

**A GUIDE FOR**

**GRADUATE STUDIES**

**IN**

**PLANT CELLULAR AND MOLECULAR BIOLOGY**

**The Ohio State University**

December, 2003

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## I. INTRODUCTION

### A. Program Goal

The goal of the Plant Cellular and Molecular Biology (PCMB) Graduate Program is to provide a superior academic environment and research facilities for talented and motivated young scientists to develop independent thinking and experimental skills to address fundamental biological problems. The program achieves this goal through a combination of rigorous coursework, seminars by prominent scientists, and original research closely guided by the faculty.

### B. Programs of Study

PCMB offers programs leading to Master of Science (M. Sc.) and Doctor of Philosophy (Ph.D.) degrees with research areas covering molecular biology, cell biology, developmental biology, biochemistry, physiology, structure and biotechnology. Moreover, PCMB faculty participate actively in interdisciplinary programs such as Environmental Science, Molecular, Cellular, and Developmental Biology (MCDB), Plant Molecular Biology and Biotechnology (PMBB), Ohio Biochemistry Program (OBP), and Biophysical Program. These programs facilitate interactions among the different departments within the College of Biological Science and among the different colleges.

### C. This Guide

This Guide will be distributed to all PCMB students, staff and faculty electronically. Any individual who wishes to receive a personal hardcopy should contact the PCMB Graduate Program Secretary Ms. Denise Blackburn-Smith:

**E-mail:** [blackburn-smith.2@osu.edu](mailto:blackburn-smith.2@osu.edu)

**Regular mail:** Graduate Program, Department of Plant Cellular and Molecular Biology, The Ohio State University, 500 Aronoff Laboratory, 318 W. 12<sup>th</sup> Avenue, Columbus, OH 43210-1293.

For further information about graduate studies, please visit the following websites:

*OSU Graduate School:* <http://www.gradsch.ohio-state.edu/>

*PCMB Department:* <http://www.biosci.ohio-state.edu/~plantbio/plantbio.html>

### D. Petition

All rules and regulations in this guide may be petitioned under extraordinary circumstances. Petitions should be made in consultation with your advisor and submitted to the Graduate Studies Committee by your advisor for approval.

## II. THE REQUIREMENTS FOR ADMISSION AND MAINTENANCE OF GOOD STANDING

### A. Requirements for Admission

Applicants to the PCMB Graduate Program must submit a completed OSU graduate application, transcripts of all prior college work, three letters of recommendation, a statement of purpose, and scores for the GRE General test. Undergraduate course work in physics, calculus, and genetics as well as a background in plant sciences strengthens the application. International applicants must also submit scores from the TOEFL or Michigan Test of Written English. If an international applicant wishes to be considered for Graduate Teaching Associateship, scores from the Test of Spoken English (TSE) are also mandatory. In general, the department will not consider applicants with a grade-point average below 3.0, a TOEFL score below 500, or a Michigan Test score below 80. Each applicant will be evaluated on the basis of his/her complete application file, rather than by any single criterion.

In general, PCMB students are supported as Graduate Teaching Associate (GTA) or Graduate Research Associate (GRA) with tuition and fee waivers. Exceptional first-year students may be supported by departmental or university fellowships. All students are eligible to compete for various university fellowships. Information for such fellowships may be found in the Graduate School web pages. All financial support is contingent upon the conditions that the student maintains good academic standing (see below and Graduate School Handbook), fulfills the assigned duties associated with the support, and has a valid visa status (for international students). See section VI for more details.

### B. Requirements for Minimal Grades

Students who receive a grade of C+ or lower (including U's in S/U courses) in two courses required for a degree program within the Department will be denied further registration in the Department. Students who are on academic probations (below 3.0 cumulative grade point) for two successive quarters will be ineligible for financial support from the Department.

### C. Number of Credit Hours To Register

The number of credit hours a student needs to register for each quarter depends upon whether the student is a Graduate Associate (GA) or not. A Graduate Associate includes an appointment as a GTA, GRA or a Graduate Administrative Associate (GAA). See Section VI on "Graduate Associates" for more details.

- GAs holding a 50% or greater appointment must register for at least 9 hours in Autumn, Winter and Spring quarters, and at least 7 hours in the Summer.

- Doctoral students who have passed their Admission to Candidacy Exam (see section V.F) must register for at least 12 credit hours for each quarter, including the Summer quarter, in which they hold a 50% or greater GA appointment.
- Students holding graduate fellowships must register for at least 15 credit hours for each quarter.

It is strongly recommended that a graduate student pursuing a Ph.D. degree registers for not more than a total of 260 credit hours for the entire period of graduate studies.

#### **D. Annual Report**

All students must complete an annual evaluation form (Appendix A) and submit it to the GSC chair. The form must be submitted by the end of the winter quarter of succeeding year.

### **III. IMPORTANT RESOURCES FOR ASSISTANCE**

#### **The Graduate School Handbook**

All graduate students are advised that their program of study, although administered by the Department, must satisfy both Departmental and Graduate School requirements. All programs are subject to approval by the Graduate School. It is very important that you become acquainted with the requirements of your degree program as outlined in the current Graduate School Handbook.

#### **The Graduate Studies Committee**

The PCMB Graduate Studies Committee (GSC) serves as the link between you and your advisor on the one hand and the Graduate School on the other. If you have questions about either departmental or Graduate School requirements which your advisor is unable to answer, see the GSC Chair. He/she will also represent you in Graduate School matters, certify your status when necessary, and supply you with Graduate School forms (e.g., Permission to Take the Admission to Candidacy Exam, Application to Graduate) when necessary.

## IV. MASTER OF SCIENCE DEGREE PROGRAM

Plant Cellular and Molecular Biology (PCMB) offers the Master of Science (M.Sc.) degree under both Graduate School thesis and non-thesis options. A student will be admitted into the non-thesis option only under extraordinary cases. The PCMB GSC will review such cases carefully and make the decision accordingly. For both options, a student bears full responsibility to establish an Advisory Committee consisting of faculty members during the first quarter to guide his/her studies.

### A. Thesis Option (Plan A)

#### i. Course Requirements

In addition to fulfilling the requirements of the Graduate School, candidates for the M.Sc. degree shall have completed, with a grade of B- or higher and prior to taking the Master's examination, at least 12 credits in PCMB courses.

These requirements cannot be met by auditing. All graduate students must take a minimum of 23 quarter-hours (excluding 693 and 999 and seminars) of graduate credit courses while in residence in the OSU Graduate School. All students must register for a minimum of three (3) quarters of Plant Biology 999 before the M.Sc. degree will be granted.

During the autumn, winter and spring quarters each year when they are enrolled, all students are required to attend the PCMB departmental seminars (PB 800). Each student should enroll for 1 hour of credit for PB 800 under the direction of the GSC Chair. Attendance will be taken. Attendance at less than 70% of the seminars in a quarter will result in an unsatisfactory grade ("U"). If a student anticipates missing the seminars due to time conflict with other academic activities such as performing GTA duties, the student must obtain approval from the GSC prior to the beginning of each quarter. Once the quarter begins, the GSC will not honor any excuses from a student for missing seminars, except for under extraordinary situations such as medical emergencies.

In addition to having 12 credits in courses within the Department, a student shall have had at least one (non-audit) course each in physics, calculus, and genetics. If these courses are not a part of a student's undergraduate training, they must be taken for credit during the first year of residency.

#### ii. Teaching Requirement

All *Plan A* M. Sc. students are required to teach one quarter at the introductory level (100-200 level courses).

#### iii. Transfer Credits

Refer to the Graduate School Handbook for rules on transfer credit. Students may transfer up to 10 hours towards the M. Sc. degree from an accredited University.

#### **iv. Advisory Committee**

Each student should establish an Advisory Committee consisting of at least three Graduate faculty members (including the research advisor), at least two of which must be members of the PCMB Graduate Program. Normally the Advisory Committee also conducts the Master's Examination and evaluates the Master's thesis. The membership of the Advisory Committee must be approved by the GSC.

The Advisory Committee should meet during the first year of the student's studies to discuss the student's course program and research project. The Committee may meet at other times during the student's program as necessary.

#### **v. Thesis**

The draft of the Master's Thesis should be provided to the members of the Advisory Committee at least two weeks before the date of the Master's Examination. The student should provide the advisor with a revised copy of the thesis at least three days before the Examination. See the Graduate School Handbook and instructions concerning the typing and form of the Master's Thesis (available from the Office of the Graduate School.)

The draft of the thesis must be unanimously approved by the Committee before the student can proceed with the Master's Examination. In the event of a dissenting vote on the thesis approval, the student must first work with the dissenting Committee member to correct any perceived deficiencies in the thesis. If the matter cannot be resolved in this manner, the student's Advisory Committee should work out a solution. If the matter still cannot be resolved by this second step, it will be referred to the GSC for a final solution.

#### **vi. Master's Examination**

1. All candidates for the M. Sc. degree are required to take an oral examination after the submission and approval of the draft of the thesis by the Master's Advisory Committee.
2. The candidate should distribute to the members of the Committee written credentials of previous training at least two days before the examination.
3. The Committee administers an oral examination of 2 hours duration, which addresses the candidate's field of specialization (thesis defense), the student's proficiency in basic plant biology and related subjects, the ability to integrate information, and the ability to solve problems.

On the basis of this examination, the Committee determines whether the candidate is qualified to receive a M. Sc. degree in PCMB. Approval must be unanimous. Final approval of the thesis occurs after the examination is satisfactorily completed. If the M. Sc. degree is non-terminal for the student, the Committee will also determine whether the student is qualified to continue studies towards a Ph.D. degree. A recommendation on whether or not the student should be allowed to continue toward Ph.D. studies should be forwarded to the GSC for final approval.

4. Students who fail this examination may request a second examination. The second examination must be administered by the same examining committee. Students failing this second examination will not receive a M. Sc. The second examination must be completed by the end of the next consecutive quarter.

### **vii. Bound Thesis Copy**

In addition to submitting the electronic version of the thesis as required by the Graduate School, each student shall present to the Department a clean, final copy of the same document which will be bound at departmental expenses and deposited in the departmental archives.

### **viii. Time Limit**

Graduate students are eligible for PCMB departmental financial support for up to eight (8) quarters of work toward an M. Sc. degree at OSU. Requests for additional quarters of support must be made by the advisor to the GSC with justifications. The GSC strongly recommends that the M. Sc. degree be completed within no more than 3 years.

## **B. Non-Thesis Option (Plan B)**

### **i. The Two Tracks**

Two tracks are available for non-thesis Master's.

#### *Track 1:*

- A minimum of **55 quarter hours** of graduate course work (excluding 693, 999, and seminars).
- A minimum of 35 hours in the Department of PCMB. Grades must be B- or higher in all courses counted toward the 35 hours.

#### *Track 2:*

- A minimum of **50 quarter hours** of courses (excluding 999)

- A minimum of 35 hours in the Department of PCMB (excluding 999 but including 693, 694 credit).
- A **written paper** based on library research for 5 hours of 693 credit. The paper must be approved by the Master's Advisory Committee.

During the autumn, winter and spring quarters each year when they are enrolled, all students are required to attend the PCMB departmental seminars (PB 800). Each student should enroll for 1 hour of credit for PB 800 under the direction of the GSC Chair. Attendance will be taken. Attendance at less than 70% of the seminars in a quarter will result in an unsatisfactory grade ("U"). If a student anticipates missing the seminars due to time conflict with other academic activities such as performing GTA duties, the student must obtain approval from the GSC prior to the beginning of each quarter. Once the quarter begins, the GSC will not honor any excuses from a student for missing seminars, except for under extraordinary situations such as medical emergencies.

## **ii. Advisory Committee and Examination**

A Master's Advisory Committee must be established and meet as indicated under Plan A (Thesis Option).

The format of the Non-thesis Master's Examination is identical for both tracks 1 and 2. It includes a four-hour written portion required by the Graduate School. The content and scope of this portion will be determined by the Advisory Committee.

A two-hour oral examination is also required and is administered by the Advisory Committee. The oral examination determines the student's proficiency in basic plant biology and related subjects, their ability to integrate information and to solve scientific problems.

On the basis of this examination, the Committee decides whether the candidate is qualified to receive a M. Sc. degree in PCMB. The approval requires a unanimous vote.

## **iii. Time Limit**

Graduate students are eligible for PCMB departmental financial support for up to eight (8) quarters of work toward an M. Sc. degree at OSU. Requests for additional quarters of support must be made by the advisor to the GSC with justifications. The GSC strongly recommends that the M. Sc. degree be completed within no more than 3 years.

## V. DOCTORAL DEGREE PROGRAM

### A. Lab Rotation Requirements

All incoming students are required to rotate through three labs before formally choosing an advisor. Each student should arrange his/her rotation for each of these quarters in advance of the start of the quarter by consulting prospective faculty members. Each rotation will be by mutual agreement between the involved student and faculty member. The student will enroll for an appropriate number of credit hours of Plant Biology 999 under the direction of the advising faculty member for the quarter of rotation. Approval of the Graduate Studies Committee will be required for any student who wishes to pursue more than four rotations.

### B. Initial Advisor

The student's initial advisor upon arrival at the university will be the first rotation advisor, until such time as the student has reached an agreement to join a research group. If this rotation advisor is already responsible for the initial advising of two other students, the Graduate Student Committee will select an alternative initial advisor. The initial advisor will be responsible for assisting the student in identifying appropriate courses.

### C. Research Advisor

In general, no later than the end of the student's third or last rotation, a mutual agreement to join a laboratory should be made between the student and a prospective research advisor, who will send a memo to the GSC confirming this choice. This memo should be signed both by the advisor and the advisee. Failure to identify a research advisor within one quarter after the last rotation will result in a recommendation from the GSC that financial support from the Department be terminated. In addition, students who are without a research advisor for more than one quarter following completion of the required rotations will be denied permission for further enrollment in the Department.

If a student has two co-advisors, an arrangement must be made such that one co-advisor will assume primary advising responsibilities. If a student wishes to change his/her research advisor (s) during the course of studies, the new advisor should send a memo to the GSC confirming this choice. This memo should be signed both by the new advisor and the advisee. Although it is not necessary for the previous advisor to sign this memo, an agreement to change advisor should be made mutually, if possible, by the student and the previous research advisor.

### D. Advisory Committee

In addition to choosing a research advisor, a student must also establish an Advisory Committee and a Dissertation Committee (see Section V. G. ii.). The

membership of both committees, which may be identical or different, is selected by the student in consultation with the advisor. The student thereafter submits recommendations for membership to the GSC for approval. The Advisory Committee consists of four faculty members including the student's advisor; at least three members of the Advisory Committee, including the student's advisor, must be members of the PCMB Graduate Faculty. The membership of the Advisory Committee may be changed if necessary, subject to the approval of the GSC.

The Advisory Committee should be formed during the student's second academic year, after the selection of a research advisor. The committee aids the student in planning both the student's academic and research programs. It is recommended that the student meet with this committee at least annually, although more frequent meetings may be requested by the advisor, committee, or student. The Advisory Committee also conducts the Admission to Candidacy Exam (ACE).

### **E. Course Requirements**

The student is required to take a total of 35 credits of graduate level courses excluding 800, 999 and non-participant seminars (inclusive of courses taken for the M. Sc. degree). Of those 35 credits, at least 20 must be in PCMB and must be completed with a grade of B- or higher. All students must take the core courses, which are listed below and also in Appendix B. Under exceptional circumstances, a student may petition waiver of a particular course through the GSC. The petition must include sound justification. Usually, a waiver may be considered if a student can document that he/her has taken and satisfactorily passed a similar course elsewhere. The GSC may or may not grant the waiver based on its own judgment. A student who wishes to use the waiver option must do so at the earliest possible time to avoid delay in the studies. Nonacademic reasons cannot be used as justification for the waiver.

#### **The core curriculum:**

Plant Molecular Biology	PB622 (4 cr)
Plant Genetics & Genomics	PB623 (4 cr)
Plant Biochemistry	PB735 (3 cr) or PB 736 (3 cr)
Plant Physiology	PB630 (3 cr) or PB631 (3 cr)
Plant Anatomy/Cell Biology	PB643 (5 cr) or PB648 (4 cr)

All students are strongly encouraged to consult with their initial/research advisors and the Advisory Committees for taking all of the elective courses, to ensure that any courses taken will be counted towards their Ph.D. degree programs. As with most requirements, aspects of the course requirements can be waived or altered for exceptional cases upon petition to the GSC. This course requirement must be completed before taking the Admission to Candidacy Examination.

During the autumn, winter and spring quarters each year when they are enrolled, all students are required to attend the PCMB departmental seminars (PB 800). Each student should enroll for 1 hour of credit for PB 800 under the direction of the GSC Chair. Attendance will be taken. Attendance at less than 70% of the seminars in a quarter will result in an unsatisfactory grade ("U"). If a student anticipates missing the seminars due to time conflict with other academic activities such as performing GTA duties, the student must obtain approval from the GSC prior to the beginning of each quarter. Once the quarter begins, the GSC will not honor any excuses from a student for missing seminars, except for under extraordinary situations such as medical emergencies.

All graduate students must register for a minimum of nine (9) quarters of Plant Biology 999 (six additional quarters following completion of the M. Sc. degree) before the Ph.D. degree will be granted.

### **F. Teaching Requirement**

All Ph.D. students are required to teach at least one quarter as a graduate teaching assistant during their graduate career in the Department.

### **G. Transfer Credits**

Students may transfer up to 45 hours from a M.S. program for credit towards the Ph.D. thus reducing the total number of hours necessary to complete the degree from 135 to 90. Consult the Graduate School Handbook for further details.

### **H. Admission to Candidacy Exam (ACE)**

(See also relevant sections in the Graduate School Handbook)

A student should take the ACE by no later than the end of their third year in the program. By this time the student should have (1) completed the course requirements with a GPA of at least 3.0, and (2) defined and started dissertation research. Exceptions will be considered by the GSC in individual cases, within the guidelines of the Graduate School Handbook.

A student planning on taking the ACE should meet with the Advisory Committee at least several months before the exam to work out the final aspects of fulfilling the course requirements and to update the committee on the progress in research. Written documentation of readiness to take the ACE should be submitted to the GSC by the student's advisor. This documentation should include:

- (a) an updated CV of the student,

- (b) a list of graduate courses taken and grades, and
- (c) a brief description of the student's current and intended research.

If possible, all documents should be submitted as PDF's to facilitate timely distribution among the GSC members for evaluation. GSC approval is required for the ACE to proceed.

### **i. Written Portion**

1. The objective of the ACE is to test the student's ability 1) to identify an important area of research, b) to formulate meaningful and testable hypotheses, c) to select strategic and feasible methodology, d) to explain the context (literature and relevant data) of the questions, and e) to write a coherent and convincing grant proposal.
2. The student proposes to its Advisory Committee one to three possible topics in an area different from the student's doctoral research to form the subject for the grant proposal.
3. The Advisory Committee will evaluate and approve the topic of the proposal. This can be done easily by e-mail communication, or by a meeting between and student and the Advisory Committee if so desired.
4. The grant proposal should represent the student's own creativity and intellectual work. A proposal previously written by the student and evaluated by peer review cannot be used for the ACE. An example is a proposal submitted to fulfill course requirements. Nor is a proposal acceptable if it overlaps extensively with existing grant proposals, for example those from the student's advisor.
5. After the Advisory Committee has approved the topic of the proposal, the student submits a one-page summary of the proposal to the Advisory Committee. The topic must be approved unanimously by the student's Advisory Committee. A committee member indicates approval by signing the summary or by e-mail communications. If the topic is rejected, the above steps are repeated.
6. Upon approval, the student has 4 weeks to complete the grant proposal. During the process, the student may consult fellow graduate students and postdoctoral researchers on ideas and on the proposal itself. Faculty input should be minimal. Any major participation of the research advisor in the proposal preparation must be documented. However, both the student and the advisor should be fully aware that any significant inputs from the advisor on the proposal may jeopardize the quality of the ACE. The student should be prepared to fully defend and justify the proposal orally.

7. The format should follow that required by the agency to which the proposal will be “submitted”. In any case, it should be no longer than 10 pages, single-spaced with one inch margins and a 12 point font. Included in the 10 pages are figures and tables, but not references. (See the information sheet in Appendix C to this Guide.)
8. The student submits copies of the completed proposal and evaluation form ("Plant Cellular and Molecular Biology ACE Research Proposal Evaluation Form" - see Appendix C) to the Advisory Committee. Each committee member provides a written evaluation and a numerical rating. The advisor collects the completed Evaluation Forms and comments and distributes copies to the candidate and to all members of the Candidacy Exam Committee including the Graduate School Faculty Representative.
9. If the proposal is judged acceptable as is or with minor revision, an Oral Examination is scheduled and conducted in no sooner than two weeks. If one or more member(s) of the Committee indicates that the proposal requires major revisions, the student shall submit a revised proposal to the Committee within two weeks.
10. If the revision is acceptable, an Oral Exam is scheduled. If the revised proposal is still judged as seriously flawed, the Committee can either recommend that:
  - The student be given the option of canceling the exam with an overall grade of Unsatisfactory. If this option is chosen, the Chair of the Candidacy Exam Committee returns the exam results form to the Graduate School along with a letter signed by the student to waive his/her right to take the Oral part of the ACE (See relevant section in the Graduate Student Handbook)
  - The Oral Exam be scheduled and the student be evaluated on the basis of both the written and oral portions of the ACE.

## **ii. Oral Portion**

1. The Committee that conducts the Oral Portion of the ACE consists of at least five faculty members including the Advisory Committee and the Graduate School Faculty Representative.
2. The Oral portion of the ACE will be held no sooner than two weeks after the Advisory Committee approves the written part of the proposal. It is strongly encouraged that this portion of the ACE be conducted immediately after the two-week grace period. This portion should last for 2 hours. No presentation of the proposal should be required. During this two-hour period, the Committee should focus on questioning the student about the content of the proposal and about any subjects directly or indirectly related to

it. These could include techniques, current literature, and basic and broad biological background. The Exam could also test student's awareness of current and new progresses in plant biology/general biology and biology-related social issues.

3. The Oral and the Written Portions are considered one exam. It is possible that either the Written or Oral portion is judged Unsatisfactory, but is counterbalanced by a sufficiently good performance on the other portion to obtain an overall Satisfactory grade. Committee approval must be unanimous.

4. If the student fails the exam, the Committee must decide (a) whether the student is or is not permitted to take a second ACE, and (b) whether all or part of the exam should be repeated (see relevant sections in the Graduate School Handbook.)

5. At the end of the ACE, the result will be given to the student and be recorded on the Graduate School form. A copy of this form must be delivered to the GSC Chair and the original returned to the Graduate School.

## **I. Dissertation Research**

### **i. Requirements for High-Quality Original Research**

The Ph.D. degree is a prestigious research degree. A person must have demonstrated the ability to perform original and independent research of high quality and to write up reports/publications of research results to earn the degree. The Ph.D. dissertation provides this opportunity.

A student should strive to begin the dissertation research as soon as possible. It should be understood that every dissertation research must investigate new and important biological problems. Such research must lead to original contributions in the field of research. This is best judged by the publication of results as research articles in reputable refereed journals in the student's field of research. It is expected that at least a part of the student's research will have been published or accepted for publication by the time the dissertation is submitted for approval. If a student's work is not yet published at that time, the committee will expect proof that the student has produced publishable research results. This can best be demonstrated by the student's submitting a manuscript (or manuscripts) ready for submission to the committee alongside the dissertation. A student must fully understand that any research results that are not of publication quality cannot be accepted as a dissertation. To avoid such a situation, it is important that a student reads and keeps up with the literature, takes initiatives to discuss research frequently with the advisor and the advisory committee members, and takes initiatives to write up research results for timely publications.

### **ii. Dissertation Committee**

The Dissertation Committee will follow the student's progress in research, be available for advice, and – if necessary – help in resolving conflicts between the student and his/her advisor. It should be formed once the student has identified a research area, typically during the second year in the program (i.e., within the first year of having selected a research advisor). It consists of at least three (or four if a student has two co-advisors) members of the Graduate Faculty - at least two of whom must be from PCMB. The Dissertation Committee can be, but does not have to be, identical with the Advisory Committee. The Dissertation Committee will be joined by a member of the Graduate School Faculty Representative for the Final Oral Examination.

### **iii. Dissertation**

The student shall submit a draft copy of the dissertation to the Dissertation Committee at least one week before the due date for the Draft Approval Form. The Graduate School Representative is not normally involved in reading and approving the draft of the Dissertation but this representative must be given an opportunity to read this document at least one week before the Final Oral Examination. A copy of the signed Draft Approval Form must be given to the GSC Chair and be deposited in the student's permanent file.

The dissertation draft must be unanimously approved by the Dissertation Committee before the student will be allowed to take the Final Oral Examination. In the event of a dissenting vote on the thesis approval, the student must first work with the dissenting Committee member to correct any perceived deficiencies in the thesis. If the matter cannot be resolved in this manner, the student's Advisory Committee should work out a solution. If the matter still cannot be resolved by this second step, it will be referred to the GSC for a final solution.

The student shall provide the advisor with a completed, revised copy of the Dissertation at least one week before the Final Oral Exam for the Ph.D.

### **iv. Final Oral Examination**

The Final Oral Examination is held after approval of the dissertation draft. This examination will be approximately two hours in length. The student will present his or her work in an exit seminar of approximately 60 minutes. This exit seminar is public and it is the graduate student's responsibility to announce the seminar appropriately and well in advance to the members of the Department and other possibly interested parties. The examination following the seminar is not public and will only be attended by the student and the members of the Dissertation Committee (including the Graduate School Faculty Representative). The examination will test the student's knowledge of his/her research area and dissertation work. In addition, the candidate's ability to place his/her work into the broader context of plant science will be evaluated. Please see the Graduate School Handbook for additional details. The student is considered to have completed the

Final Oral Examination successfully when there is no more than one unsatisfactory vote from the Final Oral Examination Committee. A final appeal procedure exists for students who fail the Final Oral Examination. See the Graduate School Handbook for details.

#### **v. Bound Dissertation Copy**

In addition to submitting the electronic version of the dissertation as required by the Graduate School, each student shall present to the Department a clean, final hard copy of the same document which will be bound at departmental expenses and deposited in the departmental archives.

## VI. GRADUATE ASSOCIATES (GAs)

Qualified PCMB students are supported as Graduate Teaching Associate (GTA), Graduate Research Associate (GRA), or Graduate Administrative Associate (GAA) with tuition and fee waivers. All financial support is contingent upon the conditions that the student maintains good academic standing (see below and Graduate School Handbook), fulfills the assigned duties associated with the support, and has a valid visa status (for international students).

### A. Eligibility

See relevant section of the Graduate School Handbook. To hold a GA appointment, a student must satisfy the following eligibility requirements.

1. Must be pursuing a graduate degree at this university.
2. Must register to the required credit hours.
  - GAs holding a 50% or greater appointment must register for at least 9 hours in Autumn, Winter and Spring quarters, and at least 7 hours in the Summer.
  - Doctoral students who have passed their ACE must register for at least 12 credit hours for each quarter they hold a 50% or greater GA, including the Summer.
3. Must be in good standing in the OSU Graduate School when the appointment or reappointment becomes effective.
4. Must maintain reasonable progress toward a graduate degree as determined by the Department's.
5. Must satisfy other requirements published by the GSC or the employing unit.

See relevant section of the Graduate School Handbook for additional information.

After being accepted for departmental support by the GSC, the student will receive a letter of offer of an associateship from the chairperson of the GSC. A returned copy of that letter signed by the graduate student shall constitute a commitment to accept the appointment for the period indicated. International students must pass the Spoken English Test ("Mock Teaching Test") before the end of their 3rd quarter to remain eligible for financial support through the PCMB Department.

### B. Facilities

The Department provides its GAs with office space and other facilities and supplies necessary to carry out their assigned duties. These will include such items as a desk and chair, file space, a mailbox and access to a typewriter, word processor, duplicating equipment and a telephone.

### **C. General Duties and Work Load**

The type of associateship a student receives (GTA, GRA, GAA and etc) depends on departmental teaching loads and the availability of grant funds. The Department Chair assigns GA duties in consultation with the GSC and the student advisors.

Normally a GTA on a 50% FTE appointment entails service for not more than 20 hours per week. This may include 10 or more hours of instructional contact in addition to time spent on such work as preparation in connection with course assistance, student counseling, or other related activities. GTAs are expected to consult with the faculty member supervising their work assignment concerning absences between quarters and to make arrangements to complete course preparations required in the week preceding the first day of class for each quarter.

A GA on active duties may not accept other gainful employment without permission from the PCMB GSC. International GAs must obey regulations of the US Bureau of Citizenship and Immigration Service (BCIS). The Office of International Education (OIE) can provide specific information.

### **D. Reappointment after Resignation**

A GA who voluntarily resigns the appointment because of unwillingness to perform assigned duties will not be considered for reappointment. A GA who resigns due to exceptional circumstances such as health or personal problems may be considered for reappointment in the following year, at which time the student will compete with all other applicants for available associate positions.

### **E. Grievance Procedures**

Resolution of grievances should be sought sequentially through discussion with the faculty advisor(s), the GSC, and the department chairperson. If such discussions fail to provide a resolution, the grievance procedures established by the Graduate School should be followed. Copies of such procedures are available in the departmental office and the Graduate School.

## **VII. DEPARTING AND RETURNING STUDENTS**

### **A. Departing Students**

Students leaving the Department will be required to fill out a severance form. A copy of this form will be provided to the student's advisor at the time of scheduling of the final M. Sc. or Ph.D. examination. The form provides a space to validate the proper return of keys and other departmental or lab properties. A student should understand that all original lab/research notes are the properties of the Ohio State University and must remain in the lab unless other arrangements have been made between the student and the dissertation advisor. The severance form must be approved by the GSC Chair before the student leaves the department. Students who leave the department without completing a degree must follow the same procedures.

### **B. Returning Students**

A student who has interrupted studies in the Department for less than two years may reactivate his/her student status by calling the OSU Graduate School at (614) 292-6031. If the interruption is longer than two years, the student must petition to the GSC for readmission.

**Appendix A**  
**PCMB Graduate Student Annual Report Form**  
**Department of Plant Cellular and Molecular Biology**

**Date:**

**Report period:**

**Student Name:**

**Phone:**

**Email:**

**Undergraduate Degree:**

**Institution:**

**Major/Degree:**

**Years:**

**Graduate Degree:**

**Date entered program:**

**Number of quarters in program:**

**Research Rotations (Labs/Dates):**

**Faculty Advisor:**

**Courses Completed for the report period (number/credit hours/date/grade):**

**Courses Planned for following year (number/ credit hours/date):**

**Graduate Advisory Committee:**

**Members/dates met:**

**Admission to Candidacy Exam (Date):**

**Committee Members:**

**Graduate Teaching Experience** (course/date):

**Research Presentations at Professional Meetings** (authors, date, title, meeting name):

**Publications** (authors, date, title, journal):

**Awards/Grants** (agency, title, value, date):

**Service to Department** (description/date):

**Please, attach copies of teaching performance evaluations for all the quarters during the report period that you have taught.**

**Signatures**

**Student:**

**Date:**

**Faculty advisor:**

**Date:**

## APPENDIX B

### CORE CURRICULUM FOR THE PH.D. PROGRAM

All students must take the core courses, which also are listed in section V.C. Under exceptional circumstances, a student may petition waiver of a particular course through the Graduate Studies Committee (GSC). The petition must include sound justifications. Usually, a waiver may be considered if a student can document that he/her has taken and satisfactorily passed a similar course elsewhere. The GSC may or may not grant the waiver based on its own judgment. A student who wishes to use the waiver option must do so at the earliest possible time to avoid delay in the studies. Any nonacademic reasons cannot be used as justifications for the waiver.

#### The core curriculum:

Plant Molecular Biology	PB622 (4 cr)
Plant Genetics & Genomics	PB623 (4 cr)
Plant Biochemistry	PB735 (3 cr) or PB 736 (3 cr)
Plant Physiology	PB630 (3 cr) or PB631 (3 cr)
Plant Anatomy/Cell Biology	PB643 (5 cr) or PB648 (4 cr)

**APPENDIX C**

**MATERIALS FOR THE**

**ADMISSION TO CANDIDACY EXAM**

**PLANT CELLULAR AND MOLECULAR BIOLOGY  
ADMISSION TO CANDIDACY EXAM  
RESEARCH PROPOSAL EVALUATION FORM**

DATE OF DISTRIBUTION OF PROPOSAL: \_\_\_\_\_

DATE REVIEW NEEDS TO BE  
RETURNED: \_\_\_\_\_

NAME OF  
STUDENT: \_\_\_\_\_

TITLE OF  
PROPOSAL: \_\_\_\_\_

POTENTIAL TARGET AGENCY AND SECTION FOR FUNDING: \_\_\_\_\_

\*\*\*\*\*

**Overall rating of proposal** (see guidelines)

Excellent      1   2   3   4   5   6   7   8   9   10      Unacceptable

**Evaluation:** Comment on: (1) the strengths of the proposal, (2), critical improvements that need to be made in the proposal, (3) overall evaluation including whether the proposal is acceptable enough to proceed with the oral portion of Candidacy Exam, or whether the proposal requires major revision before proceeding to the Oral. Note that only one round of major revisions is allowed. Write comments on a separate sheet.

\_\_\_\_\_  
Signature of Reviewer

\_\_\_\_\_  
Date

**INSTRUCTIONS AND CRITERIA FOR WRITING AND EVALUATING  
THE RESEARCH PROPOSAL  
FOR THE PLANT CELLULAR AND MOLECULAR BIOLOGY  
ADMISSION TO CANDIDACY EXAM**

Procedures for the ACE, including selection of the topic of the proposal, are described in the “A Guide for Graduate Studies in Plant Cellular and Molecular Biology.” At the time of final stages of proposal preparation, the candidate should obtain the form for Scheduling the Candidacy Examination from the Graduate School office (250 University Hall). The candidate should arrange a time and place for the oral examination and file the form with the Graduate School at least two weeks prior to the scheduled date of the oral portion of the Examination.

When the proposal is written, the student should make copies “Research Proposal Evaluation Form”. The student should fill in the top half of the form and distribute it to each member of the Advisory Committee. The student should ensure that his/her advisor is aware of the date of return of the evaluations and that the advisor notifies the members of the committee to return the evaluations in a timely fashion.

The proposal will be evaluated by each member of the Advisory Committee. Each member will give an overall score and provide a written review. The proposal is evaluated with respect to the quality of the research questions being asked, the methodology, logic, and writing. These comments help the student prepare for the oral defense of the proposal, which constitutes the second required portion of the ACE.

The Research Proposal Evaluation Form contains a return date on which the student can expect to receive the evaluations from each committee member. The student’s advisor will collect the evaluations and distribute copies to the student and to all members of the Exam Committee, including the Graduate School Faculty Representative. Depending on the evaluations, the Oral Exam may proceed or be cancelled. Refer to “A Guide for Graduate Studies in Plant Cellular and Molecular Biology’ for specific protocols.

## Numerical Scale for Overall Rating

- a. **1 or 2** indicates a superior proposal, combining both scientific merit (a well chosen, timely project) and scientific insight (a well designed, well reasoned approach to the research); these scores are equivalent to a letter grade of A.
- b. **3 or 4** indicates a very good proposal with minor flaws in scientific merits and/or methodology. The scores are equivalent to a letter grade of A- or B+.
- c. **5 or 6** indicates a good proposal with some serious flaws. The proposal has some merit, but may not be well justified or well reasoned. The proposal could be rectified with serious revisions. The scores are equivalent to a letter grade of B.
- d. **7 or 8** indicates a seriously flawed proposal, but in which sufficient acceptable material has been presented to warrant further consideration. It should be viewed as the minimal acceptable level of the written portion of the examination. The scores are equivalent to a letter grade of B-.
- e. **9 or 10** indicates an unacceptable proposal. It has fatal flaws including misconceptions with respect to the scientific value, aims or methods of the proposed research, and writing. The proposal cannot be easily salvaged without very significant changes in the proposal. The scores are equivalent to grades of C and E, neither of which is considered a passing grade for the Candidacy Examination.

If some members of the Advisory Committee rate the proposal either 9 or 10, the committee should decide if any purpose would be served by continuing with the Oral Exam. The student being examined should be given the option of canceling the examination with an overall grade of UNSATISFACTORY. If this is the case, the chair of the Exam Committee should return the examination results form to the Graduate School, together with a letter signed by the student being examined to indicate his/her agreement to waive the oral portion of the examination. If this option is exercised, the Candidacy Exam Committee must decide whether to allow the candidate a second opportunity to perform ACE. If permitted, this second Exam must be completed within six months. The Graduate School Handbook provides authoritative guidelines for this exercise.

## A Brief Guide to Research Proposal Writing

The format should follow that required by the agency to which the proposal will be “submitted”. In any case, it should be no longer than 10 pages long, single-spaced with one inch margins and a 12 point font. Included in the 10 pages are figures and tables, but not references. Sufficient information needs to be included to facilitate an effective review by committee members without requiring them to refer to the literature.

**Abstract** The abstract should be one paragraph, not to exceed 250 words. It should be a summary statement of the background, research goals, methodology, and expected outcomes and impact.

**Aims & Hypotheses** The specific aims of the proposal and the hypotheses to be tested should be clearly defined and justified.

**Background** The introductory portion of the proposal should discuss the current status, knowledge gaps, and/or pressing issues in field of the proposed research. This discussion serves the purpose of formulating testable hypotheses. It needs to be presented such the reviewers are convinced of the importance, necessity and feasibility of the proposal research. The writing needs to maintain a balance between providing sufficient information and brevity.

**Experimental design** The experiments should be well planned to convince reviewers that they will succeed. This section should not be simply a listing of the techniques to be used or a detailed description of methods. Rather, it should be a general experimental design with brief and informative description of key aspects of the methods with thoughtful justifications. It is important to discuss why a particular method is used, what pros and cons are associated with method, and what alternative approaches will be used. It is also essential to discuss how data generated from an experiment will be analyzed and interpreted.

**References** All cited references should be listed at the end of the project description, following the formats for full citation (i.e., with all authors' names, complete article title, inclusive pages numbers and year of publication listed) established by major journals.