

SYLLABUS

The Skull

Anth 466

Instructor: Dr. Joan Richtsmeier

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Office hours: Before and after class or by appointment

Course website: use ANGEL

Richtsmeier lab website: <http://getahead.psu.edu>

Please note that emails should only be used to inform Dr. Richtsmeier of emergency situations or to set up a time for an appointment. If you have something to discuss, have a problem with an assignment, or are expecting to be missing a class, you should make an appointment or talk with me before or after class.

Course objectives: The major objective of this course is to provide a survey of what is known about the Mammalian skull from many perspectives including evolution, development, anatomy, function, and variation. Lectures and readings will be oriented at introducing the students to the available data. The students will learn to critically discuss, defend, synthesize, question, and write about ideas presented in class.

Course description: The course will consist of lectures, a laboratory component, presentations, and open discussion. Students will learn about the basic architecture of the mammalian skull using the highly specialized human skull and be introduced to various specializations of extinct and extant species. The section on evolution will cover the evolution of the skull from the earliest jawless vertebrates to the general mammalian condition. This section will focus on critical evolutionary innovations that enabled the jawed skull to evolve. While we discuss evolution of the mammalian skull during this segment of the course, students will be introduced to the details of the skull using specimens of modern human skulls. Students will be taught the various bones of the human skull and specific bony landmarks. Students will be required to know the human skull and to generalize this knowledge to the skulls of other mammals.

During the section on development we will discuss the embryological and fetal formation of skeletal and soft tissues that combine to form the head. This will require a review of some of the genetic pathways responsible for the formation of bony anlagen and cartilage precursors but our focus will not be on the genetics of development but on structures and processes of development. Other topics related to development include the ways in which bone changes shape and size during prenatal and postnatal growth, and how changes in growth can result in evolutionary change in morphology.

Readings on functional anatomy and other topics relating to skull variation will be assigned to pairs of students or individual students (depending upon enrollment). These will be presented in a "journal club" format during a class period, with open discussion with the rest of the class. While some instruction will be given, small group discussion will be encouraged (or forced!) on topics covered in assigned readings.

Students will use the information presented in class to conduct a final project. The students will form groups and will choose a special topic that they will research from the

various aspects covered in class (e.g., evolution, development, functional anatomy). The students in each group will organize this project (see section on class project below). Some class time will be given in order for the students to get organized but most of the research must be done outside of class. This is a GROUP project with equal amounts of work falling on all group members' shoulders. Students must agree to the equality in the division of labor among the group members. The group project will be presented to the class. Each student will hand in a written research paper on his or her aspect of the group project. There will be no final exam.

Learning the bones of the skull. The skull is a complex structure and it takes a great deal of time to learn it. I will introduce each bone of the skull to you during class lectures in the first half of the semester. You will NOT know the bones or their salient characteristics from this introduction. In order to learn the bones you will need to spend time on your own with the bones. Isolated skull bones and articulated skulls will be available for your study in the Anthropology museum on the second floor of the Carpenter Building. These will be on a cart that you can sign out at the museum desk and wheel to an empty space. I will provide you with the hours of availability of museum space. Be cognizant of the museum room schedules (e.g., do not get comfortable to study in 219 if another class is scheduled to use that space 10 minutes after your arrival). The cart and skulls on it will be available to you any time the museum is open (9:00am – 4:00pm M-TH and Fridays 9-3). The museum is NOT open in the evenings or on weekends so plan accordingly. Do not think you can learn the whole skull two days before the quiz. The best way to learn the skull is to set a minimum of two one-hour periods aside each week and come to the museum to spend time with the bones. I encourage you to work with each other but please be respectful of others in the museum while you are working there.

A library from my personal collection covering osteology and embryology of the skull will also be available for your use in 311 or 319 Carpenter. My office is next door (Room 320) and I am happy to answer any questions AFTER you have tried to answer them yourself using the materials available in the lab and the museum. It is expected that you will talk with one another, but please remember that 311 and 319 are research laboratories and people are there to get work done. There will be others working there with you, including people who are NOT in this class. Feel free to ask them questions; they all know the skull very well.

Evaluation, grading and exams: Grading is based primarily on three quizzes, a “journal club” type presentation of a scholarly article, and the group project which has an oral and written component. The group project topics are fairly broad, and will be further discussed in class. The first two quizzes (osteology) are each worth 15% of your grade while the third (embryology) is worth 10% of the final grade. You will receive a combined score on your written and oral portions of your presentation, each are worth 20% of your grade. The remaining 20% will be calculated from class participation including the presentation of your scholarly article. ***Realize that you must be present to participate.*** Realize also that you will have to complete all readings to be a contributing discussant in class. If I have not heard from you in class, you cannot get an “A” for this component, so speak up! I reserve the right to change and/or add readings to the weekly assignments.

Attendance: Class attendance is **mandatory**. This means that absences will be taken into account when grades are given. If you must miss a class for a University-approved curricular or extracurricular activity, discuss this with me BEFORE you miss the class, not after. If you are ill, you (or a less-ill roommate) should either telephone or email me.

Writing assignment/ class project: Students will assemble themselves into small groups (approximately 3-4 students/group). Graduate students must disperse throughout the class and should not be in the same group. Each group will choose or be assigned a topic. Each student in each group will choose an aspect of this topic; e.g., anatomy (soft and hard tissue), functional anatomy, evolution, development, anomalies, variation. Topics can be diverse: e.g., structural diversity of the face within or across a broad range of species; a theoretical idea (significance of the neural crest to evolution of the head); a concrete study of a specific structure like the brain and braincase. Once the group has a cogent plan for how they are going to divide up the topic, they need to present this plan to the Professor. All group participants will need to agree that the work is shared equally and no one person did substantially less or substantially more work than others in the group (no free rides on this project). The projects will be presented to the rest of the class during the last four class periods. Each student must hand in a written research paper concerning their specific topic. The format of the paper will be discussed further in class, but this is a research paper that should be 15-20 pages long with proper scholarly citations. The oral presentation should highlight and summarize the major points of the written paper in which they are more fully developed. The written paper is due on the Friday of the last week that this class meets, that is **Friday, December 14**.

Academic integrity: Penn State defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed by their own efforts. In this class especially, respect for each other's ideas, history and dignity is expected and required. My hope would be that this behavior might spill over into your everyday (out-of-the-classroom) life. Dishonesty of any kind will not be tolerated in this course. If I see you looking at another student's test during a quiz, I will take your quiz from you and you will receive a zero on that quiz. Dishonesty includes but is not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Judicial Affairs office for possible further disciplinary sanction.

Ethical considerations: You will be using actual human skeletal remains in this class. Not only are they fragile and costly (a skull costs from \$500 to \$1000); they are the remains of a human who lived on this earth. For this reason, all skeletal materials need to be handled with care and respect. Any one who treats the human specimens with a lack of respect will receive a warning. If that same person is found to treat specimens disrespectfully for a second time, the student will be denied access to the laboratory and the specimens. There will be no second warning. This will consequently impact the student's grade.

Disability Access Statement: Penn State encourages qualified people with disabilities to participate in its programs and activities and is committed to the policy that all people shall have equal access to programs, facilities, and admissions without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. If you anticipate needing any type of accommodation in this course or have questions about physical access, please tell Dr. Richtsmeier as soon as possible (i.e., TODAY).

Course Materials: Required text books:

White, TD and PA Folkens 2005 Human Osteology. Academic Press (IN BOOKSTORE)

An embryology text of your choice:

Sperber, Geoffrey H. 2000 Craniofacial Development. BC Decker. ***OUT OF PRINT****

Look at ANGEL page to get other suggestions for embryology texts and order one of your choosing on line. Feel free to buy an early edition used one. Embryology has not changed much but the knowledge of genetics underlying development has.

Other reading

There is a folder called "Selected Readings" on the ANGEL page for this class that contains folders loosely organized by broad topics containing a number of interesting reprints of current articles. Read the abstract of each of these articles during the first week or two of class to get an idea of the issues of interest in modern craniofacial research. You will be required to choose one of these articles (or another that you find yourself after it is approved by me) and to present it to the class.

Evolution of the skull is a broad topic with a long history. The Hanken and Hall series, THE SKULL consists of 3 volumes. Volume 1 concerns Development, Volume 2 concerns Patterns of Structural and Systematic Diversity. These books contain large bibliographies and can be consulted for further reading. They will be in my lab. If you have a particular interest and want some further reading, especially for your projects, please ask me. I have used many published articles and the following texts to prepare lectures. Many of these will be available in Room 311 Carpenter.

Liem, HM, Northcutt, G, Romer, AS, Nelson, G 2001 Functional Anatomy of the Vertebrates. An Evolutionary Perspective. 3rd edition. Harcourt.

Carlson, BM 1999 Human embryology and developmental biology. 2nd edition. Mosby.

Larsen, WJ 1997 Human embryology. 2nd edition. Churchill Livingstone.

Moore, WJ 1981 The Mammalian Skull. Cambridge University Press.

Romer, AS 1966 Vertebrate Paleontology, 3rd edition. University of Chicago Press.

Kardong, KV 1998 Vertebrates. Comparative anatomy, function, evolution. 2nd edition. McGraw Hill

Hall, BK 1999 The neural crest in development and evolution. Springer.

*****N.B. Dr. R reserves the right to change, update, delete, or add any lectures, assignments, or quizzes she pleases through the semester.**

Class date	Class activity	General Topic	Assignments Due the following class
August 27	Lecture and discussion	Introduction; course syllabus, required texts; development versus evolution versus anatomy and how to teach this course;	Define all terms on handout and bring questions to class; Liem article (Xerox).
August 29	Lecture and discussion	Basic concepts, names of bones, body axes, vocabulary	Appropriate parts of White and Folkens
August 31	Bone lab: The human skull as your physical model	The human skull: an introduction to structure and anatomy: frontal, parietal bones	Appropriate parts of White and Folkens
September 3	NO CLASS	LABOR DAY	NO CLASS
September 5	Bone lab: The human skull as your physical model	The human skull Occipital, temporal bones	Study for the bone practical experience
September 7	The bone practical experience! Although you are required to take this practice quiz, the grade will not be figured into your average for the semester.	A practice practical exam will be given (and graded!) in class on the frontal and parietal bones so that you may all experience what the real bone quizzes will be like. Lecture to follow if there is time.	Appropriate parts of White and Folkens
September 10	Lecture and discussion	Mammals: what's a head got to do with it? Form follows function. Evolution as a basis for understanding the skull...and a little development	Appropriate parts of White and Folkens
September 12	Bone lab: The human skull as your physical model	The human skull: Temporal, sphenoid	Appropriate parts of White and Folkens
September 14	Bone lab: The human skull as your physical model	The human skull: sphenoid, ethmoid bone	Appropriate parts of White and Folkens
September 17	Lecture and discussion	Where did our head come from? Vertebrates and chordates and a logical architectural division of the skull	Appropriate parts of White and Folkens
September 19	Bone lab: The human skull as your physical model	Small bones of the skull: inferior nasal conchae, nasal bones, lacrimal bones, vomer	Appropriate parts of White and Folkens
September 21	Lecture and discussion	Phylogeny of the cranial skeleton from jawless craniates to early tetrapods	Appropriate parts of White and Folkens
September 24	Lecture and discussion	Phylogeny of the cranial skeleton from jawless craniates to early tetrapods The evolution of the mammalian cranial skeleton. Trends: strength and reduction of isolated elements;	Appropriate parts of White and Folkens
September 26	Lecture and discussion	The evolution of the mammalian	Study for the bone quiz

		cranial skeleton. Trends: strength and reduction of isolated elements; braincase evolution; skull changes correlated with sense organs; temporal fenestration and jaw musculature; jaw and middle ear changes	
September 28	Bone Quiz 1 DOWN SYNDROME CONFERENCE FOR DR. R.	Bone Quiz 1 Bone quiz on all bones from frontal to ethmoid	
October 1	Small group discussion in class to determine paper to read and supporting materials	Deciding on your article to present	Appropriate parts of White and Folkens
October 3	Bone lab: The human skull as your physical model	The human skull: Zygomatics, maxilla	Appropriate parts of White and Folkens
October 5	Lecture and discussion	The evolution of the mammalian cranial skeleton. Trends: strength and reduction of isolated elements; braincase evolution; skull changes correlated with sense organs; temporal fenestration and jaw musculature; jaw and middle ear changes	Appropriate parts of White and Folkens
October 8	Bone lab: The human skull as your physical model	The human skull: palantine, mandible	Appropriate parts of White and Folkens
October 10	Bone lab: The human skull as your physical model	The human skull: mandible	Appropriate parts of White and Folkens
October 12	Bone lab: The human skull as your physical model	The human skull: hyoid, auditory ossicles, question/answer	Appropriate parts of White and Folkens
October 15	small group activity: make your own bone quiz and small group meeting for final presentations	deciding on your final project	Study for your bone quiz
October 17	Lecture and discussion	Development as a basis for understanding the skull; gastrulation, embryonic induction, poles and axes primitive streak, notochord	Sperber Pp 3-76 or appropriate reading from your chosen development text
October 19	Lecture and discussion	Development: induction of the nervous system, neurulation, mesodermal germ layer	Sperber Pp 67-76, 171-182 or appropriate reading from your chosen development text
October 22	Bone Quiz 2	Bone Quiz 2	Sperber Pp 183-192 or appropriate reading from your chosen development text

October 24	Lecture and discussion	Development: neural crest and development of the face, neural crest, branchial arches	Appropriate reading from your chosen development text
October 26	Lecture and discussion	Development: neural crest and development of the face, neural crest, branchial arches	Appropriate reading from your chosen development text
October 29	Lecture and discussion	Evolution of neural crest	Appropriate reading from your chosen development text
October 31	Lecture and discussion	Evolution of neural crest	Appropriate reading from your chosen development text
November 2	Lecture and discussion	Development: development of bone; development of the sense organs (eye)	Appropriate reading from your chosen development text
November 5	Lecture and discussion	Evolution of osseous tissues	Study for development quiz
November 7	Discussion	meet with groups for presentations	Study for development quiz
November 9	Embryology Quiz 3	quiz on development; discuss format of discussions for next few classes;	Read what is assigned by students presenting Nov 12
November 12	Discussion	Students discussion leaders:TBD	Read what is assigned by students presenting Nov 14
November 14	Discussion	Students discussion leaders:TBD	Read what is assigned by students presenting Nov 16
November 16	Discussion	Students discussion leaders:TBD	Read what is assigned by students presenting Nov 26
November 19-23	THANKSGIVING WEEK OFF	November 19-23	THANKSGIVING WEEK OFF
November 26	Discussion	Students discussion leaders: TBD	Read what is assigned by students presenting Nov 28
November 28	Discussion	Student discussion leaders: TBD	Read what is assigned by students presenting Nov 30
November 30	Discussion	Students discussion leaders: TBD	Read what is assigned by students presenting Dec 3
December 3	Discussion	Students discussion leaders: TBD	Read what is assigned by students presenting Dec 5
December 5	Discussion	Student discussion leaders: TBD	Assignment from group 1 ?
December 7	Group presentation	?	Assignment from group 2 ?
December 10	Group presentation	?	Assignment from group 3?
December 12	Group presentation	?	Assignment from group 4?
December 14	Group presentation	?	