Archaeology 305: Human Variation and Adaptation (Winter 2005)

**Professor:** Warren Wilson  
**Tel.:** 220-2665  
**Office:** ES 852  
**Office hours:** Weds. 2:00-3:30, Thurs. 1:30-3:00, and by appointment

**Lecture:** TR 11:00—12:15, SA 104  
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**Course Description**

In *Natural History*, Roman scientific writer Pliny the Elder remarked that, although human countenance is made up of only “ten parts or a little more,” people were so fashioned that “among the many thousands no two exist who cannot be distinguished.” How are we to explain this rich multiplicity of human physical forms? The goal of this course is to introduce you to the scientific study of human variability. We will begin with an overview of the scientific method and the anthropological approach to the study of human diversity. We will then cover the biological bases of human variation in discussions of genes in human populations, the heritability of traits, and population genetics. In the latter part of the course we will look at human variation as the outcome of adaptation to a variety of environmental factors. This course should help you to understand the biology underlying the variation of human physical and psychic forms and to sort fact from fiction in the contentious and clouded debates over human variation.

**General Instruction**

**Lecture:** In order to meet the goals of the course you have to come regularly to class and **ON TIME**. Be prepared by reading what is assigned for the day. You are responsible for lecture material and any announcements concerning changes in schedule, etc. Please note that lectures are not a summary of the material presented in the text and that, on the balance, exam questions will be drawn from material emphasized in lecture.

**Prerequisites:** While I will briefly cover molecular genetics and the of inheritance of simple (Mendelian) traits, you should have a basic understanding of these topics prior to taking this course. If you are concerned about this, please see or contact me during the first week of classes.

**Reading:** (both of these books may be purchased from the Univ. Calgary Book Store)  
Wilson (editor) ARKY 305 Reading Packet

Several readings will be placed on reserve in both the MacKimmie Library. In addition, there are several recommended readings. The recommended readings are not required, they are provided to enhance your knowledge of the subject in question. Keep in mind that you are not finished with the reading assignment until you thoroughly understand it. This will sometimes require you to read an assignment more than once. An effective way of ensuring comprehension is to read the assignment then go back through it and summarize its main points in your notebook.
Evaluation: You will be evaluated based on your performance on two exams (multiple choice and short answer) and take-home, short-answer questions assigned during the semester. The first exam is a mid-term exam which will be held on February 17. The second exam will be a comprehensive final scheduled by the Registrar. If you miss the mid-term exam, a single makeup examination will be given on the evening of April 14. This will be provided only for those who miss the exam due death in the family, illness, or other extremely debilitating circumstance. Prior to each exam I will hand out a list of key terms and concepts that will be covered on the exams. Do not define a key term in isolation; rather, define and understand it in relation to the other key terms within the context of the course.

Your final grade will be calculated as follows:
- Exam #1: Mid-term (March 2) 30%
- Exam #2: Comprehensive Final (Registrar Scheduled) 40%
- Short Answer Assignments (Questions on Readings) 30%

Mark distribution:
- A+ ___ >95%
- A___ 94—90%
- A-____ 89—85%
- B+____ 84—81%
- B___ 80—78%
- B-____ 77—73%
- C+____ 72—66%
- C___ 65—61%
- C-____ 60—56%
- D+____ 55—51%
- D___ 50%
- F____<50%

Note: The A+ grade is used to indicate outstanding performance in a subject area, but does not have a higher grade point average than an A grade (4.0).

Disabilities: If you have any diagnosed or suspected physical or learning disability which may require my awareness and special effort on my part to facilitate your learning the material or taking exams in this course, please contact the Disability Resource Center (MC 293, 220-8237) to obtain the appropriate documents and assistance.

E-mail: Students are encouraged to use the lectures and office hours to ask questions. For after-hours questions, the use of email is acceptable. Please write ‘ARKY 305’ in the ‘Subject’ portion of the email. The instructor and TA receive numerous e-mails every day. By clearly identifying the subject of your email, you will help us reply more efficiently to your emails. Keep in mind that the use of proper grammar in your message will render your question easier for us to understand. Note that if the instructor or TAs think that your question and related answer is of general interest, they may decide to post them on the course Blackboard space (your name will not appear).

Office Hours: I enjoy visitors during my office hours and am happy to schedule additional times as necessary. These hours are yours and I encourage you to take advantage of them, whether you are having difficulty with some aspect of the course, or if you would like to discuss in greater detail something that was touched on in class.
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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>Jan. 11</td>
<td>Introduction: anthropology &amp; science</td>
<td>hate crimes reading (on blackboard)</td>
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<tr>
<td>Jan. 13</td>
<td>Anthropological approaches to human variation</td>
<td>Marks; Ehrlich &amp; Holm</td>
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<td>Jan. 18</td>
<td>Biological basis of variation: genes &amp; mutation</td>
<td>Cummings</td>
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<td>Jan. 20</td>
<td>Inheritance of simple traits: exceptions to Mendel’s laws</td>
<td>Lewis*</td>
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<td>Jan. 25</td>
<td>Video on Huntington’s Chorea</td>
<td>Rennie; Goodman; consent form</td>
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<td>Jan. 27</td>
<td>Complex traits</td>
<td>Lewis</td>
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<td>Feb. 1</td>
<td>Video on Complex Traits (&quot;Who are you?&quot;)</td>
<td>Jones</td>
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<td>Feb. 3</td>
<td>Complex traits: IQ &amp; intelligence</td>
<td>Lewontin</td>
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<td>Feb. 8</td>
<td>Sex &amp; Gender: biology of sex</td>
<td>Lewis*</td>
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<td>Feb. 10</td>
<td>Sex &amp; Gender: biocultural etiology of gender</td>
<td>Fausto-Sterling and Sapolsky</td>
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<td>Feb. 15</td>
<td>Human Ecology: adaptation, research methods</td>
<td>K &amp; B: Ch. 6</td>
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<td>Feb. 17</td>
<td>MID-TERM EXAM</td>
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<td>Feb. 22 &amp; 24</td>
<td>Reading Break (no classes)</td>
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<td>Mar. 1</td>
<td>Evolution: Mechanisms</td>
<td>K &amp; B: Ch. 1</td>
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<td>Mar. 3</td>
<td>Adaptation to solar stress: skin colour</td>
<td>Loomis</td>
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<td>Mar. 8</td>
<td>Adaptation to thermal stress: general adaptations &amp; heat</td>
<td>K &amp; B Pp. 131—149</td>
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<td>Mar. 10</td>
<td>Adaptation to thermal stress: heat and cold</td>
<td>K &amp; B Pp. 149—161</td>
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<td>Mar. 15</td>
<td>Adaptation to malnutrition: requirements</td>
<td>K &amp; B Pp. 186-202</td>
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<td>Mar. 17</td>
<td>Adaptation to malnutrition: undernutrition</td>
<td>None</td>
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<td>Mar. 22</td>
<td>Adaptation to thermal and dietary stress: video on Inuit</td>
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<td>Mar. 29</td>
<td>Population Ecology</td>
<td>K &amp; B: Ch. 5</td>
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<td>Mar. 31</td>
<td>Human Adaptation to Hypoxia</td>
<td>K &amp; B Pp. 202-204</td>
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<td>Apr. 5</td>
<td>Adaptation to high altitude: Judy Sterner speaks</td>
<td>K &amp; B Pp. 162-173</td>
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<td>Apr. 7</td>
<td>Disease stress</td>
<td>K &amp; B: Ch. 4</td>
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<td>Apr. 12</td>
<td>Human Adaptation to Disease: Ebola video</td>
<td>Background on ebola³</td>
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<td>Apr. 14</td>
<td>Human Adaptation to Disease: Ebola video</td>
<td>Kolata</td>
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<td>Apr. ?</td>
<td>REGISTRAR SCHEDULED FINAL EXAM</td>
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1 Note, the schedule of topics may change, but the exam dates will not.
2 Those readings labeled with an "*" can be found on reserve at MacKimmie Library. K & B = Kormondy & Brown’s *Fundamentals of Human Ecology*.
3 For a detailed bibliography of the readings, see page 4 of this syllabus.

Readings from the Reading Packet and Reserve

Jan 15:

Jan 20:
- For genetics review, if necessary: Molnar, Stephen 1998. *Human Variation*. Prentice-Hall, New Jersey. Pp. 34-71. *This paper is not in the reading packet, but is on reserve in MacKimmie Library and in the Archaeology Library (ES 810)*

Jan 22: (The papers for today are not in the reading packet, but are on reserve in MacKimmie Library)

Jan 27:
- Sample Informed Consent Form for the Huntington’s Disease Direct Genetic Test, from http://www.hdfoundation.org/testread/hdsatext.htm, 6 January 2001

Jan 29:

Feb 3:

Feb 5:

Feb 10: (This paper is not in the reading packet, but is on reserve in MacKimmie Library)

Feb 12:

Mar 4:

Mar 25:

Apr 8: (The papers for today are not in the reading packet, but can be found on the web.)

Apr 15:
Scientists’ tools for skeptical thinking include the following:

1. **Spin more than one hypothesis.** If there’s something to be explained, think of all the different ways in which it *could* be explained. Then think of tests by which you might systematically disprove each of the alternatives. The reliance upon carefully designed and controlled experiments is key (we will not learn much from mere contemplation). What survives, the hypothesis that resists disproof in this selection among “multiple working hypotheses,” has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.

2. **Always ask whether the hypothesis proposed can be, at least in principle, falsified.** Propositions that are untestable, unfalsifiable are not worth much. Consider the grand idea that the Universe and everything in it is just an elementary particle--an electron say--in a much bigger Cosmos. But if we can never acquire information from outside our Universe, is not the idea incapable of disproof? You must be able to check assertions out. Inveterate skeptics must be given the chance to follow your reasoning, to duplicate your experiments and see if they get the same result.

3. **Try not to get overly attached to a hypothesis just because it’s yours.** It’s only a way station in the pursuit of knowledge. Ask yourself why you like the idea. Compare it fairly with the alternatives. See if you can find reasons for rejecting it. If you don’t, others will. In science, once you generate a hypothesis your goal is to see if you can reject it, not to support it.. If you can’t reject it with your research, then it has some support.

4. **Quantify.** If whatever it is you’re explaining has some measure, some numerical quantity attached to it, you’ll be much better able to compare your results with those of others and to discriminate among competing hypotheses. What is vague and qualitative is open to many explanations. Of course there are truths to be sought in the many qualitative issues we are obliged to confront, but finding them is more challenging.

5. If there is a chain of argument, **every link in the chain must work**--not just most of them.

6. **Wherever possible there must be independent confirmation of the facts.**

7. **Encourage substantive debate** on the evidence by knowledgeable proponents of all points of view.

8. **Arguments from authority carry little weight.** Science is one of the only ways of knowing about the world that encourages its practitioners to disprove the work of authorities and gives its highest awards to those who do so.

9. **Occam’s Razor.** This convenient rule-of-thumb urges us when faced with two hypotheses that explain the data *equally well* to choose the simpler.

Throughout this semester we will use these tools. When you see conclusions presented by me or in the readings, ask yourself: “how else might we explain the phenomenon in question?” and “how good are the data that support the present conclusion?” That is, you should seek to determine which conclusions are based on reasoned argument and which are fraudulent. I suspect you will find that some conclusions made concerning human variation are not based on good science.