**Syllabus**

**Basic and Wildlife Histology**

**TRIAL COURSE** O’Hara DRAFT Sept 5 2007

Course number: **BIOL F393 and WLF F393**

4 credits

Dr. Todd O’Hara, Instructor; Ms. Katrina Knott, Teaching Assistant (TA)

Room Bunnell Building 308 (Lecture / Laboratory)

Additional support via Veterinary Services, Dr. John Blake and Ms. Rhonda Swor (Histology Facility with Veterinary Services) are expected. This group provides core histology services for the UAF. Please be courteous when we visit the Biological Resources and Diagnostic (BiRD) facility.

**Introduction**

This histology course will present the basics of tissue collection, preservation and the preparation of slides for microscopic examination in the context of Alaska wildlife diagnostics, monitoring and research. We will emphasize “form and function” as explore tissues and various cell types. It is intended to support other courses related to diseases and performing necropsies (e.g., Wildlife Diseases, WLF 305) with respect to “form and function” at the tissue and cellular level of select organ systems (e.g., the cool ones!). This course will be useful to those interested in the biomedical professions and wildlife managers and researchers interested in health assessments and diagnostics; and basic biosampling techniques and how vertebrates function.

Pre-requisites: Biol 105 & 106. Recommended: Biol 310 & 317

Texts:

*Histotechnology: A Self-Instructional Text* (Hardcover), 2nd Edition. by Freida L. Carson


Department of Biology and Wildlife

Faculty Contact: Todd O’Hara at fftmo@uaf.edu or ext.1838 (name/email/phone)

TA Contact: Katrina Knott at ftkkk@uaf.edu or ext.1838 and office at Bunnell Building 307B on M and F; T, W and Th phone is 7085.

2 credits of lecture (e.g., 1 hour on Monday and Friday)
2 credits of laboratory (e.g., Mon and Fri PM for 2.5 hours per laboratory)

This course will offer a microscopic approach to Wildlife Diseases (WLF 305) and enhance the information from *A&P (BIOL 111 and 112)* for students interested in the sampling, handling and preparation of tissues for microscopic examination and for a better understanding of tissular organization and cell function based on histologic assessments. We will compare tissues of various species (“comparative histology”) and discuss some aspects of pathogenesis (cells response to disease). The course starts with 2
weeks of necropsy ands direct hands on training of sampling.

**JUSTIFICATION:** This course is needed for students wishing to learn more about “form and function” of animals. We start by covering the basics of biosampling and tissue processing to produce the best sections for microscopic investigation. This is important for the biomedical and wildlife inclined students. We then move into the specifics of various organ systems of domestic, laboratory and wildlife animals to explore “comparative histology.” This will allow for comparisons of microscopic form to better explain the various functions of animals (e.g., marine mammals v. terrestrial mammals).

Instructional method: Two lecture sessions 1 hour long per lecture per week. 2.5-3 hour laboratory twice a week, 1 laboratory per week is instructor based (demonstrations, lectures, hands on practice, etc.), 1 laboratory per week is student activity (self learning, preparation of projects) with TA and Instructor available (supervised access to laboratory and microscopes).

**Grading Policy:** Letter grades will be determined from the performance in lectures (60%), labs (30%) and an oral presentation (10%). Lecture performance will be determined from two exams (mid-term 20% and final 30%), and participation (10%). Laboratories require approximately 2 lab assignments and participation.

For marking thresholds A = 100-91%, B = 90-81%, C = 80-71%, D = 70-61%, F < 61%.

Considering this is the first offering of the course, “curving” of grades could be considered (only in favor of the student).

**Total 1,000 points:**

Lectures 600 points:
- midterm exam 200 points
- participation 100 points
- final exam 300 points

Laboratory 300 points:
- 5 Lab quizzes (20 points each for total of 100 points)
- 2 Labs exams (100 points each for total of 200 points).

Projects and Oral Presentations: Present a case or a project during laboratory.
- 2 Projects (50 points each for total of 100 points)

Laboratories:
Students will work in pairs in the laboratory and enrollment should be a maximum of 12 to 14 students. Thus a minimum of 6-7 microscopes and work stations will be required. If supplies are limited students can work in threes and we would need 4-5 scopes and workstations.

There will be no unsupervised use of any equipment and access to the laboratory will ONLY be during the instruction periods as scheduled (this is a safety and security issue).
Dissection/Necropsy
- Cutting up fresh and previously frozen animals and tissues is an essential part of this course.
- One must participate in this activity to pass the course.
- If you are not able or willing to do this you should drop the course.
- There is no alternative allowed or available as a substitute for handling carcasses and tissues. It is where histology begins.
- This does not include those who try and become dizzy or nauseous, we fully understand this reaction and will not penalize students. We will also accommodate those with disabilities.

Course policies

Attendance/tardiness:
Attendance is vital to the grade. Much, if not all, of the exam information will be based on information from lectures, notes, student presentations, discussion, etc. during class. These notes from lectures must be obtained from another student when absence is unavoidable. Attendance is recorded occasionally to maintain an idea of who is actually attending. Repeated tardiness will be noted. Out of respect for the instructor and classmates please be on time. Laboratories cannot be missed without prior permission. Special arrangements are made for students not present in Fairbanks; however we will maintain equal rigor with respect to assignments, exams, etc.

Making up an Exam
An exam may be taken ahead of schedule if a suitable time can be agreed upon if there is a good reason. Exams can be made up after the scheduled day but this is at the discretion of the instructor (i.e., it is not guaranteed). The make-up exam, or the early exam, will not be the same exam given to the other students. There will only be one make-up exam offered. Students who miss more than one exam will have difficulty passing the course.

Plagiarism
Simply will not be tolerated in any form. When in doubt cite and quote your sources.

Academic integrity
Examinations are to be performed by the individual and any attempts to gain assistance or knowingly provide assistance during an examination will be punished according to University policy towards “cheating.” Those taking early or make up exams are to not request assistance with the exams nor provide it. The exams should not be discussed until ALL members of the class have taken a specific exam.

Disabilities Services
The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. The Instructor will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities. Please make the Instructor aware of any disabilities that may affect access or performance.
Proposed Lecture & Laboratory Topics
(schedule will be flexible to allow for unexpected opportunities, weather, etc.)

First Day: September 7, 2007 (Friday): Bunnell 308
Introductions, Review Syllabus, Required and Suggested Texts, Introduction to and quick tour of BiRD Histology Laboratory, Supplies needs…

Introduction (gross assessment, biosampling and tissue trimming)

Week 1 (September 10 and 14, 2007)
Biosampling and tissue trimming of adult caribou.
10th gross necropsy and sampling.
14th transferring tissues to alcohol and trimming for embedding.
No formal lecture- meet at BiRD facility at 1PM on Monday and Friday.

Laboratory 1A (M): Reindeer necropsy. Review of tools, equipment, containers and variety of solutions used in collection and processing of tissues. A focus on how to sample wildlife tissues.

Laboratory 1B (F) Student tissue handling, trimming, and place tissues in buffered neutral 10% formalin and/or transfer to alcohol as needed. Prepare tissues for embedding.
[O’Hara at meeting on 14th, session led by TA]

Week 2 (September 17 and 21)
Biosampling and tissue trimming of adult arctic ground squirrel.
17th gross necropsy and sampling.
21st transferring tissues to alcohol and trimming for embedding.
No formal lecture- meet at BiRD facility at 1PM on Monday and Friday.

Laboratory 2A (M): AGS and small mammal necropsy. Review of tools, equipment, containers and variety of solutions used in collection and processing of tissues, including molecular biological sampling. A focus on how to sample wildlife tissues. Will provide carcass of small mammal if available and students will practice on thawed carcasses as provided. Students practice necropsy, tissue handling and place practice tissues in pseudo-buffered neutral 10% formalin.

Laboratory 2B (F) Students practice tissue handling and trimming under direct supervision of the TA and Instructor (this lab will stress safety and quality).

I. Processing Samples for Histologic Examination

Week 3 (September 24 and 28): Bunnell 308
Lecture: Introduction (M and F), see text.
Laboratory 3A (M): Assign microscopes, practice use of microscopes, Dr. Mark Wright reviews policy and questions about microscopes, remind students about projects/cases, review necropsies and tissue trimming exercises, distribute available glass slides.

Laboratory 3B (F): TA and Instructor will review case and project guidelines and have materials available for review. Access to computer laboratory is essential for initiation of case/project with TA and Instructor present.

*Week 4 (October 1 and 5) & Week 5 (October 8 and 12)*

Lecture M and F: Basic principles of slide preparation and staining, basic and special stains use (M and F): **Bunnell 308**

Laboratory 4A: Students observe the use of basic stains on glass slides that are prepared from microtome. Basic H&E and Trichrome stains (Quick Stains). **Meet at BiRD (pending approval)** led by TA.

Laboratory 4B: Students perform slide preparation and staining under direct supervision of TA and Instructor (possibly including Rhonda Swor). Use slides from reindeer and AGS. **Meet at BiRD (pending approval)**, led by TA.

****Get approval for first project from TA and Instructor.****

Laboratory 5A: Students observe the use of microscope and perform basic operations on prepared slides. Should initiate project at this session (if not sooner). **Bunnell 308**

Laboratory 5B: Students review slides they prepared and develop more proficiency with hardware, and describe what they observe with respect to quality of tissue on slide. We will discuss various forms of artifact. Should continue project at this session. **Bunnell 308**

*Week 6 (October 15 and 18)*

**Lecture on Monday only: Bunnell 308,**

Friday lecture and lab will be at the EM laboratory at NSF (Reichardt) building

Lecture: Review of microscopy with respect to histology – light, fluorescent, electron, etc. Principles of use and application to basic histology (M only).

Laboratory 6A: Sample collection and processing for EM. Review images of EM and discuss uses.

Laboratory 6B and Friday lecture: Tour and demonstration at EM facility (pending approval). **Meet at NSF building.**

*Week 7 (October 22 and 26)*
Lecture: Introduction to basic tissue and cell structure (M & F); focus on epithelial and connective tissue components, and major organs.

Laboratory 7A (M): Instructor and TA use fresh and/or fixed tissues (liver, kidney, adrenal, etc.), models, figures, and microscope to explore the basics of tissue and cell structure (renal cortex and medulla, hepatic triad, adrenal cortex and medulla, etc.). Use wildlife examples to show variation in structures.

Laboratory 7B:
- Lab Quiz (20 pts)
- First cases/projects presented (50 points). Students review materials in previous laboratories.

*Week 8 (October 29 and November 2)*

**Lecture: Midterm examination (lecture) on Monday 200 points, no lecture on Friday.**

Laboratory 8A (M): Clean up, reorganize, and review opportunity for practicum (TA and Instructor present).

Laboratory 8B (F): Laboratory Midterm examination (laboratory exam, written and practical, 150 points).

II. Histology: Form and Function

*Week 9 (November 5 and 9) Dr. Debra Miller Visits!*

Lecture: Epidermis, dermis (includes blubber) and select mucosal surfaces on M and F.

Laboratory 9A: “Comparative dermatology” via gross examination of various skin types (cetaceans, feathered and furred). Select sections from fresh or recently thawed tissues for microscopic examination later.

Laboratory 9B:
- Lab Quiz (20 pts)
- Students review materials in 9A.
- Students consider second project and use available resources (scopes, glass slides, computers, TA, instructor, etc.), discuss ideas with instructor and TA.

*Week 10 (November 12 and 16)*

Lectures:
1) Histology for diagnostics on Monday or Friday (Dr. John Blake guest lecturer, pending approval).

2) Pulmonary and other gas exchange organs (lungs, air sacs, gills).
Laboratory 10A: Diagnostic cases at the UAF where histology proved critical, this is part of the “Preventative Health Program.” [pending approval] Possibly give some case slides to students as part of study set. Preventative approaches can apply to captive and free ranging wildlife.

Laboratory 10B
- **Lab Quiz (20 pts)**
- Huge variation in organs for gas exchange and the underlying histology. This comparative laboratory will use special stains to highlight differences in marine v. terrestrial mammals, mammals v. birds, and explore gills of fish.

**Week 11 (Monday November 19 ONLY)**
Lecture: Kidney and related structures, some Endocrine (adrenal, thyroid) – intensive assessment as compared to Week 8 with some “pathology” examples. M & F.

Laboratory 13A (M): Comparative renal anatomy (e.g., reniculated or not) and intense examination of the distinct layers of tissues and specialized stains used to assess them. Relative function of organs and layers.

**Friday - Holiday**
Laboratory 13B (NO LAB, Thanksgiving).

**Week 12 (November 26 and 30)**
Lecture (M and F): Specialized staining (antibody or “immuno”, cellular pigment differentiation, connective tissue, fluorescence, autometallography).
Lecture (part of F): Muscle (skeletal, smooth and cardiac) and bone.

Laboratory 12A: Review and Discussion of papers circulated. Examples of specialized staining slides to view. Students expected to participate in Discussions.
  - Cellular pigments: bowheads and belugas (Woshner et al.)
  - Connective tissue: bowheads (Tarpley et al., Rosa et al.)
  - Automettalography: bowheads and belugas (Woshner et al., maybe some Knott stuff)
  - Immuno – tons of stuff, Knott with MTH or CYP450 (Wilson et al papers).

Laboratory 12B:
- **Lab Quiz (20 pts)**
- Review opportunity with Instructor and TA, continued Discussion in 12A.
- Explore the gross, functional and histologic differences in the muscle types. For example, compare muscle types of deep diving animals (e.g., high myoglobin) to those of terrestrial species. Review myopathies especially those related to wildlife management – exertional!
Week 13 (December 3 and 7)


Laboratory 13A (M): Focus on digestive functions of the liver and pancreas and assessment of condition status (e.g., robust, fasting, or starving). These organs can be very useful tools to learn about digestion and practical use for biologists. Body condition!! Use caribou mortality event tissues on top of freezer in WTL!

Laboratory 13B:
- **Lab Quiz (20 pts)**
- Students review materials in 13A. Class discusses post mortem exam of animals from suspected “starvation”. Presentations #2 due and provided to class.

Week 14 (December 10 and 14)

Lecture 14 (M): Review for Final (M)

Lab 14A (M): Instructor and TA driven review, open lab, and clean up.

Lecture 14 (F) and Lab 14B (F): **Final Exam (written and practical) on Dec. 14** (last day of instruction). Lab section is 150 points, lecture is 300 points.

Organ systems not included are visual, CNS, spinal/nervous, gastrointestinal (some select examples from here), hematology/immune (covered in other courses),…

The point of the class is **NOT** to review all organ systems but to give the student an appreciation of the importance of proper tissue collection and processing and the basic application of histology to select organ systems. The “form and function” sections are to enhance current understanding of gross anatomy, animal physiology, and cellular physiology and biochemistry.