

**PLANT MOLECULAR BIOLOGY AND GENOMICS**  
**PCB 5530 Section 4205, 3 Credits**  
**FALL 2015**

**MEETING TIME & LOCATION**

M, W, F – 3<sup>rd</sup> Period 9:35-10:25AM – Plant Sciences Facility 005

**INSTRUCTORS**

**Thomas Colquhoun**

Environmental Horticulture Department  
1525 Fifield Hall  
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273-4584  
Off. Hrs TBA on an Individual Basis

**Andrew Hanson**

Horticultural Sciences Department  
2143 Fifield Hall  
University of Florida  
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273-4856  
Off. Hrs TBA on an Individual Basis

**John Davis**

School of Forest Resources &  
Conservation  
365 Newins-Ziegler Hall (morning)  
320 UF Genetics Institute (afternoon)  
University of Florida  
[jmdavis@ufl.edu](mailto:jmdavis@ufl.edu)  
846-0879  
Off. Hrs TBA on an Individual Basis

**Gary Peter, Course Coordinator**

School of Forest Resources & Conservation  
326 Newins-Ziegler Hall (morning)  
320 UF Genetics Institute (afternoon)  
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846-0896  
Off. Hrs TBA on an Individual Basis

**PREREQUISITES**

Undergraduate molecular and cellular biology or biochemistry

**OVERVIEW OF COURSE**

The course has four modules. The first two modules focus on building student understanding of basic principles and foundational knowledge of molecular mechanisms controlling plant growth, development and adaptation. The second two modules introduce students to current genomics technologies, data and analyses with the goal of stimulating students to think critically and creatively about current research questions.

**COURSE LEARNING OBJECTIVES/OUTCOMES**

*Upon completion of this course, students will:*

1. Understand the current status of knowledge in plant genome structure and the molecular mechanisms of
  - a. DNA replication & repair
  - b. Cell cycle
  - c. Transcription, splicing & translation
  - d. Regulation of gene expression
  - e. Metabolic control
2. Dissect genomes, transcriptomes, proteomes and metabolome data using
  - a. Web based tools for analysis
  - b. Case studies from the primary literature
3. Proficiently access and interpret web based data sets and apply web based tools to their interpretation
  - a. Apply tools in a research context to solve current problems
4. Integrate web based information and primary literature to generate hypotheses

LEC	DATE	TOPIC	INSTR	HMWK/READINGS
		<b>DNA REPLICATION &amp; REPAIR</b>		
1	M 8/24	Course Overview & Fidelity of DNA Replication	Peter	
2	W 8/26	DNA Repair	Peter	Singh et al. BMC Genomics 2010, 11:443;
3	F 8/28	DNA Replication - DNA Polymerases	Peter	<i>Nature Structural &amp; Molecular Biology</i> 16, 979 - 986 (2009); De
4	M 8/31	DNA Replication – Mechanisms	Peter	<b>HMWK 1 DUE</b> Johnson & O'Donnell 2005 Ann Rev. Biochem. 74:283-315; McHenry 2011 Ann Rev Biochem. 80: 403-36
5	W 9/2	DNA replication - Origins/regulation	Peter	
6	F 9/5	DNA replication - Plant DNA replication	Peter	
	M 9/7	<b>NO CLASS- LABOR DAY</b>		<b>HMWK 2 DUE</b>
7	W 9/9	Chromosome Structure, Chromatin, DNA Packaging, Nucleosomes	Peter	Plant Physiol. 207 144: 1697-714;
8	F 9/11	Chromatin Assembly & Dynamics	Peter	
9	M 9/14	Cell Cycle I. Cell Cycle Overview	Peter	<b>HMWK 3 DUE</b>
10	W 9/16	Cell Cycle II. Checkpoints	Peter	
11	F 9/18	Cell Cycle III. Plant Cell Cycle	Peter	
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>	Peter	
		<b>GENE EXPRESSION</b>		
12	M 9/21	Prokaryotic Transcription I	Colquhoun	MCB- Chap 6, 299-309
13	W 9/23	Prokaryotic Transcription II	Colquhoun	MCB- Chap 7, 395-400 Cell 98: 1-4
14	F 9/25	Transcription of the Eukaryotic Nuclear Genome	Colquhoun	MCB- Chap 6, 309-313

15	M 9/28	Regulation of Transcription of the Eukaryotic Nuclear Genome	Colquhoun	MCB- Chap 7, 400-408 Curr. Opin. Struc. Biol. 9: 48-55 Plant Phys. 118: 1111-1120 Cell 108: 475-487 Eur. J. Biochem. 262: 247-257
16	W 9/30	Processing of Transcripts of the Eukaryotic Nuclear Genome	Colquhoun	MBC page 315-329 Curr. Opin. Plant Biol. 5: 452-459 Cell 108: 439-451 Genes and Dev. 14: 1415-1429
17	F 10/2	Eukaryotic Translation	Colquhoun	<b>Homework #1 Due</b> MBC page 335-351 TIBS 28: 182-187 Curr. Opin. Plant Biol. 5: 460-465
18	M 10/5	Analysis of Protein-Protein and Protein-Nucleotide Interaction, Engineering Transcription Factors	Colquhoun	Molecular and Cellular Biochemistry 172: 67-79 RNA 11:227-233. Methods in Enzymology 328: 333-358 J Mol Biol 354: 507-519. Trends Plant Sci. 15: 308-321
19	W 10/7	Transgene Expression in Plants I	Colquhoun	Microbiol. Mol. Biol. Rev. 67: 16-37
20	F 10/9	Transgene Expression in Plants II	Colquhoun	Trends Biotechn. 21: 20-28 Curr. Opin. Biotechn. 13: 136-141 Trends Plant Sci. 7: 84-91 Mol. Breeding 15: 305-327
21	M 10/12	Biology of Gene Silencing	Colquhoun	<b>Homework #2 due</b> Cell 108: 489-500 Science292: 2277-2280 Science 297: 2215-2218 Genes Dev. 17: 49-63
22	W 10/14	Gene Silencing II	Colquhoun	<a href="http://www.nature.com/focus/rnai/animations/animation/animation.htm">http://www.nature.com/focus/rnai/animations/animation/animation.htm</a>
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>		
		<b>COMPARATIVE GENOMICS &amp; METABOLOMICS</b>		
23	F 10/16	Principles of Comparative Genomics	Hanson	
24	M 10/19	Principles of Comparative Genomics	Hanson	
25	W 10/21	Web Resources for Metabolism	Hanson	
26	F 10/23	Web Resources for Metabolism	Hanson	
27	M 10/26	Comparative Genomics & Metabolism	Hanson	
28	W 10/28	Comparative Genomics & Metabolism	Hanson	
29	F 10/30	Comparative Genomics & Metabolism	Hanson	
30	M 11/2	Metabolic control analysis	Hanson	
31	W 11/4	Metabolomics	Hanson	
32	F 11/6	<b>NO CLASS- HOMECOMING</b>		
33	M 11/9	Metabolomics	Hanson	
<b>TBD</b>		<b>OUT OF CLASS EXAM</b>	<b>Hanson</b>	
	W 11/11	<b>NO CLASS – VETERANS DAY</b>		
		<b>FUNCTIONAL GENOMICS</b>		
34	F 11/13	Genome I. Assembly and Annotation	Davis	
35	M 11/16	Genome II. Structure and Evolution	Davis	
36	W 11/18	Transcriptome I. Promoter Case Study	Davis	Detail Paper
37	F 11/20	Transcriptome II. Scaling Up Analysis	Davis	
38	M 11/23	Transcriptome III. Network Case Study	Davis	Detail Paper
	W 11/25	<b>NO CLASS - THANKSGIVING</b>		

	F 11/27	<b>NO CLASS - THANKSGIVING</b>		
39	M 11/30	Proteome. Network Case Study	Davis	Detail Paper
40	W 12/2	Reverse Genetics I. Approaches	Davis	
41	F 12/4	Reverse Genetics II. Case Study	Davis	Detail Paper
42	M 12/7	Forward Genetics I. Approaches	Davis	
43	W 12/9	Forward Genetics II. Case Study	Davis	Detail Paper
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>	<b>Davis</b>	

### Additional Reading Materials

*Biochemistry and Molecular Biology of Plants*, (Buchanan, Grissem, Jones, 2<sup>nd</sup> edition, 2015)

*Molecular Biology of the Cell* (Alberts et al., 6<sup>th</sup> Edition, 2014)

*Genes IX* (Lewin, 2008)

*Methods in Enzymology Guide to Molecular Cloning Techniques* (Berger, Kimmel, ed. 1987)

Papers from the primary literature will be assigned

### GRADING

The four sections of this course will be graded independently. The final grade will be determined by performance on homework and the exams. Each section will be worth 100 points. The final grade is assigned based on the cumulative percentage attained over all 4 sections. Class attendance and participation will be considered in assigning grades.

Information on current UF general grades and grading policies can be found at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> and the Graduate Catalog at <http://gradcatalog.ufl.edu/content.php?catoid=2&navoid=762#grades>

**Note:** EXAMS will be scheduled in the evenings outside of normal class hours or they will be take home exams.

### Course Materials on Web (Onedrive):

URL: <https://onedrive.live.com/about/en-us/#>

User name: [pcb5530@live.com](mailto:pcb5530@live.com)

Password: ufpmcb

### PROFESSIONALISM STATEMENT

Scientists are professionals guided by specific values and behaviors. These values and behaviors include respect, cooperation, active participation, ethics, intellectual inquiry, integrity, timeliness, and attendance. In addition to your performance on the graded materials, you will be evaluated on your growth as a professional. Professional

characteristics include punctuality, attendance, participation, collegial attitude, and willingness to learn from and help others learn. Your attendance at all classes is a firm expectation, but if you are ill or an emergency occurs, contact your instructor PRIOR TO the scheduled class time.

## **CLASS POLICIES**

**LATE ASSIGNMENTS-** A penalty of 33% per day will be taken off for each late assignment. Reasonable explanations for late assignments will be taken under consideration, particularly if communicated ahead of the deadline.

**MAKEUP EXAMS-** Make-up exams or course work will be accepted only by special permission of the course instructors. Permission to make up work will be granted on a case by case basis and not all requests will be approved.

### **Grades and Grade Points**

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Absences and Make-Up Work**

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

### **Academic Honesty**

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>.

### **Software Use:**

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to

monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

### **Campus Helping Resources**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)*
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs
  - Community Provider Database
- *Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)*

### **Services for Students with Disabilities**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)