests for vision/visual reflexes, etc...

- *READ Nolte, Chapter 14*

14. **AUDITORY SYSTEM (2/25)**: hair cells and auditory stimulus transduction, afferent input pathways and functional considerations, olivocochlear system, inferior colliculi, medial geniculate nucleus, primary auditory cortex (A1), clinical hearing tests, etc...

COMPUTER LAB: Auditory perceptual experiments (TA-led)

- *READ Nolte, Chapter 13*

15. **TASTE and SMELL (3/1)**: afferent gustatory and olfactory pathways, review of cranial nerve organization of afferent input from the tongue, cortical and subcortical targets of the chemical senses, etc...

QUIZ

- *Lab Manual; pages 62 – 70; 76 – 84*

16. **LAB 4: Vision, audition, taste and smell (3/3)**: conscious visual pathway, visuomotor reflex pathway, oculomotor control of eye muscles (including cranial nerves involved), inner ear, auditory pathways, gustatory and olfactory pathways, targets, etc...

***QUIZ 3**: Visual system structures

17. **STUDENT PRESENTATIONS/DISCUSSIONS (3/8)**: Journal articles (with neuroanatomy images) that focus on vision, audition, gustatory system, olfaction...

18. **MIDTERM EXAM (3/10)**

**** SPRING BREAK! ****

**** NO CLASS TUESDAY, 3/15 OR THURSDAY, 3/17!! ****

Motor systems

19. **Classroom lab and video: HUMAN BRAIN DISSECTION (3/22):**

20. **Classroom lab and video: HUMAN BRAIN DISSECTION (3/24)**

- *READ Nolte, Chapter 18*

21. **MOTOR SYSTEMS (3/29):** descending spinal pathways and motor control, multiple parallel control systems, upper and lower motor neurons, neuroanatomy of limb control and posture, clinical consequences of damage...

- *READ Nolte, Chapter 21*

22. **Brainstem vestibular and oculomotor systems (3/31):** review of cranial nerves for eye movement, integration of vestibulospinal afferent input with motor output/control

- *READ Nolte, Chapter 19*
- *READ Nolte, Chapter 20*

23. **Cerebellum and basal ganglia (4/5):** functional anatomy, consequence of damage (ataxia), parallel circuits in basal ganglia, substantia nigra, striatum (globus pallidus, putamen), caudate, consequence of damage (Parkinson's, Huntington's)

QUIZ

- *Lab Manual; pages 85 – 92; 102 - 112*

24. **LAB 5: Motor systems (4/7):** descending motor pathways, upper and lower motor neuron systems, input/output of the cerebellum, gross anatomy of cerebellum, basal ganglia circuitry/parallel circuits, neurochemistry and functional pathways

***QUIZ 4:** Motor systems (spinal pathways, vestibular/oculomotor networks)

25. **STUDENT PRESENTATIONS/DISCUSSIONS (4/12):** Journal articles (with neuroanatomy images) that focus on motor systems (spinal cord efferent pathways, brainstem nuclei, cerebellum, basal ganglia, frontal cortex, etc.)...

Hypothalamus, limbic system, and neocortex

- READ Nolte, Chapter 23

26. **Hypothalamus and limbic system (4/14):** anatomy of hypothalamus, parvocellular vs. magnocellular neurosecretory systems, autonomic nervous system control, functional organization; Hippocampal formation, amygdala, limbic association areas, Papez circuit, mesocorticolimbic dopamine networks

27. **Limbic system (continued) and neocortex (4/19):** paleocortex versus neocortex, structural and functional anatomy of neocortex, input/output, columnar organization

- Lab Manual; pages 113 – 125; 27 – 36 (review)

QUIZ

28. **LAB 6: Limbic structures (4/21):** e.g., amygdala, hippocampus, etc...

***QUIZ 5:** Neocortex and limbic structures...

28. **OPTIONAL COURSE REVIEW (4/26 or 4/28): DEAD WEEK** - no new material, but review of neuroanatomy and neuroanatomy labs by instructor and graduate students; brain dissection video

29. *** **FINAL EXAM**

(TBA online in February: During **FINAL EXAM WEEK, 5/2 – 5/6**)

For more information, visit <http://www.vancouver.wsu.edu/ss/finalexam.html>