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Biology 3224

# BIOLOGY of BATS

## The People

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## The Website

Biology 3224 has a WebCT website where course material, grades, and other information are presented.

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## 1.0 The Course at a Glance

The purpose of this course is to introduce the diversity and variety of bats and to illustrate their evolutionary history, their interactions with people and their conservation.

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<u>component</u>	<u>role in course</u>	<u>student skills</u>
lectures (on line)	present broad overview illustrated by specific examples	attention, recording information, assemble broad picture
selected readings	augment lectures	read and compare
practica	practical illustration, observation of bats and diversity, project design	observation, details, collaboration, small group activity, writing, communication
case studies	focus on specific questions, explore background details	read, write, compare, group discussions
essays	introduce animals and zoologists	writing, use of library, use of scientific literature, identification through intuitive and/or deductive reasoning

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<u>GRADING</u>	<u>We look for:</u>
essays (20% of final grade)	accuracy, effective communication, follow directions <i>requires use of <b>Turnitin.com</b></i>
practica (40% of final grade)	interest, enthusiasm, preparedness, attitude organization, team work, critical thinking, follow directions, original approaches and submissions
theory exams (40% of final grade)	specific knowledge about key concepts, developments and organisms; a grasp of the broader picture

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

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

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Use the Course WebCT Website to obtain relevant notes, handouts and reference materials.

## **2.0 Important Dates in the Course**

22 September , essay 1 is due by 17:00 h EDT

6 October essay 2 is due by 17:00 h EDT

14 October , mid term examination is posted at 10:00 h and due 22:00 h same day

8 December 2011, final examination is posted at 10:00 h and due by 22:00 on 9 December 2011

## **3.0 Introduction**

The purpose of this course is to use bats to introduce and explore the topics of diversity and variety, to illustrate evolutionary history and to provide practical experience in working with bats. Included is information about the lifestyles of bats 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 bats.

The lectures are arranged in 12 units, each with two recorded voice-over powerpoint presentations. The practica are arranged in 6 units, two involving group work on a project (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. Tied to these themes is the issue of conservation and interactions with people.

This course will involve writing – essays (2), essay questions on exams (2 on midterm, 3 on final), reports about case studies, and a lab project. Please read and follow the instructions about writing, source material and citing source material.

We will use weekly scheduled classes in Blackboard Collaborate (BbC) to foster discussion. This means focusing on the questions for discussion in each unit outline, but it also can mean broader discussions and more general questions. I expect everyone to attend and participate and will take attendance, docking marks from those who do not attend.

In the BbC session I can alert you to newly published material about bats, or stories about bats in the news. These will link to a question on the final exam. BbC also will be the meeting place for the practica. Students must attend the practicum session in which they are registered. In either case grades will be deducted from those who do not attend.

## **4.0 Goals**

The course has 10 main goals:

- 1) provide students with factual and conceptual information about bats, setting the stage for a better appreciation of biodiversity, evolution and adaptive radiation;
- 2) allow students to practice their skills of 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 bats;
- 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 bats;
- 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 The Web CT Site**

On the WebCT site there are the following categories of folders:

- a) course outline and details
- b) week by week lecture-related materials
- c) week by week practica-related materials
- d) case studies
- e) essay 1 (includes Turnitin.com button)
- f) essay 2 (includes Turnitin.com button)
- g) mid-term examination (includes Turnitin.com button)
- h) final examination (includes Turnitin.com button).

Please consult the folders for the relevant information.

On the WebCT site, there are three categories of “discussion” boards. One invites you to ask questions of the instructor. There is a similar one for each lab section. The third category is to promote student-to-student interactions. Please take full advantage of the three categories of discussion venues but use them appropriately.

### **6.0 Submitting Materials**

The essays and the exams require you to submit materials directly to the instructor ([bfenton@uwo.ca](mailto:bfenton@uwo.ca)) and to Turnitin.com.

Files submitted directly to me ([bfenton@uwo.ca](mailto:bfenton@uwo.ca)) must be .doc or .docx. Please be sure that the file name begins with your surname, followed by your initials and the topic (e.g., FentonMB Essay1.doc). These files should include citations and abstracts – as per instructions below).

Files submitted to Turnitin.com should not include citations and abstracts.

### **7.0 Tentative Course Schedule**

Date	Lecture	Practicum
12 Sept	Unit 1 Introduction	Case Study 1
19 Sept	Unit 2 Echolocation <i>Essay 1 due on 22 September by 17:00 h</i>	A. Acoustic work
26 Sept	Unit 3 Flight	Case Study 2
3 Oct	Unit 4 Diversity, Species,	B. Anatomy and Morphology

## Speciation and Distribution

*Essay 2 due on 6 Oct by 17:00 h*

*Project Proposals due on 11 Oct by 17:00 h*

11 Oct Unit 5 Phylogeny and Evolution Case Study 3

***Midterm exam 14 Oct posted at 10:00 h (10:00 am) answers due by 10:00 pm on 14 Oct***

17 Oct Unit 6 Adaptive Radiation C. Identification

24 Oct Unit 7 Physiology and Sensory Case Study 4

31 Oct Unit 8 Reproduction and Development  
D. Field Techniques

7 Nov Unit 9 Behaviour Case Study 5

14 Nov Unit 10 Social Systems E. Project

21 Nov Unit 11 Bats, diseases and people E. Project

28 Nov Unit 12 Conservation E. Project Presentations

5 Dec Review

***Final Examination posted at 10:00 am on 8 Dec 2011 answers due by 10:00 pm 9 Dec 2011***

### **8. Readings**

There is no formal text book for this course, although you could consider getting the book “Bats, revised edition” published in 2001 (M.B. Fenton). You can obtain copies of this paperback through Fitzhenry and Whiteside in Toronto.

Each unit outline includes citations intended to identify the source of material for you. There also are readings associated with practica and case studies.

### **9. Weighting of Grades**

- a) Essays = 20% of final grade
- b) Examinations [Mid term (15%) and final (25%)] = 40% of final grade
- c) Laboratories (participation, case studies, practica assignments, project = 40% of final grade.

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

## **10.0 The Essays**

The essays are intended to give you some in depth experience with particular bats and with zoologists who study them, while honing your skills at using the library to find information in scientific journals, and developing your writing skills.

The essay part of the course requires at least 2 submissions from each student, essays 1 and 2. Students who want to improve their essay grade can apply for permission to submit a third essay. Losing marks for not having followed directions will not be accepted as a reason for applying for permission to write a third essay. **Essays are due as follows:**

**Essay 1 due on 22 September by 17:00 h**

**Essay 2 due on 6 October by 17:00 h**

Essays must be submitted electronically, one copy to M.B. Fenton, the other to Turnitin.com (see below). The copy submitted to M.B. Fenton should include the abstracts and citations. Only the body (text) of the essay should be submitted to Turnitin.com.

Each student is assigned two essay topics. Within 2 business days of posting of the grades for the second essay, students may ask permission to write a third essay. Students who have permission to write a third essay will be assigned a third topic.

Essays have three purposes: a) to give students practice in reading original scientific literature; b) to improve their facility in using library resources; and c) to give students practice 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 first essay is about a species of bat, the second about someone who studies (or has studied) bats.

### ***Searching for and finding material***

Linda Dunn from the Science (Taylor) Library has kindly agreed to hold two sessions to assist students in searching for materials for their essays. Each session will be held in the Kellogg Room.

Wednesday Sept. 14 12:30-1:30 pm

Friday Sept. 16 11:30-12:30pm.

Please sign up in advance to attend one of these sessions. Sign up sheet will be available on the WebCT site.

Below is a sample essay reporting information about a species. The sample indices the format of the essay (double spaced with margins of at least 2 cm) 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, provide 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 (see also part 16 of this course outline).

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!

**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:

### **Penalties**

- 1) keep a copy of your essay.
- 2) 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 marks for not following the directions.
- 3) be sure to italicize all scientific names (e.g., *Myotis lucifugus*). Failure **-5 marks** 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*” – “the” is un-necessary.
- 4) please cite the sources you use in preparing your essay **-5 marks** (e.g., in text Jones 1983) 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.
- 5) although direct quotations must be specifically referenced (e.g., Jones 1922, page 2), you should never use them in **-5 marks** an essay (or lab report) in this course. Penalty for using quotations, 5 marks (out of 10).
- 6) please identify your essay with your name and student number (in the upper right hand corner of each page).

- 7) remember to double space your essay and ensure that you have provided 2 cm margins all around. Not heeding this guideline will cost you 2 marks. **-2 marks**
- 8) be sure to attach copies of the abstracts (summaries) of two of the scientific papers you have cited. Not doing so will cost you 3 marks. **-3 marks**
- 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).
- 11) never use Wikipedia as a source **-5 marks**
- 12) be sure to submit your essay text to **Turnitin.com**. If you do not... **-10 marks**

### Sample Essay

Bats living in Canada are thought to fall into two groups, those that migrate and those that hibernate (van Zyll de Jong 1985). Among the migratory species is *Lasiurus cinereus*, the hoary bat which belongs to the Vespertilionidae, suborder Yangochiroptera, order Chiroptera. Adult hoary bats weigh 25-30 grams, making them medium-sized as bats go but the largest species in Canada. Van Zyll de Jong (1985) provided general information about *L. cinereus*, which occurs over much of the New World, most of North, Central and South America, and offshore islands like the Galapagos and Hawaii. *L. cinereus* mate in the fall, females store sperm over winter in their uteri, and young (usually twins) are born in late spring and early summer.

To document the movements of *L. cinereus*, biologists have attached radio transmitters to them. Before placing faith in data collected from marked animals, it was important to demonstrate that the radio tags did not adversely affect the bats. At Pinery Provincial Park, Ontario, Hickey (1992) studied foraging *L. cinereus*. He observed these bats attacking moths and compared the foraging success rates of bats with and without radio tags. He found that the bats succeeded in about 40% of their attacks on moths and the data provided no statistical evidence that the radio transmitters impaired the bats' success.

Like other bats that pursue, and catch flying insects, *L. cinereus* echolocate. Hoary bats use long (10 - 20 millisecond) echolocation calls with most energy around 20 kiloHertz as they hunt airborne prey, usually moths. When searching for targets the bats produce their echolocation pulses about every 300 milliseconds but dramatically decrease interpulse intervals (to about 5 milliseconds) when attacking an insect. Barclay et al. (1999) reported changes in the echolocation calls of *L. cinereus* recorded from different places across its range. [289 words]

Barclay, R. M. R., Fullard, J. H. and Jacobs, D. S. 1999. Variation in the echolocation calls of the hoary bat (*Lasiurus cinereus*): influence of body size, habitat structure, and geographic location. *Canadian Journal of Zoology*, 77:530-534.

Hickey, M.B.C. 1992. Effect of radiotransmitters on the attack success of hoary bats, *Lasiurus cinereus*. *Journal of Mammalogy*, 73:344-346.

Van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. 2. Bats. National Museums of Canada, Ottawa, 212 pp.

**N.B.** Note that in addition to providing some general information about the species (or other assigned topic), the actual content of the essay is determined by the papers. So, you could write about *Lasiurus cinereus* and focus on reproduction or behaviour or anatomy .... etc.

Heed the Following:

Each student has two individual essay assignments (posted on course website). Students with permission to write a third essay will be assigned a third topic. 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, will not be marked but receive a grade of 0.

Turnitin.com

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.

On the Biology 3224a WebCT 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 3224a  
ESSAY CHECKLIST**

- \_\_\_ double-spaced with margins
- \_\_\_ scientific names are correct (italiced); names of families, orders, capitalized but not italicized
- \_\_\_ word count is provided (does not exceed 310 words)
- \_\_\_ up to three citations
- \_\_\_ citations are correct (as per course outline)
- \_\_\_ copies of abstracts (only the abstracts) of two cited papers attached
- \_\_\_ name and student number on each page
- \_\_\_ no direct quotations
- \_\_\_ no footnotes
- \_\_\_ submit an electronic version of each essay (text only) to Turnitin.com
- \_\_\_ document is appropriately named and is in .doc or .docx format
- \_\_\_ did I follow the guidelines?

### **11. Laboratories**

The purpose of the practica in this course is to give students specific experience relevant to working with bats. There are three components: a) practica sessions; b) case studies; and c) course project.

Group work is a central part of this aspect of the course and it involves (requires) attendance at and participation in weekly virtual sessions. We will use WIMBA, a virtual classroom, to convene weekly meetings of each laboratory group. Students are expected to attend all of the meetings scheduled for their group and to participate in the group work. We will take attendance at these sessions and archive each one for future reference. Each student's participation grades will partly reflect their attendance at and participation in these sessions. Any time group work is required students must provide an assessment of their own contribution and that of each member of the group (a grade /10 for each) as well as comments about why the grades are appropriate.

The intention is to engage students in working through the practicum and case study material as a rehearsal for the group project.

The case studies will be used to connect lecture and practicum material. We will work through four case studies. Each will be introduced in one week, and discussed in the following week, beginning on the week starting 12 September. Group members will be assigned specific tasks and each group will submit a report about each of their case studies.

We will use four practica to set the stage: 1) bat morphology; 2) bat identification (non-acoustic); 3) field techniques for studying bats; and 4) studying the acoustic signals of bats. For each practicum session there is a unit outline identifying the goals of the exercise, as well as sources of information, self-test questions and questions for discussion.

Each lab group will undertake a joint project. Each group will submit a final report and give a brief presentation about its project.

*Grade Breakdown for Lab work (40% of final grade)*

Participation	20%	(discussion during online lab sessions)
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Practica assignments	10%
Project	10% (proposal 3%; report 5%, presentation 2%)

## 12. Examinations

There will be two examinations in this course. Each will challenge you to write 400 word essays on a topic or question relevant to vertebrate biology. If you use material not covered in the lectures and laboratories, you must cite original sources (= papers in refereed journals

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 bat biology. 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 held on 14 October **2011 (exam posted at 10:00 am and due by 22:00 h (10:00 pm) on 14 October 2011.**

The final examination will be posted at **10:00 am on 8 December 2011 and answers are due by 10:00 pm (= 22:00 h) on 9 December 2011).**

Both examinations will ask you to write two (mid-term) or three (final) 400 word long essays about specific topics.

Make-up examinations in this course will cover the course material, but may differ in format from the scheduled final or mid-term examinations.

### **Preparing for Exams**

Practice ... 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) a bat...a species (one bat cannot be more than one species). Use the scientific name. Get it right, if you mention the family, be sure to be correct (if you chose to present this information). In writing about a species, do not present information about more than one species.

2) the part of the course you found most interesting. Be sure to express your opinion and justify your choice.

3) the 'questions for discussion' in the unit outlines are other examples of the kinds of questions you can expect on the exams.

In each instance identify the story line of your answer and choose material that supports it.

The purpose of this approach to examinations is to give you the opportunity to write about something that interests you. The sample essay, and any of the lectures provide examples of the levels of detail you should use in your answer. The word count is intended to challenge you to use words carefully and make the best use of your words to address the questions.

The practice for this is at least the essays.

### **13. Posted Grades**

Your grades in the course will be posted on the 3224 WebCT site.

Please check the grades posted for your student number and draw my attention to any discrepancies.

Students will have **one week** from the date of first posting to identify discrepancies in their posted grades (compared to graded, returned material). Otherwise posted grades will stand.

### **14. 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.*

### **15. About Collaboration**

*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).*

### **16. Citing Published Works and Web Sites**

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, you must use the citation format identified below.

You will be expected to cite published material in essays and laboratory reports. If your answers to exam questions involve material not covered in the course, you will also have to cite sources there. 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:

“Frelich and Reich (1995) studied forests in the Great Lakes Region. Vegetation plays a role in the formation of linear dunes (Tsoar and Møller 1986). Bats are mammals that fly and fill a variety of trophic roles in the tropical ecosystems where they occur (Fenton 2001). Syme et al. (2001) 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):

Fenton, M.B. 2001. Bats, revised edition. Facts On File Inc., New York.

Frelich, L.E. and P.B. Reich. 1995. Neighborhood effects, disturbance, and succession in forests of the western Great Lakes Region. *Écoscience*, 2:148-158.

Syme, D.M., M.B. Fenton, and J. Zigouris. 2001. Roosts and food supplies ameliorate the impact of a bad summer on reproduction by the bat, *Myotis lucifugus* LeConte (Chiroptera : Vespertilionidae). *Écoscience*, 8:18-25.

Tsoar, H. and J.T. Møller. 1986. The role of vegetation in the formation of linear sand dunes. Pp. 75-95. In W.G. Nickling (editor). *Aeolian geomorphology*. Allen and Unwin, Boston.

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:

Tsoar, H. and J.T. Møller. 1986. The role of vegetation in the formation of linear sand dunes. Pp. 75-95. In W.G. Nickling (editor). *Aeolian geomorphology*. Allen and Unwin, Boston.

Books must be cited thus:

Fenton, M.B. 2001. Bats, revised edition. Facts On File Inc., New York.

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

Never use footnotes.

Never use direct quotations.