

PLANT MOLECULAR BIOLOGY AND GENOMICS
PCB 5530 Section 4205, 3 Credits
FALL 2016

MEETING TIME & LOCATION

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

INSTRUCTORS

Thomas Colquhoun

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

Andrew Hanson

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John Davis

School of Forest Resources &
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365 Newins-Ziegler Hall (morning)
320 UF Genetics Institute (afternoon)
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846-0879
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Gary Peter, Course Coordinator

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326 Newins-Ziegler Hall (morning)
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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
		DNA REPLICATION & REPAIR		
1	M 8/22	Course Overview & Fidelity of DNA Replication	Peter	
2	W 8/24	DNA Repair	Peter	Singh et al. BMC Genomics 2010, 11:443;
3	F 8/26	DNA Replication - DNA Polymerases	Peter	<i>Nature Structural & Molecular Biology</i> 16, 979 - 986 (2009); De
4	M 8/29	DNA Replication Mechanisms	Peter	HMWK 1 DUE Johnson & O'Donnell 2005 Ann Rev. Biochem. 74:283-315; McHenry 2011 Ann Rev Biochem. 80: 403-36
5	W 8/31	DNA replication - Origins/regulation	Peter	
6	F 9/2	DNA replication - Plant DNA replication	Peter	
	M 9/5	NO CLASS- LABOR DAY		HMWK 2 DUE
7	W 9/7	Chromosome Structure, Chromatin, DNA Packaging, Nucleosomes	Peter	Plant Physiol. 207 144: 1697-714;
8	F 9/9	Chromatin Assembly & Dynamics	Peter	
9	M 9/12	Cell Cycle I. Cell Cycle Overview	Peter	HMWK 3 DUE
10	W 9/14	Cell Cycle II. Checkpoints	Peter	
11	F 9/16	Cell Cycle III. Plant Cell Cycle	Peter	
	TBD	OUT OF CLASS EXAM	Peter	
		GENE EXPRESSION		
12	M 9/19	Prokaryotic Transcription I	Colquhoun	MCB- Chap 6, 299-309
13	W 9/21	Prokaryotic Transcription II	Colquhoun	MCB- Chap 7, 395-400 Cell 98: 1-4
14	F 9/23	Transcription of the Eukaryotic Nuclear Genome	Colquhoun	MCB- Chap 6, 309-313
15	M 9/26	Regulation of Transcription of the	Colquhoun	MCB- Chap 7, 400-408 Curr. Opin. Struc. Biol. 9: 48-55

		Eukaryotic Nuclear Genome		Plant Phys. 118: 1111-1120 Cell 108: 475-487 Eur. J. Biochem. 262: 247-257
16	W 9/28	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 9/30	Eukaryotic Translation	Colquhoun	Homework #1 Due MBC page 335-351 TIBS 28: 182-187 Curr. Opin. Plant Biol. 5: 460-465
18	M 10/3	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 10/5	Transgene Expression in Plants I	Colquhoun	Microbiol. Mol. Biol. Rev. 67: 16-37
20	F 10/7	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 10/10	Biology of Gene Silencing	Colquhoun	Homework #2 due Cell 108: 489-500 Science292: 2277-2280 Science 297: 2215-2218 Genes Dev. 17: 49-63
22	W 10/12	Gene Silencing II	Colquhoun	http://www.nature.com/focus/mai/animations/animation/animation.htm
	TBD	OUT OF CLASS EXAM		
	F 10/14	NO CLASS- HOMECOMING		
		COMPARATIVE GENOMICS & METABOLOMICS		
23	M 10/17	Principles of Comparative Genomics	Hanson	
24	W 10/19	Principles of Comparative Genomics	Hanson	
25	F 10/21	Web Resources for Metabolism	Hanson	
26	M 10/24	Web Resources for Metabolism	Hanson	
27	W 10/26	Comparative Genomics & Metabolism	Hanson	
28	F 10/28	Comparative Genomics & Metabolism	Hanson	
29	M 10/31	Comparative Genomics & Metabolism	Hanson	
30	W 11/2	Metabolic control analysis	Hanson	
31	F 11/4	Metabolomics	Hanson	
32	M 11/7	Metabolomics	Hanson	
TBD		OUT OF CLASS EXAM	Hanson	
33	W 11/9	Genome I. Assembly and Annotation		
	F 11/11	NO CLASS – VETERANS DAY		
		FUNCTIONAL GENOMICS		
34	M 11/14	Genome II. Structure and Evolution		
35	W 11/16	Transcriptome I. Promoter Case Study		
36	F 11/18	Transcriptome II. Scaling Up Analysis		Detail Paper
37	M 11/21	Transcriptome III. Network Case Study		Detail Paper
	W 11/23	NO CLASS - THANKSGIVING		
	F 11/25	NO CLASS - THANKSGIVING		

38	M 11/28	Proteome. Network Case Study		Detail Paper
39	W 11/30	Reverse Genetics I. Approaches		
40	F 12/2	Reverse Genetics II. Case Study		Detail Paper
41	M 12/5	Forward Genetics I. Approaches		
42	W 12/7	Forward Genetics II. Case Study		Detail Paper
	TBD	OUT OF CLASS EXAM		

Additional Reading Materials

Biochemistry and Molecular Biology of Plants, (Buchanan, Grissem, Jones, 2nd edition, 2015)

Molecular Biology of the Cell (Alberts et al., 6th 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

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/*
 - 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/*

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/

University of Florida Complaints Policy

The University of Florida believes strongly in the ability of students to express concerns regarding their experiences at the University. The University encourages its students who wish to file a written complaint to submit that complaint directly to the department that manages that policy.

A student who is unsure as to the official responsible for handling his or her particular complaint may contact the Ombuds office or the Dean of Students Office. For complaints that are not satisfactorily resolved at the department level or which seem to

be broader than one department, students are encouraged to submit those complaints to one of the following locations: Ombuds: <http://www.ombuds.ufl.edu/>
31 Tigert Hall, 352-392-1308

The purpose of the Ombuds office is to assist students in resolving problems and conflicts that arise in the course of interacting with the University of Florida. By considering problems in an unbiased way, the Ombuds works to achieve a fair resolution and works to protect the rights of all parties involved.

Dean of Students Office: <http://www.dso.ufl.edu/>
202 Peabody Hall, 352-392-1261

The Dean of Students Office works with students, faculty, and families to address a broad range of complaints either through directly assisting the student involved to resolve the issue, working with the student to contact the appropriate personnel, or referring the student to resources or offices that can directly address the issue. Follow up is provided to the student until the situation is resolved. Additionally, the University of Florida regulations provide a procedure for filing a formal grievance in Regulation 4.012: <http://regulations.ufl.edu/regulations/uf-4-student-affairs>