VERTEBRATE BIOLOGY

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The Website
Biology 2471b has an Owl Sakai website where course material, grades, and other information are presented.

Logistics

Students will have access to posted materials on line (Owl Sakai). For lectures, there are 12 units, each with a unit outline, a pdf of the lecture notes, self-test questions, and .mov files of voice over powerpoint lectures. For laboratories, there are 12 units together with one final lab devoted to project presentation, each of the lab units has an outline of the lab, plus lab material posted to Owl Sakai.

Students must participate in the weekly meeting of their laboratory group (in Blackboard Collaborate - BbC, a virtual classroom). We will take attendance, deducting marks for missed sessions, or for late arrivals to or early departures from the meetings.

As part of the lecture component, students are invited to participate in a weekly BbC class discussion. We will use these scheduled sessions for group presentations about project work.

Essays and answers to exam questions must be submitted as .doc or .docx files to bfenton@uwo.ca and to Turnitin.com. Please name the files: yoursurnameyourinitialassignment.doc(x). In other words Fentonbessay2.doc. Submit one file per essay (or exam).
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### 1.0 The Course at a Glance

Purpose of this course: to introduce the diversity and variety of vertebrate animals and illustrate their evolutionary history.

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<th>student skills</th>
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<tr>
<td>lectures (on line)</td>
<td>present broad overview illustrated by specific examples;</td>
<td>attention, recording information, assemble broad picture</td>
</tr>
<tr>
<td>text</td>
<td>augment lectures</td>
<td>read and compare</td>
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<tr>
<td>laboratory (on line)</td>
<td>practical illustration observation, of animals and diversity project design</td>
<td>writing &amp; oral communication observation, collaboration, small group activity working in groups</td>
</tr>
<tr>
<td>essays</td>
<td>introduce animals and zoologists</td>
<td>writing, use of library identification through intuitive and/or deductive reasoning</td>
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### GRADING

We look for:

| essays                  | accuracy, effective communication, follow directions                           |
| (20% of final grade)    | 

requires use of Turnitin.com via Course Owl Sakai link

| laboratory              | interest, enthusiasm, preparedness, attitude, organization, team work, critical thinking, follow directions, original approaches and submissions |
| (40% of final grade)    | 

| theory exams            | specific knowledge about key concepts, developments and organisms a grasp of the broader picture |
| (40% of final grade)    | 

Our responsibility .... to present the information and try to answer questions

Your responsibility .... to gather and review the information and ask questions

Use the Course WebCT Website to access Turnitin link, obtain relevant notes, handouts and reference materials.
2.0 **Important Dates in the Course**

24 January 2013, essay 1 is due by 17:00 h EDT = 5:00 pm  
6 February 2013, essay 2 is due by 17:00 h EDT = 5:00 pm  
8 February 2013, mid term examination is posted at 10:00 h = 10:00 am  
12 April 2013, final examination is posted at 10:00 h = 10:00 am. It is due at 10:00 pm  
(22:00 h) on 13 April 2013.

3.0 **Introduction**

The purpose of this course is to introduce you to the diversity and variety of vertebrate animals and illustrate their evolutionary history. Included is information about the lifestyles of animals as well as the relationships between structure and function. We will consider both living and fossil forms and survey the basic approaches to living across vertebrates. General topics for consideration include phylogeny and development as well as the systems involved in support, locomotion, feeding, digestion, circulation, communication, osmoregulation, gaseous exchange, reproduction and sensory operations (see tentative course schedule).

Six themes recur throughout the course: 1) parallel and convergent evolution; 2) adaptive radiation; 3) analogous and homologous structures; 4) cost: benefit ratios; 5) connectedness between systems; 6) zoogeography.

4.0 **Goals**

The course has 10 main goals:
1) provide students with factual and conceptual information about vertebrates, setting the stage for a better appreciation of the evolution and adaptive radiation;  
2) allow students to practice their skills of observation, interpretation and note-taking;  
3) provide students with the opportunity to hone their skills of observation to allow them to better appreciate the inner and outer workings of animals;  
4) expose students to the wealth of information available in scientific journals that deal with zoology, while giving them opportunities to use various tools in their quest for specific information;  
5) require students to practice writing about animals;  
6) require team work  
7) require spoken presentations.  
8) provide a stimulus for planning and gaining control of your course work.  
9) provide an opportunity to practice your organizational skills  
10) expect students to follow directions about the: a) correct use and presentation of scientific names (and other terms); b) about citing material, whether in the text or in the Literature Cited (at the end of essays or laboratory reports); and c) the presentation of course material.
5.0 Tentative Course Schedule

<table>
<thead>
<tr>
<th>Week of January</th>
<th>Unit</th>
<th>laboratories - week #</th>
</tr>
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<tr>
<td>7</td>
<td>Setting The Stage</td>
<td>1. Introduction to On-Line Labs</td>
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<tr>
<td>14</td>
<td>Vampires &amp; vampires</td>
<td>2. Diversity of Fishes; Case Study 1</td>
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<td>21</td>
<td>support</td>
<td>3. Diversity of Amphibians; Case Study 1</td>
</tr>
<tr>
<td>28</td>
<td>movement</td>
<td>4. Diversity of Reptiles; Case Study 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>24 January Essay 1 due by 17:00 h</strong></td>
</tr>
</tbody>
</table>

Week of February

| 4              | feeding | 5. Diversity of Birds; Case Study 2 |
|                |         | **6 February Essay 2 due by 17:00 h** |
| 8              | February Mid term exam due by 17:00 h |
| 11             | circulation | 6. Diversity of Mammals Case Study 3 |
| 18             | ski week | 7. Introduction to bones; Case study 3 |
| 25             | gaseous exchange | 8. Structure and Function; Case Study 4 |

Week of March

| 4              | excretion | 9. Structure and Function- Skulls; Case Study 4 |
| 11             | reproduction & development | 10. Structure and Function - Teeth |
| 18             | nervous system | 11. Structure and Function - Limbs |
| 25             | feathers & flight | 12. Structure and Function assignment due (written due 3 days after presentation will give time to provide feedback) |

Week of April

| 1              | review | 12 April 2012 at 10:00 h ... final exam posted; it is due at 10:00 pm (22:00 h on 13 April 2013). |

6. The Text Books

Students taking the course are strongly encouraged to read the two assigned texts, namely

Students may also benefit from consulting appropriate reference texts about vertebrate biology, for example:
7.0 Weighting of Grades

a) Essays = 20% of final grade
b) Examinations [Mid term (15%) and final (25%)] = 40% of final grade
c) Laboratories (sessions, participation, project presentation and report) = 40% of final grade.
   Case Study - Written Answers 4% x 4 = 16%
   Written Project Report = 10%
   Project Presentation = 5%
   Participation/Attendance = 5%

To achieve a passing grade in the course, students must pass both examination and laboratory components of the course.

8.0 Suggestions about writing

1. Pick a story line.
   How?
   If it is an essay the two scientific papers about which you will write provide the story line.
   If it is an exam, the question provides you with the story line.

2. Find material.
   How?
   If it is an essay, find two scientific papers on the topic, whether about a species or written by a biologist.
   If it is an exam, the course material provides you with material from which to choose.

3. Then write.
   *Write clearly.
   *Choose your words with care. Say what you mean, mean what you say.
   *Use the active voice (see below). Make direct statements.
   *Avoid repetition.
   *Focus on your story line (hence the restriction to writing each essay about two scientific papers).
   *Consult the book "the elements of style" by William Strunk Jr. and E.B. White (see also below) about correct use of words.

4. Then let the first draft sit for a day.

5. Now go back and read the whole draft out loud to yourself. Be sure to speak each word. As you read check your spelling and grammar. This is a perfect opportunity to get a classmate to read and comment on your draft and you reciprocate by doing the same for them. Please note that reading over and commenting on an essay written by a classmate does not constitute plagiarism. This interaction is not appropriate for answers to exams.

6. Assess the clarity of your writing by determining the Gunning Fog Index (GFI) of what you have written. Get your GFI calculated at http://gunning-fog-index.com/. To some people an
"ideal" GFI is 7 or 8, and anything > 12 is considered very hard to read. Plays by William Shakespeare, books by Mark Twain, and The Bible have GFIs of 6. The sample essay has a Gunning Fog Index of >10 --- I should have done better than that. Try to make your GFI < 10. You must provide a GFI for each of your essays and exam essays.

You will see that using short sentences and "simple" words is the way to a low GFI. If you have time, experiment with your writing. You can read more about the GFI at


You can calculate the GFI by the following steps.

Step 1. sample passage of at least 100 words
Step 2. divide total number of words in the sample by the number of sentences ... to get average sentence length (ASL)
Step 3. count number of words of ≥ 3 syllables that are NOT i) proper nouns, ii) combinations of easy words or hyphenated words; or iii) two syllable verbs made into three by adding -es or -ed to the ends
Step 4. divide the number from step 3 by the number of words in the sample to get PHW, percent hard words
Step 5. add ASL (step 2) and PHW (step 4) and multiply by 0.4 (fog index = 0.4*(ASL+PHW)).

7. Now submit it -- do follow the directions about format and submission (to me and to Turnitin.com).

Here are some of my favourite examples out of Strunk and White.

From page 18 (Active voice)
"4. Use the active voice. The active voice is usually more direct and vigorous than the passive:

"I shall always remember my first visit to Boston." This is much better than "My first visit to Boston will always be remembered by me." The latter sentence is less direct, less bold, and less concise. If the writer tries to make it more concise by omitting "by me", my first visit to Boston will always be remembered, it becomes less definite: is it the writer or some person undisclosed or the world at large that will always remember the visit?

This rule does not, of course, mean that the writer should entirely discard the passive voice, which is frequently convenient and sometimes necessary.

The habitual use of the active voice, however, makes for forcible writing. This is true not only in the narrative concerned principally with action, but in writing of any kind. Many a tame sentence of description or exposition can be made lively and emphatic by substituting a transitive in the active voice for some such perfunctory expression.

There were a great number of dead leaves lying on the ground.

Dead leaves covered the ground

At dawn the crowing of a rooster could be heard.

The cock's crow came with dawn.
The reason he left college was that his health became impaired. Failing health compelled him to leave college.

It was not long before he was very sorry that he had said what he had. He soon repented his words.

Note, in the examples above, that when a sentence is made stronger, it usually becomes shorter. Thus, brevity is a by-product of vigor."

*There is no reason to use the passive voice in any of your writing in this course. None.*

Use the correct word
From page 53.

**Nauseous.** **Nauseated.** The first means "sickening to contemplate”, the latter means that you feel as though you are going to be sick to your stomach.

**9.0 The Essays**

The ESSAYS are intended to give you some in depth experience with particular animals, and with zoologists, while honing your skills at using the library to find information in scientific journals, and developing your writing skills. See the posted "suggestions about writing" for further information.

The essay part of the course requires at least 2 submissions from each student, essays 1 and 2. **Essays are due as follows:**

- **Essay 1 due on 24 January 2013 by 17:00 h (= 5:00 pm)**
- **Essay 2 due on 6 February 2013 by 17:00 h (= 5:00 pm)**

Essays must be submitted in electronically to M.B. Fenton ([bfenton@uwo.ca](mailto:bfenton@uwo.ca)) as Word files, and electronically to Turnitin.com via Course Owl Sakai.

Essays have three purposes: a) to give students practise in reading original scientific literature; b) to improve their facility in using library resources; and c) to give students practise in writing about science. Each essay must be 300±10 words (you must provide a word count that does not include citations). Your grade in the essay part of the course will be based on your two highest essay grades. The essay is about a species of vertebrate, the second about a zoologist.

Assess the clarity of your writing by determining the Gunning Fog Index (GFI) of what you have written. Get your GFI calculated at [http://gunning-fog-index.com/](http://gunning-fog-index.com/). To some people an "ideal" GFI is 7 or 8, and anything > 12 is considered very hard to read. Plays by William Shakespeare, books by Mark Twain, and The Bible have GFIs of 6. The sample essay has a Gunning Fog Index of >10 --- I should have done better than that. **Try to make your GFI < 10. You must provide a GFI for each of your essays and exam essays.**

Below is a sample essay reporting information about a species. The sample indices the
format of the essay (double spaced) and properly cited sources of information. Marks will be
deducted for the grades assigned to essays not submitted in this format.

When grading essays I expect to find a story about the animal (or zoologist) that presents
general information (what the animal is, how it fits into the classification of vertebrates, about its
lifestyle, and where it occurs in the world) or, for the zoologist, the current business address.
Most of the essay (~250 words), however, should present details drawn from the cited scientific
paper (= paper published in a refereed journal; not from a website, a book or an
encyclopaedia). Never from Wikipedia ... never. What did the study reported in the paper tell us
about the species/or what did the zoologist discover? Similarly, for the zoologist, information
about her/his most recent papers. In presenting information from scientific papers, develop and
follow a story line making sure that you answer the following questions about the papers you
cite: a) what was the purpose of the study? b) what did the study reveal? The sources of general
and specific information should be cited as in the sample essay.

When writing, use the active voice and present information in a clear and objective
fashion, being careful to give credit where credit is due (= cite your sources). Imagine that your
audience is students at your level of experience and education (as opposed to children, the
"general public" or specialists in the area you select). Spelling and grammar matter!

Sample Essay

Brock Fenton
Number xxy

Finney’s Bat

Icarus bat is an exceptionally well preserved fossil bat from the Eocene. Recovered from
the Green River shales in Wyoming, this fossil demonstrated that fully developed bats were
present by 50 million years ago. Icarus bat was preserved in enough detail that Jepsen was able
to examine the shoulder morphology and confirm that the animal could fly. Icarus bata differed
from most living bats in that it had a small claw on the second finger. Simmons et al. described
Finney’s bat from the same deposits where I. index had been found. Although the two bats were
about the same size, Finney’s bat had a small claw on the end of each finger. The details of the
shoulder structure of Finney’s bat confirm that it, too, could fly. In the interim, according to
Simmons and Geisler, other well preserved bats from Eocene deposits have been described from
other parts of the world providing a glimpse of the bat fauna of the Eocene.

Predictably perhaps, well preserved fossil animals, including bats, are often placed in their own families. Many of the usual biological information, such as patterns and timing of reproduction, are not available for fossil species. Some of the Eocene bats from the Messel deposits in Germany are so well preserved that it is possible to determine what insects they ate. Although it is clear that all of the well preserved Eocene bats could fly, there are different views about whether or not they could echolocate. Simmons et al. used the structure of the malleus, the relative size of the cochlea, and the details of the stylohyal bone to argue that while Finney’s bat did not echolocate, the other Eocene bats did. The Simmons et al.’s interpretation suggests that early bats could fly before they could echolocate. (297 words). GFI 10.9.

Supporting Material

Scientific names

Icarus bat = Icaronycteris index

Finney’s bat = Onychonycteris finneyi

Citations and Abstracts


Abstract. A fossil skeleton of an early Eocene bat, the oldest known flying mammal, was found in southwest Wyoming. The bat is assigned to the new species Icaronycteris index of the suborder Microchiroptera. It was apparently of a young male whose body was buried in varved marls of the Green River Formation, on the bottom of Fossil Lake, about 50 million years ago. The bones, some as slender as a human hair, show a few "primitive" characteristics such as a clawed index finger and a complete phalangeal formula, but the bat was fully developed
-an anatomically precocious contemporary of the dog-sized polydactylous horse.


ABSTRACT
The Eocene fossil record of bats (Chiroptera) includes four genera known from relatively complete skeletons: *Icaronycteris*, *Archaeonycteris*, *Hassianycteris*, and *Palaeochiropteryx*. Phylogenetic relationships of these taxa to each other and to extant lineages of bats were investigated in a parsimony analysis of 195 morphological characters, 12 rDNA restriction site characters, and one character based on the number of R-1 tandem repeats in the mtDNA d-loop region. Results indicate that *Icaronycteris*, *Archaeonycteris*, *Hassianycteris*, and *Palaeochiropteryx* represent a series of consecutive sister-taxa to extant microchiropteran bats. This conclusion stands in contrast to previous suggestions that these fossil forms represent either a primitive grade ancestral to both Megachiroptera and Microchiroptera (e.g., Eochiroptera) or a separate clade within Microchiroptera (e.g., Palaeochiropterygoidea). A new higher-level classification is proposed to better reflect hypothesized relationships among Eocene fossil bats and extant taxa. Critical features of this classification include restriction of Microchiroptera to the smallest clade that includes all extant bats that use sophisticated echolocation (Emballonuridae 1 Yinochiroptera 1 Yangochiroptera), and formal recognition of two more inclusive clades that encompass Microchiroptera plus the four fossil genera. Comparisons of results of separate phylogenetic analyses including and subsequently excluding the fossil taxa indicate that inclusion of the fossils changes the results in two ways: (1) altering perceived relationships among extant forms at a few poorly supported nodes; and (2) reducing perceived support for some nodes near the base of the tree. Inclusion of the fossils affects some character polarities (hence slightly changing tree topology), and also changes the levels at which transformations appear to apply (hence altering perceived support for some clades). Results of an additional phylogenetic analysis in which soft-tissue and molecular characters were excluded from consideration indicate that these characters are critical for determination of relationships among extant lineages. Our phylogeny provides a basis for evaluating previous hypotheses on the evolution of flight,
echolocation, and foraging strategies. We propose that flight evolved before echolocation, and that the first bats used vision for orientation in their arboreal/aerial environment. The evolution of flight was followed by the origin of low-duty-cycle laryngeal echolocation in early members of the microchiropteran lineage. This system was most likely simple at first, permitting orientation and obstacle detection but not detection or tracking of airborne prey. Owing to the mechanical coupling of ventilation and flight, the energy costs of echolocation to flying bats were relatively low. In contrast, the benefits of aerial insectivory were substantial, and a more sophisticated low-duty-cycle echolocation system capable of detecting, tracking, and assessing airborne prey subsequently evolved rapidly. The need for an increasingly derived auditory system, together with limits on body size imposed by the mechanics of flight, echolocation, and prey capture, may have resulted in reduction and simplification of the visual system as echolocation became increasingly important. Our analysis confirms previous suggestions that Icaronycteris, Archaeonycteris, Hassianycteris, and Palaeochiropteryx used echolocation. Foraging strategies of these forms were reconstructed based on postcranial osteology and wing form, cochlear size, and stomach contents. In the context of our phylogeny, we suggest that foraging behavior in the microchiropteran lineage evolved in a series of steps: (1) gleaning food objects during short flights from a perch using vision for orientation and obstacle detection; prey detection by passive means, including vision and/or listening for prey-generated sounds (no known examples in fossil record); (2) gleaning stationary prey from a perch using echolocation and vision for orientation and obstacle detection; prey detection by passive means (Icaronycteris, Archaeonycteris); (3) perch hunting for both stationary and flying prey using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation for flying prey and passive means for stationary prey (Icaronycteris and/or Archaeonycteris may have done this at times); (4) combined perch hunting and continuous aerial hawking using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation for flying prey and passive means for stationary prey; calcar-supported uropatagium used for prey capture (common ancestor of Hassianycteris and Palaeochiropteryx; retained in Palaeochiropteryx); (5) exclusive reliance on continuous aerial hawking using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation (Hassianycteris; common ancestor of Microchiroptera). The transition to using echolocation to detect and track prey would have been difficult in cluttered environments owing to interference produced by
multiple returning echoes. We therefore propose that this transition occurred in bats that foraged in forest gaps and along the edges of lakes and rivers in situations where potential perch sites were adjacent to relatively clutter-free open spaces. Aerial hawking using echolocation to detect, track, and evaluate prey was apparently the primitive foraging strategy for Microchiroptera. This implies that gleaning, passive prey detection, and perch hunting among extant microchiropterans are secondarily derived specializations rather than retentions of primitive habits. Each of these habits has apparently evolved multiple times.

The evolution of continuous aerial hawking may have been the “key innovation” responsible for the burst of diversification in microchiropteran bats that occurred during the Eocene. Fossils referable to six major extant lineages are known from Middle–Late Eocene deposits, and reconstruction of ghost lineages leads to the conclusion that at least seven more extant lineages were minimally present by the end of the Eocene.


Bats (Chiroptera) represent one of the largest and most diverse radiations of mammals, accounting for one-fifth of extant species1. Although recent studies unambiguously support bat monophyly2–4 and consensus is rapidly emerging about evolutionary relationships among extant lineages5–8, the fossil record of bats extends over 50 million years, and early evolution of the group remains poorly understood5,7–9. Here we describe a new bat from the Early Eocene Green River Formation of Wyoming, USA, with features that are more primitive than seen in any previously known bat. The evolutionary pathways that led to flapping flight and echolocation in bats have been in dispute7–18, and until now fossils have been of limited use in documenting transitions involved in this marked change in lifestyle. Phylogenetically informed comparisons of the new taxon with other bats and non-flying mammals reveal that critical morphological and functional changes evolved incrementally. Forelimb anatomy indicates that the new bat was capable of powered flight like other Eocene bats, but ear morphology suggests that it lacked their echolocation abilities, supporting a ‘flight first’ hypothesis for chiropteran evolution. The shape of the wings suggests that an undulating gliding–fluttering flight style may be primitive for bats, and the presence of a long calcar indicates that a broad tail membrane evolved early in Chiroptera, probably functioning as an additional airfoil rather than as a preycapture device. Limb proportions and retention of claws on all digits indicate that the new bat may have been an agile climber that employed quadrupedal locomotion and under-branch hanging behaviour.

END OF ESSAY SUBMISSION
Heed the Following:

Each student has two individual essay assignments (posted on course website). No two students have the same assignments. Be sure to write about the animal or zoologist assigned to you! Late essays, by definition any not submitted on time (= in class on due date), will not be marked but receive a grade of 0.

**Turnitin.com**

**Plagiarism is a major scholastic offense** (see Scholastic Offense Policy in the Western Academic Calendar) with penalties up to and including expulsion. Students must write their assignments in their own words. Whenever an idea, or a passage, is taken from another author, the debt must be acknowledged by using proper referencing such as footnotes or citations. Quotation marks should be used whenever a phrase, sentence or passage is copied verbatim; rewording or paraphrasing another’s idea requires a citation only. The minimum penalty for an assignment that contains plagiarized material will be a grade of zero. Plagiarism checking software will be used on all essay submissions. Please read the information about plagiarism on the turnitin.com website.

I will use Turnitin.com to identify incidences of plagiarism. Be sure to submit only the body of your essay to Turnitin.com as citations would automatically appear as material copied from elsewhere. Check the Turnitin.com report for your essay (or exam answer). A 10% overlap is not alarming, but anything over that immediately suggests plagiarism. Note that not submitting citations or abstracts to Turnitin.com will immediately reduce the overlap in the report.

On the Biology 2471b Owl Sakai site there will be connections to Turnitin.com for submitting the text of your essay. Do not submit the citations as they will show up as copied from elsewhere.

**Biology 2471b**

**ESSAY CHECKLIST**

__ double-spaced  
__ word count is provided (does not exceed 310 words)  
__ up to three citations  
__ name and student number on each page  
__ no direct quotations  
__ Supporting material is correct  
  a) Scientific names and common names as per course outline  
  b) Full citations (all authors, journal name written out, as per course outline)  
  c) Abstracts (copy and paste from electronic document)  
__ no footnotes
submit an electronic version of each essay to Turnitin.com
files in .doc or .docx format
did I include the GFI?
did I follow the guidelines?

10. Finding Information

Whether it is for the essays, laboratory projects or any other use, finding the most relevant information can be a challenge. Surely, search engines such as Google® make it relatively easy to get started, but fine tuning your search to maximize the returns requires familiarity with the available tools, and practise. To make it easier for you to become accustomed to searching for information, Ms Linda Dunn from the Library has agreed to organize optional workshops. Please use the sign-up sheets on the Owl Sakai site to register for these sessions.

There will be 6 information sessions all held in the **Kellogg Room, Taylor Library:**

- Thursday 10 Jan 10:30 to 11:30 am
- Thursday 10 Jan 11:30 to 12:30 am
- Friday 11 Jan 10:30 to 11:30 am
- Monday 14 Jan 11:30 am to 12:30 pm
- Tuesday 15 Jan 12:30 to 1:30 pm
- Tuesday 15 Jan 1:30 to 2:30 pm

The library research web guide is linked to the Browse by Program page off of the Western Libraries web page. It's accessed by clicking on Browse By Program --> Life Sciences- --> Biology and see left navigation side bar.

Material covered during the information sessions: Linda Dunn will make sure students who attend walk out at the end of the session with at least 3 viable primary research articles from peer reviewed journals. Students will be introduced to and complete search strategies in the following resources: Zoology and Biology web resource pages, Integrated taxonomic information system, MSW, Mammalian Species (use to get to primary cited references & do a cited reference search on them in WOS), BIOSIS, Zoological Record (note: peer review sort of articles, access to chapters and books on their species & and export to Refworks), Library Catalogue (keyword search for species name or genus if former is too specific which retrieves chapters on topic in handbooks), Refworks, and Ulrich’s (to determine whether a journal is refereed).

There is a limit of 22 persons per session in the Kellogg Rm. Please use the sign-up sheet in Owl Sakai to register for a session.

11.0 Examinations

There will be two examinations in this course. Each will challenge you to write up to 400 words on topics or questions relevant to vertebrate biology. When using material not covered in the lectures and laboratories, students must cite original sources (= papers in refereed journals).

Both examinations are open book/take home. For each examination, the question sheet will be posted on the Owl Sakai site at the time and on the date specified. For the midterm
examination, students must submit their written answers (in Word format) within 12 h of the
time the question sheet is posted. For both midterm and final examination, students must post
their answers to Turnitin.com.

Examinations give you the opportunity to use the experience, skills and knowledge that
you have acquired in the course. In both examinations, you will be asked to use evidence of your
choosing to address general principles in vertebrate zoology. This means that you will not be
challenged to regurgitate many factual details, rather to use evidence (factual details) you select
in support of general concepts and principles.

While I am happy to review the grading of anyone’s answer to any question on either the
mid term or the final examination (or essay), and correct any mistakes I have made in addition, I
will not negotiate about the grade awarded for any specific answer. To maximize the learning
potential associated with the examinations, students who believe that their grade on the mid term
examination is not an accurate reflection of their knowledge or ability (= are not pleased by their
mid-term grade) can ask, in writing, that the one half of the 15% (7.5% of the final grade) be
moved to their final examination. This would make the final worth 32.5% of the final grade in
the course. Students wishing to exercise this option must make the request in writing (email will
do) within 5 business days of my posting the grades from the mid term examination.

The mid term examination will be posted on Owl Sakai at 10:00 h Eastern Standard
Time (= 10:00 am on 6 February 2013) and answers must be submitted to bfenton@uwo.ca by
22:00 h Eastern Standard Time (= 10:00 pm) on 6 February 2013. The Turnitin.com time
window will close at 22:15 h on 6 Feb 2013.

The final examination will be posted on Owl Sakai at 10:00 h Eastern Standard Time
(= 10:00 am) on 12 April 2013 and answers must be submitted to bfenton@uwo.ca by 22:00
h Eastern Standard Time (= 10:00 pm) on 13 April 2013. Both examinations will ask you to
write 400 word long essays about specific topics. For the final examination, the Turnitin.com
window will close at 22:15 h on 12 April 2013.

The final make-up examination for the course will be held in early May and may differ in format
from the final examination.

Preparing for Exams
Practise … the examination will say “write 400 words about ….” Use them to your advantage.
Remember, the word limits (in exams or essays) are to encourage you to organize your answers
and present the most appropriate example(s).

1) an animal … a species (one animal cannot be more than one species). Get it right … phylum
etc. (if you chose to present this information). In writing about a species, do not present
information about more than one species (e.g., if you were writing about a snake, it is unlikely to
be both venomous and a constrictor).

3) write about the part of the course you found most interesting. Be sure to express your opinion
Laboratories

Laboratories for this course are online. For much of the laboratory portion of this course, students will be working in groups. There are three parts to the laboratory portion of this course:

1) The diversity of vertebrates
2) Group analysis of case studies about topics relevant to vertebrate biology
3) A group project involving data collection, analysis, and presentation

Each week, during their assigned laboratory session, students will meet with their group members and TA via Bbl (which can be accessed through the Owl Sakai) to have an online discussion session. Students are expected to be present for and participate in these sessions as attendance and participation will a significant portion of their grade!

We strongly recommended that students use a microphone and web cam to participate in the lab sessions of this course. This allows for better discussion, which enhances the online learning experience.

During the first lab week, we will introduce you to Blackboard Collaborate and how to be a good, participating student in an online classroom.

The diversity of vertebrates.

Students are expected to have viewed the powerpoint presentations about the topic to be covered (see laboratory schedule) so as to be prepared to ask questions on material about which they are uncertain, and to consider the discussion questions presented alongside the material.

Group analysis of case Studies about topics relevant to vertebrate biology,

Case Studies (four in total)

Every other week, students/groups will be assigned a case study to consider. During the week in which the case study is introduced, background information will be presented highlighting the key terms and ideas. (*With the new changes, the TA will not always be presenting the info). Then, prior to next meeting the following week, students are expected to review the case study in detail and be prepared to answer the associated discussion questions and have a general discussion on the topic. We expect that this discussion will be largely student-led, and the TA will act more as a moderator to facilitate discussion rather than as the primary source of information. Finally, the following week, each group is expected to submit written answers to the case study questions—via email to their TAs—prior to the assignment of the next case study.

A group project involving analysis, and presentation of form and function.

As a group, students will carry out a project involving the collection, presentation, and interpretation of materials. The interpretations will be presented in both in a written report and
an oral presentation delivered via Owl Sakai. Details about the project will be presented during the course.

Allocation of laboratory grades.

In total, the laboratory is worth 40% of your overall grade in this course.

- Case Study - Written Answers 4% x 4 = 16%
- Written Project Report = 10%
- Project presentation = 5%
- Attendance at project presentations = 2% x2
- Participation/Attendance = 5%

**Structure and Function**

The purpose of the project is to give students experience at seeing the details of structures, at assessing them, and then providing an interpretation of form and function. The learning outcome is having students learn how to make sense of biological structures (in this case bones and teeth) while learning some anatomy.

At one level this means examining the pair of specimens assigned and answering the questions: a) what is it?; b) what does it do?; c) from which animal did it come? The challenge in answering these questions is leading your group mates through the process with the specimens – how you got to your interpretation. The actual name of the species of animals does (may) not matter, and interpretation of a specimen may be flawed in the absence of more information. In a sense there is no “right” answer, perhaps even if you have the whole specimen.

We will accomplish this in five laboratory sessions (that occur in the course after a general introduction to vertebrates).

In the first session, the TA will take four different specimens (two pairs) and lead students through the thought processes they used to derive their interpretation. The specimens will be provided in advance, the week before, to give students a chance to familiarize themselves with them. Then the identity of the specimen will be provided/revealed ... and everyone will be asked if that changes their interpretation and/or their conclusions. At the end of the session each student will be given the assignment for the second session.

Skulls will be the theme of the second session. Each student will make a brief (<5 min) presentation to the group, leading them through their answers to the questions about the two specimens. A second student will provide an alternate interpretation of the specimens. By the end of the session the group should have arrived at a consensus about the answers to the questions for each specimen. Again, does knowing the identity of the animal change your interpretation? At the end of the session each student will be given the assignment for the next session ... this time two specimens per student.

Teeth will be the theme in the third session which will consolidate each group’s approach to the challenge of answering the basic questions about specimens. At the end of the session each group will be assigned specimens for the last session.

Bones will be the focus of the fourth session. Again, each student will answer the basic questions about the material. At the end of the session, the specimens for the fifth session will be distributed.

In the fifth session, each group will be challenged to provide an interpretation for the collection of specimens assigned to them. The report will include spoken presentations (each
member of the group participating), and a written submission.

13. Other Important Information

SUBMITTING MATERIAL ON TIME
Material must be submitted on time. In the absence of an appropriate written explanation (e.g., from a medical doctor), late essays or other material will not be accepted and will receive a grade of "0". Discussions and decisions about permission to submit late material must involve Brock Fenton.

ABOUT COLLABORATION
In the laboratories students must work in teams.

We will accept one oral submission per team, so each team member must be identified on the submitted material. Each member of the team will receive the grade awarded to the material.

While we encourage students to establish study groups for the course (more material to follow), overt collaboration is not appropriate on essays or in the examinations. In essays (which are individually assigned) and examinations, the submitted work should be that of the student identified with it (by name and student number).

Penalties – How to Avoid Them
Avoid losing marks for not following directions (★ below) - about essay format, about the presentation of scientific names, about sources and how to cite them correctly.

Guidelines
Please keep the following guidelines in mind as you research and prepare your essays:

★ 1) provide a word count for your essay (yes, "a", "the", "and", etc. count as words). If your essay is longer than 300+10 words, you will lose -2 marks

★ 2) be sure to put scientific names (species, genera) in italics (e.g., Myotis lucifugus). Failure to follow this guideline will cost you 5 marks (out of 10). The accepted abbreviation for a scientific name after you have presented the whole name, is the first letter of the name of the genus capitalized and followed by a period (e.g., M. lucifugus). Never write a scientific name as “the Myotis lucifugus” – a “the” is un-necessary. The names of phyla, orders, and families must not be in italics, but must be capitalized.

★ 3) please cite the sources you use in preparing your essay (e.g., in text Jones) and provide the full bibliographic citations for them at the end of the essay (as outlined in the models presented below). No essay should have more than three citations. Failure to heed these guidelines will cost you -5 marks
up to 5 marks (out of 10).
★ 4) although direct quotations must be specifically referenced
(e.g., Jones 1922, page 2), you should never use them in
an essay (or lab report in this course). Penalty for using
quotations, 5 marks (out of 10).
5) please identify your essay with your name and student number
(in the upper right hand corner of each page).
★ 6) remember to double space your essay. Not heeding this guideline
will cost you 2 marks.
★ 7) be sure to include copies of the abstracts (summaries) of two
of the scientific papers you have cited. Not doing so
will cost you 3 marks.
8) no essay will have more than three citations.
9) each essay is based on two scientific papers
9) the review series, Mammalian Species is not a journal. If you are
not sure about the “journals” you have selected for your essay,
be sure to ask - two sources must be journals (not texts, web sites,
encyclopaedias or reviews).
10) never use Wikipedia as a source
11) be sure to submit your essay text to Turnitin.com. If you do not
12) be sure to calculate the GFI for your submission. If not

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How to Cite Published Works

There is no one accepted format for citing published works. Indeed, journals requiring the
same details of citation are the exception rather than the rule. In this course, we will use the
citation format identified below.

You will be expected to cite published material in essays and laboratory reports. The
purpose of citing published works is twofold. First is communication, making it easy for
someone else to find the work(s) that you cite. Second is giving credit where it is due (to the
author(s) who reported the information). In this course, we will follow one common scientific
mode of citing published works. This model makes it easy for anyone to find the cited material.
Remember there are many styles for citing published works, but please use the one described
below for this course.

In the text of the paper, you can refer to material in a variety of ways. For example, in the
text show author(s) and date as per the following excerpt:

“Frellich and Reich studied forests in the Great Lakes Region. Vegetation plays a role in the
formation of linear dunes (Tsoar and Møller). Bats are mammals that fly and fill a variety of
trophic roles in the tropical ecosystems where they occur (Fenton). Syme et al. showed how
roosts and food supplies can combine to allow bats to survive inclement summer weather.”

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At the end of the paper, present the detailed citations in alphabetical order by surname of first author. Use the following format. Journal papers must be cited as follows (in each situation, the author(s) and initials are provided along with the date of publication, the title, the publisher (for books) or journal with volume number and pagination):


Note the different approaches used to cite single authors, two authors and more than two authors. By the way, “et al.” should be written just like that. It is an abbreviation for the Latin, et alia (literally, ‘and others’). Remember that you cannot change the order of authors on a publication (for example to place the zoologist you are writing about as the first author).

Chapters in books must be cited as follows:

Books must be cited thus:

Internet sources must be cited so that I can enter the cited information and access the site.

Never use footnotes.
Never use direct quotations.