

Sequencing Plants, Pets and Pathogens: The Genomics of Non-Humans (3 credits)

PLPA 1902 – Fall Semester 2018
Tuesday / Thursday 1:30 – 2:45pm
Magrath Library 6
St. Paul Campus

Syllabus (version: 9/4/18)

Instructor

Nevin Young

[Plant Pathology](#)

[Plant Biology](#)

612-625-2225 / 320 Cargill Building

Office Hours: Most Fridays, 9:00 – 10:00 am. Please email before coming over.

Email Address: nevin@umn.edu

Note: Dr. Young is generally available to answer e-mail questions if this is more convenient. Also, Dr. Young is usually available to chat before or after class.

Time and Location

Classes meet in **Magrath Library 6 on Tuesdays and Thursdays from 1:30 to 2:45 pm**. Students should attend every class because new material not found in readings, videos or handouts is presented each day and this material is important for tests and assignments. Students should arrive ready to discuss the readings, handouts and videos assigned for that day.

Class Organization and Structure

Sequencing Plants, Pets and Pathogens: The Genomics of Non-Humans (PLPA 1902) is a Freshman Seminar that examines genomic insights into plants, animals and microbes. Students explore DNA sequencing of crop varieties, animal breeds and disease pathogens, the genetic basis of domestication, primate genomes, genome engineering, de-extinction, the DNA Tree of Life, and metagenomic sequencing of microbial communities and epidemics. Student learning comes primarily from videos, contemporary press articles, in-class practicums, group activities, and debates.

Canvas Site

<https://canvas.umn.edu/courses/72544>

(Best accessed through your own X500 password and Canvas Dashboard)

Textbook and Readings

There is no textbook for Sequencing Plants, Pets and Pathogens. All assigned readings and videos are found on the class Canvas site or handed out in class.

Learner Outcomes

- Understand basic principles of genomics, DNA sequencing and bioinformatic data-mining.
- Explore recent discoveries in non-human species made possible by advances in DNA sequencing and data-mining.
- Develop holistic perspective on the genomic basis of biology.
- Recognize commonalities in genomic information across biological systems.
- Appreciate the role of “big data” in sequence-based biology.
- Understand the impacts of DNA sequencing technologies on civic debates.
- Recognize the role of genomics on economic, environmental and agricultural decision-making.

GRADING (Version 9/4/18)

Grades for the course will be determined based on the following exams and assignments (details provided below):

- 100 points: Take-home Exam 1
- 100 points: Take-home Exam 2
- 80 points: Debate Participation
- 80 points: Student project and Voicethread video
- 45 points: Online Quizzes (10 Quizzes, 5 points each, Lowest score dropped)
- 30 points: Genomics Class Notes Forum (7 Forums, 5 points each, Lowest score dropped)
- 15 points: Dr. Young evaluation of class participation and intangibles
- **PROJECTED POINT TOTAL: 450 points**

Sorry, PLPA 1902 does not include an option for extra credit or re-submitted homework. Be sure to stay current and submit assignments on time.

Letter grades in PLPA 1902 are then calculated by the following formula:

A	94.00 and above
A-	90.00 - 93.99
B+	87.00 - 89.99
B	83.00 - 86.99
B-	80.00 - 82.99
C+	77.00 - 79.99
C	73.00 - 76.99
C-	70.00 - 72.99
D+	65.00 - 69.99
D	60.00 - 64.99
F	59.99 and below

I Assigned at the discretion of the instructor. This grade can only be given when, due to extraordinary circumstances, a student is prevented from completing the work of the course on time, but has already completed a significant portion of the class.

PLEASE NOTE: Grading for written assignments and essay questions will generally be guided by the following formula:

25% Scientific Accuracy

25% Depth

25% Creativity

25% Writing Quality

ALSO: Organization, legibility, and grammar are always taken into consideration in grading assignments! For any assignment handed in as a hard copy, please leave a 1.25" margin on the top and sides to provide space for instructor comments. Assignments should always be typed.

Grade Disputes

Students who feel an assignment has been graded incorrectly ***should submit a written or email explanation within one week of having the assignment returned. Grades cannot be disputed more than one week after an assignment or exam is returned.*** If the disputed grade is a matter of opinion, the entire assignment or exam will be given to the two other knowledgeable instructors for re-grading. Their decision will be final. Errors due to a simple miscalculation can be corrected immediately. The Student Dispute Resolution Center (sos@umn.edu or call 612-624-7272) is also available to help resolve grade conflicts if they arise.

QUIZZES, ASSIGNMENTS and EXAMS

Weekly Canvas Quizzes

Most weeks of the semester, there is a Canvas Quiz (5 points each) that is required between class on Tuesday and class on Thursday (some sections span weekends instead). You must complete this quiz before coming to class on Thursday or you will lose credit for that week. Every quiz relates to that week's videos, readings and class discussions. You will get two chances to do the quiz and you will see which answers were incorrect before starting your second try. There is no option for make-up quizzes, as they will be available on-line. *Please note*, your lowest quiz score will be dropped before calculating the final course grade.

Genomics Google Forum

Since there isn't an introductory textbook for the field of Non-Human Genomics, we will be writing our own study guide during the course of the semester. For this, students will need to contribute relevant, novel, and informative posts to a class-wide forum consisting of 8 thought questions. This activity is worth 5 points for each week's set of posts. Details about the timing, structure, number and focus will be described in further detail in class, but generally you need to upload your posts the day before we move onto a new subject area. Again, there is no option for make-up

forum posts, as the activity is available on-line. *Please note*, your Forum post with the lowest grade will be dropped before calculating the final course grade.

Before at-home exams and other major assignments, forum posts will be edited, annotated and organized by Dr. Young into a format that makes them more useful for studying.

Debates

The purpose of in-class debates is for you to appreciate differing opinions and arguments about controversial issues in genomics and sequence-based biology. Each student will participate in one of two in-class debates. For this, you will be randomly assigned to a small group of students, and either to the pro- or con- side. More details will follow around the time of the first debate.

Student Projects

The final week of classes, students will work in groups and present a video-based project on the genomics of a non-human species or a recent genomics-related discovery announced in the news. Projects need to go back to the original scientific article to enrich presentations. The project, which will be presented in class in VoiceThread video format, followed by Question and Answer, will be evaluated by all students in class as well as the instructor.

At-Home Exams

There will be two at-home Canvas exams. At least half of the questions will be fact-based, multiple choice questions derived from quiz and discussion questions throughout in the semester. Others will be short answer questions typed directly into the Canvas site. There is a time-limit for exams and each exam must be completed in one setting. That means you will need to plan ahead and ensure you have the time and materials needed for the exam once you begin.

Both **Canvas exams will be open-book** (you can consult any written or on-line resource) – **but you cannot discuss any part of the exam or receive any assistance from any other person, including other students in class.** Also remember, answers may be submitted to “TurnItIn” to ensure that there is no temptation to plagiarize.

COURSE MANAGEMENT

Excused Absences

If you miss more than one class period, written documentation for an excused absence will be required. In cases where you know ahead of time that you’ll be missing class(es), then please provide a written explanation to the instructor as far in advance as possible, and certainly no more than three days after any missed class or assignment. There are no plans for excused absences from the Canvas Quizzes, Google Forum, Canvas Exams or Student Project, since these activities can all be completed outside of the classroom.

Dr. Young will determine whether the absence is excused. Written documentation from a health clinic, physician, clergy, funeral director, coach or academic adviser will help to validate any requests for an excused absence.

Class Participation

Attending and participating in class on a regular basis is essential for succeeding in *Sequence Plants, Pets and Pathogens*. Subjects presented in class are explored in further detail through student discussion and are generally the topics covered most on exams.

To encourage class participation throughout the semester, Dr. Young will assign frequent in-class activities during class and you need to participate every time. **For many in-class activities, participating in a group is absolutely required.** Students are not allowed to sit by themselves during required small group activities.

Scholastic Conduct

All students in PLPA 1902 are expected to do their own work on graded assignment noted as such (even though collaboration and discussion among students is generally encouraged). To make it clear what types of activities are ***not acceptable*** in class, here is a summary of the University of Minnesota Student Handbook on Scholastic Conduct:

“cheating on assignments or examinations; plagiarizing, which means misrepresenting as your own work any part of work done by another; submitting the same paper or substantially similar papers to meet different course requirements without the approval and consent of all instructors concerned; depriving another student of necessary course material; or interfering with another student's work.”

None of these activities will be tolerated in PLPA 1902. Any scholastic misconduct will lead to failure or expulsion from class.

Students are also reminded that disrupting class is disrespectful to other students and can lead to dismissal from that class period. Repeated problems can lead to expulsion from class. ***The use of cell phones, tablets or laptops on activities unrelated to PLPA 1902 is not permitted. Cell phone conversations can never occur during class.***

Students who violate these rules or disrupt the learning environment for others will be dismissed from class, may receive a reduced final grade, and are also potentially subject to disciplinary action.

Disabilities

PLPA 1902 is committed to providing equitable access to learning opportunities for

all students. The Disability Resource Center (DRC) is the campus office that collaborates with students with disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (*e.g.*, mental health, attentional, learning, chronic health, sensory or physical), contact the DRC at 612-626-1333 (180 McNamara) to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with the DRC and have a current letter requesting accommodations, please contact the instructors early in the semester to review how those accommodations can be implemented in the course.

Constructive and Open Class Discussions

Everyone's experience and opinions will be valued. Everyone doesn't have to agree with one another, or even with the instructor – but differing viewpoints must be communicated respectfully. We should all strive to discuss and evaluate positions based on their supporting evidence and fact-based reasoning. Diverse types of supporting evidence are welcome. Everyone will be expected to learn from discussions and everyone will have the chance to test and, if desired, revise their views.

UNIVERSITY OF MINNESOTA STANDARDIZED COURSE INFORMATION

Student Workload Statement

- Sequencing Plants, Pets and Pathogens meets twice per week, 75 minutes per session, throughout the semester.
- Students are expected to attend all classes unless special arrangements have been made ahead of time or students provide documentation for an excused absence.
- Most weeks there is approximately 1.5 hour of reading and/or video viewing that takes place outside of class.
- Most weeks there is a Subject Mastery Quiz (Canvas) that students need to complete before coming to the Thursday class session.
- Most weeks there is a group Google Forum to which students must contribute.
- Midway through the semester, students participate as part of a larger group in a genomics debate.
- During the final third of the semester, students will develop individual and group presentations on a chosen genomic topic.

Class Structure

- Tuesday classes are usually lecture / discussion with presentation of new

topics and material.

- Thursday classes usually include small group learning activities that are based on readings and/or videos outside the classroom combined with active learning in the classroom.
- Students are expected to complete the readings / videos and on-line mastery quiz (graded) before coming to class.
- Selected controversial topics will be explored through the use of formal “Lincoln-Douglas” style debates, where students develop argument defending either the pro- or con- side of the topic.
- Throughout the semester, student attendance, participation, responses and feedback will be enabled through various Canvas-based activities.

Major Milestones

- There are two take-home exams during the semester. Together, these exams are approximately 50% “fact-based science” and 50% student reflection about nuanced, controversial or evolving topics.
- Students participate in one of two in-class debates, in 2018 tentatively planned to focus on the following topics: “De-Extinction” and the other on the topic of “CRISPR/Gene Drive”. Active participation in the debate, a corresponding write-up, and peer evaluation are all required for this activity.
- Students will choose a genomics-related topic midway through the semester as the basis for a project that includes both an individual Powerpoint report as well as a group-based VoiceThread video, presented in class and followed by a question and answer session. A graded progress report form, submitted halfway through the project, is required.

SEQUENCING PLANTS, PETS AND PATHOGENS (FALL 2018)				
(version 07/13/18)				
Week	Date	Modules / Titles	In Class Activities	Homework
Week 1	9/4/18	Course Intro & Genomics Quickstart	Class Intro / What Is Genomics?	–
	9/5/18	Genes and Genomes Video/Quiz	–	Canvass Quiz (1) (due 9/6/18)
	9/6/18	Genomics Review & Sequencing Preview	How to Sequence the Human Genome	Google Forum (1) (due 9/10/18)
Week 2	9/11/18	Next Generation DNA Sequencing	How to Sequence DNA	Before class: "How to sequence..."
	9/12/18	DNA Blast Searching Tutorial Video/Quiz	–	Canvass Quiz (2) (9/13/18)
	9/13/18	BLAST-ing a Genome Sequence	Data-mining a DNA Sequence	Google Forum (2) (9/17/18)
Week 3	9/18/18	Exploring Genome Architecture	Maize genome sequence case study	Before class: "How do you build a genome...?"
	9/19/18	DNA Transposons Video/Quiz	–	Canvass Quiz (3) (9/20/18)
	9/20/18	Browsing Genome Sequences (+Epigenomics)	Data-mining a DNA Sequence	Google Forum (3) (9/24/18)
Week 4	9/25/18	Domestication Genomics	Domestication of Horses, Cats & Dogs	"Cat Domestication..."
	9/26/18	Corn Domestication Video/Quiz	–	Canvass Quiz (4) (9/27/18)
	9/27/18	Evo-Devo Genomics	Evo-Devo & The Octopus Genome	Google Forum (4) (10/1/18)
Week 5	10/2/18	Genetic Testing	SNPs & DNA Chips	Before class: "Where did your dog come from?"
	10/3/18	DNA Testing Thoroughbreds Video/Quiz	–	Canvass Quiz (5) (10/4/18)
	10/4/18	A Peak at Human Genome Testing	23 and Me Website	(no google forum)
	10/4/18	CANVASS EXAM 1	–	Due Tuesday, 10/9/18 @ 1:30pm
Week 6	10/9/18	Engineering Genomes	Modifying genomes with CRISPRs	Before class: "Basics of gene cloning"
	10/10/18	CRISPR/Cas9 Video/Quiz	–	Canvass Quiz (6) (10/11/18)
	10/11/18	Debate Preparation	CRISPR Debate Preparation	–
Week 7	10/16/18	CRISPRs Debate (1)	"CRISPRs should be treated as genetic engineering"	Write-ups & Peer Evaluations (due 10/17/18)
	10/18/18	Sequencing Ancient Organisms	Sequencing Ancient DNA	Before class: "Footprints of climate change"
	10/20/18	Woolly Mammoth Video/Quiz	–	Canvass Quiz (7) (10/23/18)
Week 8	10/23/18	Debate Preparation	De-Extinction Debate Preparation	–
	10/25/18	De-extinction Debate (2)	"Extinct organisms should be brought back to life"	Write-ups & Peer Evaluations (due 10/29/18)
Week 9	10/30/18	Sequencing Hominids	Neanderthal and Desnovian Genomes	Before class: "How Neanderthal are you?"
	10/31/18	Neanderthal & Desnovian Mating Video/Quiz	–	Canvass Quiz (8) (11/1/18)
	11/1/18	Function of Neanderthal Genes	Neanderthal Genes in Human Genomes	Google Forum (5) (11/5/18)
Week 10	11/6/18	DNA Tree of Life and Project Intro	Phylogenomics and Student Projects	Before class: "How does genetic info evolve"
	11/8/18	Sequencing Microbial Communities	Microbiology, Metagenomics and Microbiomes	Before class: "Archae and the Tree of Life"
	11/9/18	Invisible Universe of Microbiome Video/Quiz	–	Canvass Quiz (9) (11/13/18)
Week 11	11/13/18	Human Microbiome	Human Microbiome & Microbiome websites	Google Forum (6) (11/14/18)
	11/15/18	Sequencing Epidemics	Sequencing Pathogenic Microbes	Before class " Ebola evolved In deadlier enemy"
	11/17/18	Genome Sequencing for Pathogens Video/Quiz	–	Canvass Quiz (10) (11/20/18)
Week 12	11/20/18	Tracking Epidemics	Disease Sequence Tracking Case Studies	Google Forum (7) (11/26/18)
	11/22/18	(THANKSGIVING)		
Week 13	11/27/18	Student project preparations	Student project individual work	–
	11/29/18	Student project preparations'	Student project individual work	–
Week 14	12/4/18	Student Projects 1	Student video presentations & question/answers	Voicethread / Presentations
	12/6/18	Student Projects 2	Student video presentations & question/answers	Voicethread / Presentations
	12/10/18	CANVASS EXAM 2	–	Due Tuesday, 12/11/18 @ 1:30pm