

# PLANT PATHOLOGY, PH.D.

The discipline of plant pathology is directed toward understanding and solving disease problems of plants. The field is broad and complex, integrating disciplines as varied as molecular biology, genetics, cell biology, organismal biology, population and community ecology, meteorology, statistics, computer science, chemistry, and physics. Plant pathology encompasses basic and applied research, employs both model systems and economically important plants, and requires both laboratory and field experimentation. Active research programs in the department encompass this full spectrum of questions and approaches, including research on virology, nematology, fungal genetics, tissue culture, soil microbiology and ecology, forest pathology, bacterial plant pathogens, molecular biology of parasite–host interactions, microbial ecology, epidemiology, and integrated disease management strategies.

The graduate program in plant pathology educates students in the science of plant pathology and prepares them for successful careers. Students develop the following skills required to meet diverse professional situations: excellence in research; breadth and depth in plant pathology; breadth in an allied field; strong critical and analytical thinking skills; and effective communication skills. Students become sufficiently knowledgeable in all aspects of plant pathology to identify key research questions, recognize significant discoveries, and think analytically about interpretation of data.

The level of proficiency in specific areas will vary with the student's research area and career goals, and will be appropriate to the student's degree program (M.S. or Ph.D.). Specific areas of proficiency addressed by the Ph.D. curriculum include etiology, diagnosis, and management of plant disease; ecology and epidemiology; genetics and physiology of plant–microbe interactions; and organismal biology. Ph.D. students may elect an optional professional development experience as part of their curriculum. Graduates of the program attain positions in teaching, research in academic positions, government services, industry, extension services, and private practice.

The program is comprised of about 100 faculty members, graduate students, and research and support staff. It is housed in an eight-story wing of Russell Laboratories, a teaching and research facility on the UW–Madison campus, which is surrounded by other facilities that are also devoted to biological research. Russell Labs, together with the extensive research facilities available on the rest of the UW–Madison campus and at field research stations throughout Wisconsin, provide a rich and comprehensive environment for research and graduate studies in all branches of plant pathology.

## ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched

the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 1
Spring Deadline	December 1*
Summer Deadline	December 1
GRE (Graduate Record Examinations)	Not required.
English Proficiency Test	Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements ( <a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

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This program does not normally admit students for the Spring term. Students should apply for Fall admission unless instructed otherwise by the program.

Students who are admitted to the department must meet the Graduate School requirements, including completion of a bachelor's degree. Satisfactory preparation for graduate study in plant pathology includes coursework in biology, chemistry, math, and physics. Successful applicants have generally completed this foundation coursework before admission (see UW–Madison equivalent courses below). However, if foundation course requirements have not been fulfilled before matriculation, they must be completed as early as possible in the course of study.

Successful applicants typically exceed the minimum requirement of a 3.0 GPA (on a 4.0 scale); exceed the minimum required Test of English as a Foreign Language (iTOEFL) score of 92, or a 7 on the International English Language Testing System (IELTS) exam (international applicants); and articulate a strong interest in the discipline in their application. Prior research experience is an asset for any applicant, and letters of recommendation from research advisors are viewed as one of the most useful means of evaluating applications.

The application deadline for the fall semester is the preceding December 1. Applications received after that date will be reviewed, but they are disadvantaged for admission and financial support.

A complete admission application acts as the application for financial support. Offers of financial support accompany offers of admission for students admitted to Plant Pathology. Most students hold research assistantships (RAs).

Code	Title	Credits
<b>FOUNDATION COURSES</b>		
<b>Biology (must complete 3 out of 4)</b>		
GENETICS 466	Principles of Genetics	3
BOTANY 300 or BOTANY 305	Plant Anatomy Plant Morphology and Evolution	4
BOTANY 500	Plant Physiology	3–4

F&W ECOL/ BOTANY/ ZOOLOGY 460	General Ecology	4
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**Chemistry**

Inorganic Chemistry (complete one of the following options)

CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	9
CHEM 109	Advanced General Chemistry	5

*Organic Chemistry (complete one of following options)*

CHEM 341 & CHEM 342	Elementary Organic Chemistry and Elementary Organic Chemistry Laboratory	4
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CHEM 343 & CHEM 344 & CHEM 345	Organic Chemistry I and Introductory Organic Chemistry Laboratory and Organic Chemistry II	8
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*Biochemistry (complete one of the following options)*

BIOCHEM 501	Introduction to Biochemistry	3
BIOCHEM 507 & BIOCHEM 508	General Biochemistry I and General Biochemistry II	6-7

**Physics (complete one of the following options)**

PHYSICS 103 & PHYSICS 104	General Physics and General Physics	8
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PHYSICS 201 & PHYSICS 202	General Physics and General Physics	10
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PHYSICS 207 & PHYSICS 208	General Physics and General Physics	10
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**Calculus**

MATH 221	Calculus and Analytic Geometry I (recommended) <sup>1</sup>	5
or MATH 211	Calculus	

**Statistics**

STAT 371	Introductory Applied Statistics for the Life Sciences	3
or STAT 301	Introduction to Statistical Methods	

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MATH 211 can also meet foundational requirements, but unlike MATH 221 it is not targeted for Biology students. Students looking to meet foundation requirements through UW-Madison coursework are advised to take MATH 221.

**FUNDING****GRADUATE SCHOOL RESOURCES**

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

**PROGRAM RESOURCES**

The department offers stipends to the most highly qualified applicants, and students are funded throughout their programs by research assistantships, fellowships, or traineeships. The department nominates

outstanding students for external fellowships and supports and assists students who apply for scholarships and other forms of financial support.

Additional information regarding funding can be found on the department's funding information webpage (<https://plantpath.wisc.edu/funding-information/>).

**REQUIREMENTS****MINIMUM GRADUATE SCHOOL REQUIREMENTS**

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirementsstext>), in addition to the program requirements listed below.

**MAJOR REQUIREMENTS****MODE OF INSTRUCTION**

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

**Mode of Instruction Definitions**

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

**Evening/Weekend:** Courses meet on the UW-Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW-Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

**CURRICULAR REQUIREMENTS****Requirement Detail**

Minimum	51 credits
Credit Requirement	

Minimum	32 credits
Residence Credit Requirement	

Minimum Graduate Coursework Requirement	26 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy ( <a href="https://policy.wisc.edu/library/UW-1244">https://policy.wisc.edu/library/UW-1244</a> ).
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Overall Graduate GPA Requirement	3.00 GPA required. This program follows the Graduate School's policy: <a href="https://policy.wisc.edu/library/UW-1203">https://policy.wisc.edu/library/UW-1203</a> ( <a href="https://policy.wisc.edu/library/UW-1203/">https://policy.wisc.edu/library/UW-1203/</a> ).
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Other Grade n/a  
Requirements

Assessments and Examinations Students in the Plant Pathology Ph.D. must complete certification paperwork to outline their coursework, pass a departmental written qualifying exam, pass an oral preliminary examination, and prepare, publicly present, and defend a dissertation.

Language Requirements None.

Graduate School Breadth Requirement All doctoral students are required to complete a doctoral minor or graduate/professional certificate.

## REQUIRED COURSES

Students must complete the foundation requirements; UW-Madison coursework that can be used to meet foundation requirements is listed on the Admissions tab. The expectation is that a majority of these are met through undergraduate coursework, often taken at other universities during a student's undergraduate career. A review of undergraduate transcripts to check for foundation requirements is part of the admission process, and students are notified if they will be required to take foundation requirements as part of their graduate program of study. Foundation courses include three of four from Genetics, Plant Anatomy/Morphology, Plant Physiology, and General Ecology; 2 semesters of General Chemistry, Organic Chemistry (including a lab), and Biochemistry; one semester of General Physics (with lab); and Introductory Calculus and Statistics.

Major requirements include the courses listed below. The remaining credits to fulfill the credit minimum are electives in consultation with the student's advisor and committee.

Code	Title	Credits
<b>MAJOR REQUIREMENTS</b>		
PL PATH 300	Introduction to Plant Pathology	4
PL PATH/BOTANY/ ENTOM 505	Plant-Microbe Interactions: Molecular and Ecological Aspects	3
PL PATH 559	Diseases of Economic Plants	3
PL PATH 602	Ecology, Epidemiology and Control of Plant Diseases	3
PL PATH 799	Practicum in Plant Pathology Teaching	2
PL PATH 875	Special Topics (Must complete two semesters)	1-4
PL PATH 923	Seminar (Must complete two semesters)	1

## POLICIES

### GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

## MAJOR-SPECIFIC POLICIES

### PRIOR COURSEWORK

#### Graduate Work from Other Institutions

This program follows the Graduate School's policy for (<https://policy.wisc.edu/library/UW-1216/>) Graduate School Transfer Credits for Prior Coursework. (<https://policy.wisc.edu/library/UW-1216/>)

#### UW-Madison Undergraduate

This program follows the Graduate School's policy for (<https://policy.wisc.edu/library/UW-1216/>) Graduate School Transfer Credits for Prior Coursework. (<https://policy.wisc.edu/library/UW-1216/>)

#### UW-Madison University Special

This program follows the Graduate School's policy for (<https://policy.wisc.edu/library/UW-1216/>) Graduate School Transfer Credits for Prior Coursework. (<https://policy.wisc.edu/library/UW-1216/>)

### PROBATION

This program follows the Graduate School's Probation policy (<https://policy.wisc.edu/library/UW-1217/>).

### ADVISOR / COMMITTEE

This program follows the Graduate School's Advisor policy (<https://policy.wisc.edu/library/UW-1232/>) and the Graduate School's Committees policy. (<https://policy.wisc.edu/library/UW-1201/>)

### CREDITS PER TERM ALLOWED

15 credits

### TIME LIMITS

This program follows the Graduate School's Time Limits policy (<https://policy.wisc.edu/library/UW-1221/>). A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

### GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
  - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employeeabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)

- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

### Plant Pathology Grievance and Appeals Procedures

If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve academic and non-academic grievances. Students' concerns about unfair treatment are best handled directly with the person responsible for the objectionable action. If the student is uncomfortable making direct contact with the individual(s) involved, they should contact the Plant Pathology Department Chair, the Student Services Coordinator, or the Russell Labs Department Administrator.

Students are encouraged to also use campus resources (above) if the issue involves sexual harassment or assault, violence, discrimination, bias or hate, hostile or intimidating behavior, employment concerns, or disability accommodations.

Procedures for proper accounting of student grievances:

1. The student is encouraged to speak first with the person toward whom the grievance is directed to see if a situation can be resolved at this level.
2. Should a satisfactory resolution not be achieved, the student should contact the Plant Pathology Department Chair, the Student Services Coordinator, or the Russell Labs Department Administrator to discuss the grievance. Students can also contact any of the Russell Labs Department Chairs to discuss the grievance. Any of the above people will facilitate problem resolution through informal channels and facilitate any complaints or issues of students. The first attempt is to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties if necessary.
3. If the issue is not resolved to the student's satisfaction the student can submit the grievance to the Department Chair and Student Services Coordinator in writing, within 120 calendar days of the alleged unfair treatment.
4. On receipt of a written complaint, a faculty committee will be convened to manage the grievance. The program faculty committee will obtain a written response from the person toward whom the complaint is directed. This response will be shared with the person filing the grievance.
5. The faculty committee will determine a decision regarding the grievance, and will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.
6. At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty committee, the party may file a written appeal. Either party has 15

working days to file a written appeal to the College of Agricultural and Life Sciences Academic Affairs Office.

7. Documentation of the grievance will be stored for at least 7 years. Significant grievances that set a precedent will be stored indefinitely.

The Graduate School has procedures for students wishing to appeal a grievance decision made at the school/college level. These policies are described in the Graduate School's Academic Policies and Procedures: <https://grad.wisc.edu/documents/grievances-and-appeals/>.

### OTHER

n/a

## PROFESSIONAL DEVELOPMENT

### GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

### PROGRAM RESOURCES

Students in the Department of Plant Pathology are strongly encouraged to participate in events through the Plant Pathology Graduate Council. (<http://labs.russell.wisc.edu/ppgc/>)

## LEARNING OUTCOMES

1. Demonstrate an understanding of the basic processes of pathogenesis, plant defense, and defense circumvention at the molecular, genetic and physiological level for each of the major groups of plant pathogens and other plant associated microorganisms.
2. Demonstrate an understanding of the basic biology of microorganisms that are symbiotic with plants including fungi, bacteria, viruses, oomycetes, and nematodes.
3. Demonstrate an understanding of the etiology, ecology, and epidemiology of economically significant diseases caused by the major groups of plant pathogens.
4. Construct disease management strategies for the different groups of important plant pathogens.
5. Demonstrate excellent problem solving skills and a deep conceptual understanding of the science of Plant Pathology.
6. Convey knowledge in a variety of formats to diverse audiences including the public, students, and fellow scientists.

## PEOPLE

### FACULTY

Ahlquist, Paul  
 Allen, Caitilyn  
 Barak-Cunningham, Jeri  
 Bent, Andrew  
 Gevens, Amanda (chair)  
 Holland, Leslie  
 Handelsman, Jo  
 Kabbage, Mehdi  
 Koch, Paul  
 Lankau, Richard

Rakotondrafara, Aurelie  
Silva, Erin  
Solis-Lemus, Claudia  
Smith, Damon

### **AFFILIATED FACULTY**

Ane', Jean-Michel (Bacteriology)  
Groves, Russell (Entomology)  
Havey, Michael (Horticulture)  
Keller, Nancy (Medical Microbiology & Immunology)  
Pringle, Ann (Botany)  
Whitman, Thea (Soil Science)  
Yu, Jae-Hyuk (Bacteriology)

### **FACULTY ASSOCIATE**

Hudelson, Brian