**Course Syllabus: Spring 2022**

**Molecular Genetics of Plant-Pathogen Interactions**

**Plant Pathology 535 - 3 credits; Tu, Th 9:10-10:25**

**Instructor:**

Kiwamu Tanaka [kiwamu.tanaka@wsu.edu](mailto:kiwamu.tanaka@wsu.edu)

**Guest lecturers:**

Weidong Chen [w-chen@wsu.edu](mailto:w-chen@wsu.edu)

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**Course Overview:**

Plants are continuously exposed to various stresses caused by changes in the environment and attacks by other organisms. Accordingly, plants have developed multiple layers of sophisticated surveillance systems that recognize potentially life-threatening events before those organisms have a chance to cause serious damage. Our scientific interests have always been to understand the intricate and complex nature of interactions between plants and pathogenic microbes. Why do plants succumb to disease? How do certain microbes take advantage of a plant’s inner-workings to grow and reproduce? The aim of this course is to understand basic mechanisms of plant innate immunity.

**Course Objectives:**

a) To provide you with an understanding of the biology, physiology, genetics, and biochemistry of interactions between plants and their pathogens

b) To provide you with a good working knowledge of current research tools used to address questions in plant-pathogen interactions

c) To provide you with the analytical tools to critically evaluate the scientific literature, design experiments and rigorously test scientific hypotheses of plant-pathogen interactions

**Lectures and Discussions:**

Two 75-minute classroom periods per week. We will not be following a strict lecture format in each time slot but rather will have a mix of lecture and discussion. We would like to keep the course as interactive as possible. There will be 9 - 12 discussion sessions during the semester (depending on student numbers). These will be led by groups of students. Students will be organized randomly into groups of 5 or 6 at the middle of the semester. Students will be graded based on their level of participation, as a group and as individuals, in these discussions.

**Laboratories:**

This course has no laboratory component

**Discussion and Evaluation of Research Papers:**

We will critically evaluate several research papers throughout the semester dealing with various aspects of plant-pathogen interactions. Discussions will be led by groups of students using an active learning format. **You will be expected to participate actively in these discussions and 30% of your grade will be based on participation in class discussions** and your role in facilitating discussion in the class when you are leading the discussion. Students will be selected at random and assigned to each weekly discussion section. The discussion of each paper will be led by a different group. The papers can be found on the Canvas website <https://canvas.wsu.edu>.

**Exams:**

We will have two exams, one covering the first half of the class on **March 1** and one covering the second half on **May 4**. Each exam will be worth 35% of your grade.

**Discussions Groups:**

Each student will be randomly assigned to a discussion group at the beginning of the semester. Discussion groups will be randomly assigned to topics. The topics will be covered in the order listed in updated versions of the Topic Schedule. The Topic Schedule can be found on the Canvas website.

**References:**

There is no comprehensive textbook available which is suitable for a course at this level. However, reference material will be placed in the Canvas website <https://canvas.wsu.edu>. The additional reading will include more review articles, while most of the discussion papers will be primary research papers. Homework problems will also be used to illustrate basic concepts. These can be found in the Canvas website.

**Class notes:**

Class notes for most lectures will be placed on the Canvas website.

**Study Habits:**

Complete reading assignments prior to class. If the next lecture period is a discussion paper, discuss the study questions with the members of your group and be prepared to discuss them in class. Be sure to ask questions about things you don’t understand during the discussions. Exams will cover information from assigned reading as well as highlights from the discussion papers. Any topics covered in class are potential material for exams.

**Evaluation:** You will be evaluated in three different ways. Each component is presented as a percentage of your final grade:

a) general discussion participation, as a group and as an individual: 30%

b) midterm examination (closed-book, closed-note exam): 35%

c) final examination (closed-book, closed-note exam): 35%

**Students with Disabilities**:

Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, please visit the Disability Resource Center (DRC). All accommodations MUST be approved through the DRC (Admin Annex Bldg, Room 205). Please stop by or call 509-335-3417 to make an appointment with a disability specialist.

**Academic Integrity:**

Academic integrity will be strongly enforced in this course. Any student caught cheating on any assignment will be given an F grade for the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions. <http://standards.wsu.edu/policies/standards-of-conduct/>

**Cheating includes plagiarism; FOR THIS CLASS, PLAGIARISM IS THE COPYING OF ONE OR MORE COMPLETE SENTENCES FROM ANY SOURCE (regardless of source citation). (PLAGIARISM CHECKER SOFTWARE WILL BE USED)**

Academic integrity is the cornerstone of the university. You assume full responsibility for the content and integrity of the academic work you submit. You may collaborate with classmates on assignments, with the instructor's permission. However, the guiding principle of academic integrity shall be that your submitted work, examinations, reports, and projects must be your own work. Please use these resources to ensure that you don’t inadvertently violate WSU's standard of conduct. Violation of copyright laws and the intellectual property rights of others is prohibited. Prohibited acts include, but are not limited to:

1. Posting the works of another person on an internet website without the permission of the creator;
2. Copying the creative works of another without the permission of the creator;
3. Selling a recording of a presentation by another without the permission of the presenter;
4. Claiming the works of another as one’s own;
5. Using the copyrighted works or intellectual property of another for profit without the permission of the owner;
6. Copying or digitally transmitting video or audio files without the permission of the owner; or displaying a copyrighted work publicly without the permission of the owner.

**Safety:**

The Campus Safety Plan, which can be found at <http://safetyplan.wsu.edu>, contains a comprehensive listing of university policies, procedures, statistics, and information relating to campus safety, emergency management, and the health and welfare of the campus community. Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “***Alert, Assess, Act***” protocol for all types of emergencies and the *“Run, Hide, Fight”* response for an active shooter incident. Remain ***ALERT*** (through direct observation or emergency notification), ***ASSESS*** your specific situation, and ***ACT*** in the most appropriate way to assure your own safety (and the safety of others if you are able). Please sign up for emergency alerts on your account at MyWSU (<https://my.wsu.edu/>). For more information on this subject, campus safety, and related topics, please view the FBI’s *Run, Hide, Fight* video (<https://www.fbi.gov/>) and visit the WSU safety portal (<https://faculty.wsu.edu/classroom-safety/>).



**Course Schedule**

Class meets at 9:10 - 10:25 AM on Tuesdays and Thursdays

# Date Instructor Topic

~~0 Jan. 11 Tanaka Cancelled due to severe weather alert~~

1 Jan. 13 Tanaka Overview of the class

2 Jan. 18 Tanaka Brief history of plant pathology and disease triangle

3 Jan. 20 Tanaka Strategies of pathogenicity

4 Jan. 25 Tanaka Plant immune responses (PTI: pattern-triggered immunity)

5 Jan 27 Tanaka Plant immune responses (ETS: effector-triggered susceptibility)

6 Feb 1 Tanaka Plant immune responses (ETI: effector-triggered immunity)

7 Feb. 3 Tanaka Gene-for-gene disease resistance

8 Feb. 8 Tanaka Damage-associated molecular patterns (DAMPs)

9 Feb. 10 Tanaka Plant hormones in defense responses (SA, JA, ET, etc.)

10 Feb. 15 Tanaka Plant systemic resistance and immunity memory

11 Feb. 17 Tanaka Plant-symbiont interactions (nodulation, mycorrhizaion, etc.)

12 Feb. 22 Tanaka Discussion about the zig-zag model

13 Feb. 24 Tanaka Genetic study for plant immunology

14 March 1 Tanaka Make up

**15 March 3 Midterm examination**

16 March 8 Tanaka Strategies to prevent plant diseases

17 March 10 Tanaka Overview of the journal discussion

March 15 & 17 Spring Break

18 March 22 Pappu Viral RNA silencing

19 March 24 Pappu Discussion Paper #1

20 March 29 Gleason Nematode effectors

21 March 31 Gleason Discussion Paper #2

22 April 5 Jewell Plant systemic resistance

23 April 7 Jewell Discussion Paper #3

24 April 12 Chen Apoplastic effectors from necrotrophs

25 April 14 Chen Discussion Paper #4

26 April 19 Smertenko Autophagy and plant immunity

27 April 21 Smertenko Discussion Paper #5

28 April 26 Tanaka Calcium and ROS signaling for PTI and ETI

29 April 28 Tanaka Discussion Paper #6

**30 May 4 (Wed) Final examination (8:00 – 10:00 AM)**

**PL\_P 535 Class Roster**

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| **In-person participants** | | | |
| **Name** | **Email** | **Location** | **Affiliation** |
| Austin Alt | austin.alt@wsu.edu | Pullman | MPS |
| Jeremy Boutin | jeremy.boutin@wsu.edu | Pullman | MPS |
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|  |  |  |  |
| **Remote participants** |  |  |  |
| **Name** | **Email** | **Location** | **Affiliation** |
| Amber Loptien | amber.loptien@wsu.edu | Prosser | PLP |
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