GENM0201

Human Origins, Human Problems

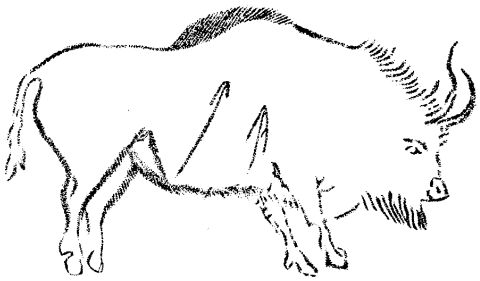
Abbreviated Preliminary Notes

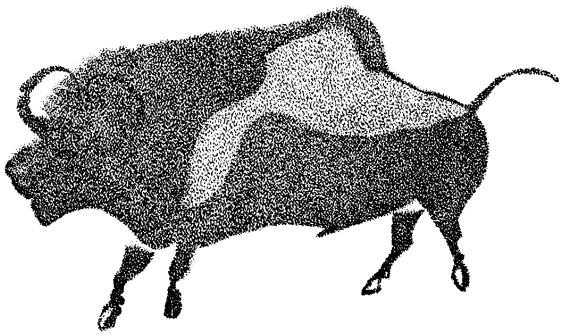
Course Authority: Prof. Ken Ashwell

Dept of Anatomy, School of Medical Sciences

Summer Session, 2010/2011

Monday November 29th to Friday December 17th 2010





Course authority: Prof. Ken Ashwell (k.ashwell@unsw.edu.au, 9385 2482), Room 114 No. 30 Botany St

Lectures will be held in **Biomed Theatre A and CLB6**. Practical Classes will be held in 101 (Dissecting Room) in the Wallace Wurth Building. The venues for tutorials will be advised.

IMPORTANT NOTES:

- **Students must wear enclosed shoes (i.e. no thongs or sandals) in the Dissecting Room.**
- **No eating, drinking or smoking in the Dissecting Room.**
- **Mobile phones must be switched off during lectures and classes.**

Official Communication By Email
All students in GENM0201 are advised that email is the official means by which the School of Medical Sciences at UNSW will communicate with you. All email messages will be sent to your official UNSW email address and, if you do not wish to use the University email system, you MUST arrange for your official mail to be forwarded to your chosen address. The University recommends that you check your email at least every other day. Facilities for checking email are available in the School of Medical Sciences and in the University Library.

Plagiarism
The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct (please see the following website where this policy is displayed: http://www.student.unsw.edu.au/academiclife/assessment/academic_misconduct.shtml) and imposes severe penalties. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalized by the award of a score of zero for the assessable work. Flagrant plagiarism will be directly referred to the Division of the Registrar for disciplinary action under UNSW rules.
The attention of students is drawn to the following extract from the above website:
"The basic principles are that you should not attempt to pass off the work of another person as your own, and it should be possible for a reader to check the information and ideas that you have used by going to the original source material. Acknowledgment should be sufficiently accurate to enable the source to be located speedily."

The following are some examples of breaches of these principles:
a) Quotation without the use of quotation marks. It is a serious breach of these rules to quote another's work without using quotation marks, even if one then refers to the quoted source. The fact that it is quoted must be acknowledged in your work.
b) Significant paraphrasing, e.g., several sentences, or one very important sentence, which in wording are very similar to the source. This applies even if the source is mentioned, unless there is also due acknowledgment of the fact that the source has been paraphrased.
c) Unacknowledged use of information or ideas, unless such information or ideas are commonplace.
d) Citing sources (e.g., texts) which you have not read, without acknowledging the 'secondary' source from which knowledge of them has been obtained.

Appropriate citation of sources therefore includes surrounding any directly quoted text with quotation marks, with block indentation for larger segments of directly-quoted text. The preferred format for citation of references is an author-date format with an alphabetically arranged bibliography at the end of the assignment. Note that merely citing textbooks or website URLs is unlikely to yield a bibliography of satisfactory standard. The internet should be avoided as a primary source of information. Inclusion of appropriate journal articles, both primary research publications and reviews, is usually expected.

OH & S – Safety Guidelines
Generic safety rules for the School of Medical Sciences can be found at the URL below.
http://medicalsciences.med.unsw.edu.au/SOMSWeb.nsf/page/Policies%20and%20Procedures

Applications for Consideration
Students who miss an assessment through illness or misadventure must submit an application for consideration within **three working day**s to New South Q. Full details for the application (e.g., Medical Certificate, etc.) are available at http://www.student.unsw.edu.au/atoz/atoz-Special.shtml

Problems With The Course
If you have any problems or grievances with the course you should, in the first instance, consult the Course Authority. If you are unable to resolve the difficulty, you can consult the Department of Anatomy's nominated Grievance Resolution Officer, who is currently Dr Priti Pandey, p.pandey@unsw.edu.au.

Course aims
The aims of this course are to:

1. *Provide the student with an understanding of the major biological (physical, ecological and evolutionary) attributes of non-human primates and humans.*
2. *To assist the student to develop a deeper appreciation of the place of humans in the natural world and their relationship to other primates.*
3. *To provide the student with some knowledge and skills from the field of biological anthropology.*
4. *Help the student to appreciate the importance and relevance of the study of human origins to problems faced by people in the modern world.*

Student learning outcomes
Students should complete the course knowing (among other things):

1. *Some basics of primate and human anatomy, especially of the skeleton, muscles and brain.*
2. *Anatomical features of the order primates and of major groups of primates.*
3. *The elements of evolutionary biology and the evidence for human evolution.*
4. *The broad patterns of evolution for the primates and humans, including major evolutionary trends.*
5. *The basis for human physical variation across the world.*
6. *Modern human health problems related to compromises during our evolution.*

The University of NSW has developed a list of attributes that its graduates should possess upon graduation (the 'graduate attributes'). The curriculum and assessment of this course have been designed to help students to develop these capabilities/attributes. Students satisfactorily completing the course will have gained knowledge and skills that contribute directly to them acquiring these attributes during their study at UNSW. One way this has occurred is through curriculum mapping of this course (see below: Assessment).

For a science based general education course, the UNSW graduate attributes are as follows:

1. *Research, inquiry and analytical thinking abilities*. Technical competence and discipline specific knowledge. Ability to construct new concepts or create new understanding through the process of enquiry, critical analysis, problem solving, research and inquiry.
2. *Capability and motivation for intellectual development*. Capacity for creativity, critical evaluation and entrepreneurship. Ability to take responsibility for and demonstrate commitment to their own learning, motivated by curiosity and an appreciation of the value of learning.
3. *Ethical, Social and Professional Understanding*. Ability to critically reflect upon broad ethical principles and codes of conduct in order to behave consistently with a personal respect and commitment to ethical practice and social responsibility. Understanding of responsibility to contribute to the community. Respect and value social, multicultural, cultural and personal diversity.
4. *Communication*. Effective and appropriate communication in both professional (intra and inter disciplinary) and social (local and international) contexts.

5. *Teamwork, collaborative and management skills*. Ability to recognize opportunities and contribute positively to collaborative scientific research, and to perceive the potential value of ideas towards practical applications. Demonstrate a capacity for self-management, teamwork, leadership and decision making based on open-mindedness, objectivity and reasoned analysis in order to achieve common goals and further the learning of themselves and others.
6. *Information literacy*. Ability to make appropriate and effective use of information and information technology relevant to their discipline.

This course and the required assessments will assist you to develop skills in all of these areas.

Assessment: 2 quizzes, one group assignment and one individual assignment

- Quizzes 1 and 2 are each worth 25% of the final mark and consist of 30 multiple-choice questions (1 in 5 choice). No marks are deducted for incorrect choices so you are advised to attempt all questions. All questions are drawn from material taught in lectures and practical classes. Knowledge of precise factual information (e.g. important dates) may be assessed in these quizzes. Practice questions are available in the tutorial classes.
- The group poster/oral presentation is worth 20% of the final mark and will be assessed by your tutor. Note that you will be assessed both on the poster itself and the oral presentation made by your group. Each of these components will have equal weighting in determining the final mark for the paired tasks. The mark given by your tutor will apply to all students in the group.
- The individual assignment is worth 30% of the final mark and will be assessed by the course authority. The assignment must include appropriately cited sources including original research articles and professional reviews. Excessive use of websites will not result in a good mark.

Lecture and Practical/Tutorial Schedule

There are **NO** classes during the week beginning 22nd November 2010

WEEK 1

Day 1	**Monday 29th November**	**5 hours**	**Biomed A**
10-11	Lecture 1	Introduction to Primate Biology (KA)	
11-12	Lecture 2	Elements of Genetics (CL)	
12-1	Lecture 3	Diversity and Evolution (CL)	
2-4	Practical 1	Primate Musculoskeletal Anatomy	

Day 2	**Tuesday 30th November**	**5 hours**	**Biomed A**
10-11	Lecture 4	The Origin and Early Evolution of Primates (KA)	
11-12	Lecture 5	Principles of Paleoanthropological Techniques (KA)	
12-1	Film	Ape and Human Behaviour	
2-3	Lecture 6	Ethics of Human Remains and Forensic Anthropology (EL)	
3-4	Tutorial 1	Group Orientation and Choosing of Poster Topics	

Day 3	**Wednesday 1st December**	**5 hours**	**Biomed A**
10-11	Lecture 7	Early Hominins (KA)	

11-12	Lecture 8	*Homo ergaster* and *Homo erectus* (KA)
12-1	Films	Portrayals of Human Ancestors
2-3	Lecture 9	Archaic *Homo sapiens* (KA)
3-4	Tutorial 2	Review of Lectures and Film Portrayals of Human Ancestors

Day 4 **Thursday 2nd December** **No classes**

Day 5 **Friday 3rd December** **No classes**

WEEK 2

Day 6	**Monday 6th December**	**5 hours**	**Biomed A**
10-11	Lecture 10	Modern *Homo sapiens* (KA)	
11-1	Practical 2	Cranial Anatomy of Australopithecines and Early Humans	
2-3	Lecture 11	Humans in Australia (EL)	
3-4	Lecture 12	Evolution of Human Behaviour (KA)	

Day 7	**Tuesday 7th December**	**5 hours**	**lectures in Biomed A**
10-11	Tutorial 3	Review of Lectures; Modern Humans, their Behaviour and Future	
11-12	Lecture 13	Origin and Mechanics of Bipedalism (CL)	
1-3	Practical 3	The Human Lower Limb and Bipedal Locomotion	
3-4	Lecture 14	Human Sexuality and the Problems of Human Childbirth (CL)	

Day 8	**Wednesday 8th December**	**6 hours**	**Biomed A**
9-10	**Quiz 1**	Covers all material from days 1 to 6 inclusive (i.e. up to Lect 12)	
10-12	Practical 4	Human Childbirth	
12-1	Lecture 15	The Hominin Brain (KA)	
2-4	Practical 5	The Human Brain	

Day 9 **Thursday 9th December** **No classes**

Day 10 **Friday 10th December** **No classes**

WEEK 3

Day 11	**Monday 13th December**	**6 hours**	**CLB6**
9-10	Lecture 16	The Comparative Anatomy and Function of the Hand (CL)	
10-12	Practical 6	The Human Hand and Tool Use	

1-2	Lecture 17	Language, Speech and the Human Face (lecture/film)(KA)
2-4	Practical 7	The Human Face and the Functional Anatomy of Language

Day 12	**Tuesday 14th December**	**5 hours**	**CLB6**
10-11	Lecture 18	Changing Patterns of Disease During Human History (KA)	
11-12	Lecture 19	Syphilis, Tuberculosis and HIV/AIDS (KA)	
1-2	Lecture 20	Variation and Adaptation of Modern Humans (CL)	
2-3	Lecture 21	Food and Diet/Malaria and Human Evolution (CL)	
3-4	Tutorial 4	Review of Lectures and Humans and Their Environment	

Day 13	**Wednesday 15th December**	**No classes**

Day 14	**Thursday 16th December**	**No classes**

Day 15	**Friday 17th December**	**5 hours**	**CLB6**
10 to 11	**Quiz 2**	Covers days 7 to 12 inclusive	
11-1	Tutorial 5	Presentation of Group Posters	
2-4	Tutorial 6	Presentation of Group Posters (continued)	

KA – Prof Ken Ashwell

CL – Dr Carol Lazer

EL – Dr Estelle Lazer

Below is an example of the lecture notes provided on 29th November.

Lecture 1 Introduction to primate biology

Specific Objectives:

1. To be able to list the key characteristics of primates.
2. To know the main groups of living primates.
3. To be able to explain the key features of primate ecology.
4. To be able to summarize the main threats to the biodiversity of primates.

The key characteristics of primates

These are set out in detail in the class notes for practical 1. Primates are, of course, mammals, which means that they possess body hair, milk (mammary) glands and maintain relatively high body temperature by internal metabolic activity (endothermy). Many of the features that characterize primates are actually 'generalized' features. In other words these mammals have not developed a specialized form in response to evolutionary pressures as have horses or dolphins, but have retained many of the features of the early mammals. This has also meant that primates have been able to evolve in a number of different directions, which explains the great diversity seen among living primates. This is readily seen in the primate upper limb, which has retained some bones that have been lost in other mammals (e.g. the clavicle or collar bone). Primates have a generalized limb structure, which allows them to engage in a range of

locomotor activities (e.g. walking on the ground on four limbs, or quadrupedalism, as seen in baboons, or swinging through trees beneath branches, brachiating or arm-swinging, as seen in gibbons). Other important features include a tendency towards an upright body posture, flattened nails (in some, but not all primates), binocular vision, colour vision, grasping hand (some with opposable thumbs or big toes), a general lack of dietary specialization, enlarged brain, a prolonged period of dependency of the infant on the mother and a tendency to live in social groups. Several of these features (binocular vision, grasping hand, vertical posture) are excellent adaptations to life in the trees leading to an **arboreal hypothesis** for primate origins. On the other hand, it has also been noted that binocular vision would have been of great benefit if early primates stalked and captured fast-moving insect prey using vision (**visual predation hypothesis**).

Primate teeth are generalized in form, meaning that these animals can eat many different types of food (e.g. fruit, leaves, insects, birds, amphibians and occasionally other mammals). Primates from the Old World (Africa, Europe and Asia) have 2 incisors, 1 canine, 2 premolars and 3 molars on each side of each dental arch. This is known as the **dental formula** and is seen in humans as well as Old World monkeys and apes. New World monkeys have three premolars, whereas the strepsirhines (prosimians) have varying dental formulae.

Most primates are active by day (**diurnal**) whereas the strepsirhines tend to be active by night (**nocturnal**). Primates have shifted from olfactory dependence (as seen for many other terrestrial mammals, e.g. dogs, rats) to visual dependence with colour vision. The ability to detect colour is beneficial in assessing the ripeness of fruit and in detecting insect prey against foliage (see below).

The main groups of living primates

Primates are usually divided into two suborders: **Strepsirhini** (strepsirhines, including lemurs, galagos and lorises) and **Haplorhini** (haplorhines, including tarsiers, monkeys, apes and humans). The haplorhines have enclosed orbits (eye sockets), enlarged brains and fused frontal bones and mandibles. Within the **Haplorhini** there is a subdivision into three groups: Superfamily **Ceboidea**, containing new world monkeys, **Cercopithecoidea** containing Old World monkeys, and **Hominoidea** including **apes** (**gibbons, orangutans, gorillas, chimpanzees and bonobos)** and humans.

We shall review the main points of the different primate types in turn:

A) Prosimians

- Most similar of all primates to the early mammalian ancestor.
- Include lemurs (Madagascar) and lorises (Africa, India, SE Asia).
- Pronounced reliance on olfaction – reflected in the moist fleshy pad (**rhinarium**) at the end of the nose.
- More laterally placed eyes than other primates.
- Different uterine structure from other primates.
- Dental comb specialization of the lower incisors and canines.
- Grooming claw on second toe.

B) Tarsiers

- All live in southeast Asian islands.
- Possess both retained ancestral traits (grooming claw and unfused mandible) and advanced traits (absence of rhinarium and dental comb).
- Large eyes dominating the face.
- Lower limbs adapted for leaping.
- Believed to occupy an evolutionary position between prosimians like the lemurs, and haplorhines like the monkeys and apes.

C) New World Monkeys

- Found in central and south America.
- Almost exclusively arboreal.
- Broad, widely flaring noses with outward facing nostrils (platyrrhine – flat-nosed).

- Include four families: Atelidae – howlers and spider monkeys; Callitrichidae - marmosets and tamarins; Cebidae – capuchins; Pithecidae – sakis.
- 3 premolars in each quadrant instead of 2 as in Old World monkeys.

D) Old World Monkeys

- Found in Africa, Asia, India.
- Most are quadrupedal and primarily arboreal.
- Noses are downward facing (catarrhine).
- Females of some species exhibit pronounced cyclical changes in the appearance of the external genitalia (associated with estrus).
- Sexual dimorphism (differences in size between genders) is typical of some terrestrial species and is particularly pronounced in baboons.

E) Hominoids

- 3 families (**Hylobatidae** - gibbons and siamangs; **Pongidae** – orangutans, gorillas, bonobos and chimpanzees; **Hominidae** – humans).
- usually larger than monkeys.
- no tail, shorter trunk than monkeys.
- more complex brain and behaviour than monkeys.
- increased infant dependency.

Interestingly, chimpanzees, bonobos (pygmy chimpanzees) and humans share more genetic similarity than do zebras and horses, or goats and sheep. On this basis it would be appropriate to group humans and chimpanzees within the same family and perhaps the same genus (*Homo*). Humans have 46 (i.e. 23 pairs of) chromosomes, while chimpanzees have 48 (i.e. 24 pairs of). The banding pattern of human chromosome 2 corresponds to those of two much smaller chimpanzee chromosomes (chromosomes 12 and 13). This finding has led to speculation that in an ancestral hominin (human), these two chromosomes fused to produce what became human chromosome 2.

Primate chromosomes, proteins and DNA

Relationships between primates may be revealed by analysis of biochemical and cytogenetic features. These include:

- Karyotyping – the analysis of chromosome shape, size, number and banding patterns.
- Amino acid sequencing – e.g. of blood proteins such as hemoglobin. The more distantly related the primate, the more amino acid substitutions in a given protein.
- DNA hybridisation – testing for differences and similarities between DNA sequences from different primates. Evolutionary similarities/differences are calculated from the number of mismatched base pairs along a hybrid DNA sequence from two primates.
- DNA sequencing – involves determining directly the sequence of nucleotides along a strand of DNA. This data is already available for humans as part of the Human Genome Project, but is not yet available for most primates.