Genetics
BIOL F362 F01 (4 units); CRN 33662,3

Course Syllabus

Jonathan Runstadler
University of Alaska Fairbanks
Spring Semester 2008

Classes: MWF 10:30am-11:30pm, Elvey Auditorium
Lab: W or Th 2-5, Bunnell 408

Version: 2/4/08
1. Course Information:

Genetics
Meeting Times: MWF 10:30-11:30, Elvey Auditorium; Lab WTh 2-5 in Bunnell 408
Prerequisites: BIOL 105X/106X (Fundamentals of Biology) or permission of instructor.

2. Instructors:
Jonathan Runstadler, M.S., D.V.M., Ph.D., Assistant Professor of Biology & Wildlife
  Office: WRRB 242
  Research Lab: WRRB Main Lab
  Phone: 474-7038 (office)
  Fax: 474-6967
  E-mail: j.runstadler@uaf.edu
  Mailbox: Institute of Arctic Biology, Irving I, Room 211
  Office hours: Monday, Tuesday 12-1 pm, or by appointment

Sara Turner, Ph.D., Postdoctoral Fellow, Institute of Arctic Biology
  Office: WRRB 234
  Research Lab: WRRB Main Lab
  Phone: 474-1146 (office)
  Fax: 474-6967
  E-mail: s.turner@uaf.edu
  Mailbox: Institute of Arctic Biology, Irving I, Room 211
  Office hours: TBA

TAs:
Kelly Balcarczyk – ftklb2@uaf.edu, 474-1534
Amy Carroll – ftabc@uaf.edu, 474-7929

3. Course Readings/Materials:


Original Research Articles and Reviews: On a regular basis, current, explanatory, historically significant, or seminal scientific research articles or reviews will be assigned for reading, review, and discussion.

Blackboard Page: Students are expected to check the course webpage on Blackboard on a regular basis.
Login at http://classes.uaf.edu/webapps/login
Click “Genetics”
Contact me by email if you are unable to access this site.

Email Notifications: On occasion, students will be contacted via email. I will assume that students will check their university-assigned email address (username@uaf.edu) on a regular basis.

4. Course Description:

Welcome to Principles of Genetics. The UAF Catalogue describes the topic of this course as follows:
**Principles of Genetics, BIOL 362, 4 credits:** Principles of inheritance; physiochemical properties of genetic systems.

**Course Organization:** Questions and discussion throughout the course are encouraged and this syllabus should be considered flexible. Lectures will be based on chapters in the text, Genetics, 6th edition, by Daniel Hartl and Elizabeth Jones, as well as recent and historical literature relevant to these topics. Basic concepts introduced in lectures will be applied through guided discussion of original research papers.

**5. Course Goals:**

**Topics you are expected to be familiar with when you begin** (at the level covered in Campbell et al., *Biology* or equivalent introductory text):
1. Molecular biology of eukaryotic gene expression
2. Eukaryotic protein synthesis and secretion.
4. Mendelian genetics.
5. Mitosis and meiosis.
6. Chromosome structure.
7. Standard techniques of modern molecular biology [restriction digests, gel electrophoresis, Southern, "Northern" and "Western" blots, hybridization with nucleic acid probes, autoradiography, making genomic and cDNA libraries, DNA sequencing, polymerase chain reaction (PCR)].

**What you are expected to be able to do when you finish:**
1. Understand the basic processes of gene expression, regulation, transmission, and change.
2. Predict different mechanisms that could be responsible for control of gene expression.
3. Recognize the advantages and limitations of the experimental methods in use by geneticists and be able to design an experiment that uses the appropriate techniques.
4. Formulate genetic hypotheses, design experiments to test the hypotheses, and interpret the observed data.
5. Discuss Eukaryotic genome organization and information content.
7. Compare the uses of forward and reverse genetics.
8. Be able to solve problems that require application of the principles of genetics from simple order to higher order problems that require the application of several concepts and quantitative analysis.
9. Appreciate the social and historical context that genetics and genomics continues to develop in and understand the genetic context of contemporary issues in the field.
10. Be able to use and have familiarity with genetic resources and information available on the internet.
11. Describe how transgenics, genomics, and proteomics can be used to study genetic principles, and be able to design experiments using these techniques.
12. Describe some of some major still unanswered questions in genetics.

Throughout the course I stress experimental approaches and problem solving. *I expect you to understand the evidence for what is known and the available methods for approaching what is unknown in modern genetics/genomics.* I also expect you to be able to read genetics papers in current journals and understand the methods and the evidence presented well enough to judge the validity of the conclusions.

I hope you will achieve these non-content goals by the end of the course. Be able to:
1. Explain where the information in the textbooks comes from and judge how reliable it is.
2. Describe how research is supported, done, communicated, evaluated, and validated or invalidated.
3. Look at other sources beyond the textbook for additional information.
4. Read a research paper in the current genetics literature.
5. Gauge how much new understanding you have gained through this course.

We will achieve these goals by implementing a variety of instructional methods.

6. Instructional Methods:

1. Lecture and Discussion: I (we) will lecture (some), and we will discuss the basic concepts of Genetics. An important source for this information is from written material.

   Discussions of Scientific papers: On occasion we will devote class and/or lab time to the discussion of review, current, historically significant or seminal papers in the field. You will receive these at least two days in advance and are expected to thoroughly read and prepare for discussion of the material.

You are expected to read the assigned textbook chapters and reading handouts and to take part in the class learning environment…ask questions when you have them and provide your thoughts when I ask for them. The textbook and the material covered in class sessions together define the material covered in the exams.

Class Participation is required. If for any reason you are not able to attend a specific class meeting, you will be responsible for catching up with the material covered during the absence. I will make a subjective assessment of each student’s class participation, and assign a grade (10% of the final grade) during final evaluation. Components of the participation grade may include but are not limited to participation in class discussions, completion of ungraded quizzes, submission of test questions, participation in laboratory and classroom activities, and the ability to work cooperatively with other students. Tardiness, absenteeism, inattentiveness, and unfamiliarity with course material will all negatively impact this subjective assessment. If you are required to participate in either (a) military or (b) UAF-required activities that will cause you to miss class, you must notify me as soon as possible before your absence. Of course, these will not negatively impact the subjective assessment of class participation.

2. Blackboard Page. Several learning resources will be available on the course Blackboard Page:
   a. The course Blackboard Page will contain links to other instructional and informative pages on genetics.
   b. A copy of this syllabus is posted on Blackboard.

3. Midterms. There will be two “midterm” exams during the semester.

4. Final Exam. The final exam will be held May 7th from 10:15-12:15 in Elvey Auditorium. The final exam will be a cumulative test of your knowledge. It will count toward 30% of the final grade.
7. Course Policies

As a UAF student, you are subject to the Student Code of Conduct. In accordance with Board of Regents' Policy 09.02.01, UAF will maintain an academic environment in which the freedom to teach, conduct research, learn, and administer the university is protected. Students will enjoy maximum benefit from this environment by accepting responsibilities commensurate with their role in the academic community. The principles of the Code are designed to facilitate communication, foster academic integrity, and defend freedoms of inquiry, discussion, and expression among members of the university community. You should become familiar with campus policies and regulations as published in the student handbook.

UAF requires students to conduct themselves honestly and responsibly, and to respect the rights of others. Conduct that unreasonably interferes with the learning environment or that violates the rights of others is prohibited. Students and student organizations will be responsible for ensuring that they and their guests comply with the Code while on property owned or controlled by the university or at activities authorized by the university.

Disciplinary action may be initiated by the university and disciplinary sanctions imposed against any student or student organization found responsible for committing, attempting to commit, or intentionally assisting in the commission of any of the following prohibited forms of conduct:

A. cheating, plagiarism, or other forms of academic dishonesty;
B. forgery, falsification, alteration, or misuse of documents, funds, or property;
C. damage or destruction of property;
D. theft of property or services;
E. harassment;
F. endangerment, assault, or infliction of physical harm;
G. disruptive or obstructive actions;
H. misuse of firearms, explosives, weapons, dangerous devices, or dangerous chemicals;
I. failure to comply with university directives;
J. misuse of alcohol or other intoxicants or drugs;
K. violation of published university policies, regulations, rules, or procedures; or
L. any other actions that result in unreasonable interference with the learning environment or the rights of others.

This list is not intended to define prohibited conduct in exhaustive terms, but rather to set forth examples to serve as guidelines for acceptable and unacceptable behavior.

Honesty is a primary responsibility of you and every other UAF student. The following are common guidelines regarding academic integrity:

1. Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.
2. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports.
3. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors.

Alleged violations of the Code of Conduct will be reviewed in accordance with procedures specified in regent's policy, university regulations and UAF rules and procedures. For additional information and details about the
Student Code of Conduct, contact the Dean of Student Services or web www.alaska.edu/bor/ or refer to the student handbook that is printed in the back of the class schedule for each semester. Students are encouraged to review the entire code.

**A Few Words on Plagiarism:**

**In general, DO NOT present someone else’s ideas or data as your own: you are expected and required to give credit where credit is due.** Plagiarism is a violation of the law and may lead to serious repercussions! Please follow the following guidelines: for any written assignments, if you use someone else’s ideas, data, or other information, write it in your own words and include the reference in parentheses directly following that information. **Avoid** copying someone else’s text. If, however, you feel you have to include an exact copy of that text, put it in quotation marks followed by the reference in parentheses. Of course, include all cited references in the Literature Cited section. During oral presentations, please acknowledge the sources by mentioning their name(s) and year of publication or by printing them on overheads, slides, or handouts. Also be aware that you need to cite earlier work by yourself. Any substantial use of any written or other materials that was used for another course or that was generated in any other circumstances will not be accepted for credit in this course. Only minor contributions from earlier work with appropriate citation(s) will be accepted.

**8. Evaluation:**

The class will be graded on a straight percentage basis: 90-100% is an A, 80-89.9% is a B, 70-79.9% is a C, 60-69.9% is a D, and < 60% is an F. **I will not grade on a curve.** This means that in principle it will be possible for everyone to get an A in this course (but of course it will also be possible for everyone to get an F). Supplemental assignments may be provided at the discretion of the instructor.

Grading breakdown:

- Participation: 100 pts
- Laboratory: 300 pts
- Comprehensive final exam: 300 pts
- Midterms: 300 pts

**Missed assignments and exams:**

**Times for assignments and exams will be designated well in advance. Completion of assignments and exams at the designated time will be the responsibility of the student. Accommodations will only be made for legitimate and documented contingencies.**

**9. Disabilities Services:**

At UAF, 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. I will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Reading (for the next lecture), Hand-outs, and Notes</th>
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<tbody>
<tr>
<td>Jan</td>
<td>25</td>
<td>F</td>
<td>Course intro, questions and approaches to learning the Principles of Genetics</td>
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<td>28</td>
<td>M</td>
<td>Nucleic acid structure and genes</td>
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<td>30</td>
<td>W</td>
<td>Central dogma of genetics, markers</td>
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<td>Feb</td>
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<td>DNA markers, cell cycle, mitosis</td>
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<td>4</td>
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<td>Meiosis, transmission genetics (segregation), complementation test</td>
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<td>Transmission genetics (two locus cross, chi square)</td>
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<td>Transmission Genetics (pedigree analysis, sex chromosomes)</td>
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<td>Genetic linkage and mapping</td>
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<td>Genetic linkage and mapping</td>
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<td>15</td>
<td>F</td>
<td>Review</td>
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<td>M</td>
<td>Midterm Exam #1</td>
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<td>20</td>
<td>W</td>
<td>Chromosome structure</td>
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<td>22</td>
<td>F</td>
<td>Human karyotypes</td>
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<td>25</td>
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<td>Guest lecture - Dr. Rosemarie Plaetke</td>
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<td>27</td>
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<td>Guest lecture – Dr. Bert Boyer</td>
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<td>Chromosomal abnormalities</td>
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<td>DNA replication</td>
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<td>Sequencing, recombination</td>
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<td>Spring break</td>
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<td>17</td>
<td>M</td>
<td>Translation</td>
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<td>19</td>
<td>W</td>
<td>Guest lecture – Dr. Mary Beth Leigh</td>
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<td>21</td>
<td>F</td>
<td>Gene regulation</td>
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<td>Translational regulation, DNA rearrangement</td>
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<td>26</td>
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<td>Pattern formation in Drosophila, TBA (Self incompatability loci)</td>
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<td>Guest lecture – Naoki Takabayashi/Diana Wolf</td>
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<td>31</td>
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<td>Mutation</td>
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<td>W</td>
<td>DNA repair</td>
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<td>F</td>
<td>Review</td>
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<td>M</td>
<td>Midterm Exam #2</td>
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<td>9</td>
<td>W</td>
<td>Cloning, Genomics</td>
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<td>F</td>
<td>Genomics, Genetic Engineering</td>
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<td>Genetics of cell cycle control</td>
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<td>W</td>
<td>Cancer genetics</td>
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<td>18</td>
<td>F</td>
<td>Bioethics</td>
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<td>M</td>
<td>Extranuclear inheritance</td>
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<td>23</td>
<td>W</td>
<td>Molecular Evolution</td>
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<td>F</td>
<td>Guest lecture – Dr. Link Olson/Dr. Matt Olson</td>
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<td>Evolution, heritability (Guest lecture?)</td>
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<td>Guest lecture – Dr. Kris Hundermark</td>
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<td>F</td>
<td>Complex traits</td>
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<tr>
<td>May</td>
<td>4</td>
<td>M</td>
<td>Wrap-up/review</td>
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<tr>
<td>May</td>
<td>7</td>
<td>Th</td>
<td>Final</td>
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