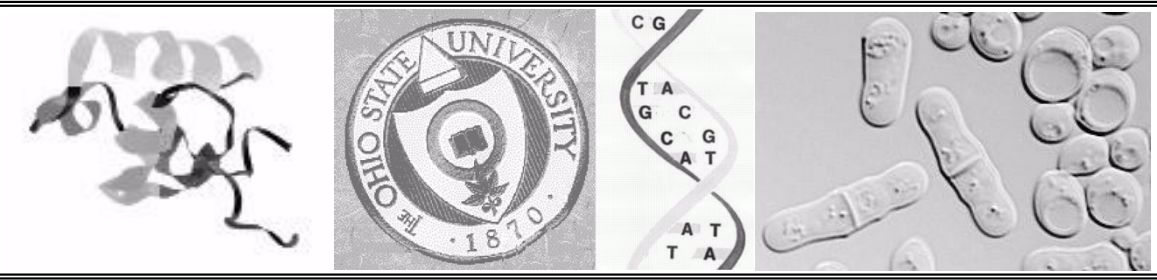
Manual for Undergraduate Studies

Molecular Genetics



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Undergraduate Degrees Offered: Bachelor of Science

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Description

The faculty of the Department of Molecular Genetics teaches and conducts research in genetics, epigenetics, molecular biology, cell biology, and developmental biology. They investigate scientific problems from the molecular to the population level, and they study viruses, fungi, protists, plants and animals as well as human beings. In spite of this diversity of interests and the broad mission of the department, the faculty shares the use of techniques from genetics and molecular biology, and common interest in the structure, expression, and evolution of genes.

The use of molecular genetic tools is revolutionizing many areas of biology. The Molecular Genetics major provides the student with the background needed for success in a graduate program leading to an exciting career in the most active areas of pure and applied biology. The major provides an excellent entry route for professional schools in dentistry, medicine and veterinary medicine, where expertise in molecular, cellular, developmental, and traditional genetics is of increasing importance.

Planning a Major program.

All students are encouraged to meet with their faculty advisor during their freshman year or as soon as they begin considering a molecular genetics major program. It is strongly encouraged that students begin the molecular genetic core courses in their sophomore year (see sample curriculum on page 8).

Completion of The Molecular Genetics Major also satisfies the GE – Statistics requirement. Molecular Genetics 5650 provides additional statistical material to those requiring additional experience.

Students with at least two semesters of independent laboratory research (generally Mol Gen 4998/4998H/) may substitute 3 credits of independent research for the requirement to complete Molecular Genetics 5601 or 5602. Your advisor must approve this substitution. If not used in place of Molecular Genetics 5601 or 5602, three credits of independent research may count as an elective in the major.

Sample curricula are shown on pages 10 and 11 of this manual.

COURSES IN THE MAJOR MUST BE APPROVED BY YOUR ADVISOR

A minimum grade of C- is required in each course in the molecular genetics major (Core Requirements and Electives)

No more than three credit hours graded S/U can be counted towards the 30 hour major

30 or more semester hours are required for the molecular genetics major, for more details please see the list of core and elective courses beginning on page 4

Dual majors.

Must consist of at least 18 unique hours in each major. The Mol Gen major has the usual 30-hour minimum and format.

Molecular Genetics Undergraduate Major

30 semester hours are required for the major

Important Note: No more than 3 hours of S/U graded courses can count towards the 30 required hours

Part A. Required Prerequisites (do not count toward the 30 hour major)

1. Bio 1113 (4) AND 1114 (4)
2. Chem 1210 (5) AND Chem 1220 (5)
3. Chem 2510 (4), 2520 (4), 2540 (2), and 2550 (2)
4. Math 1149 or Math 1150 Pre-Calculus (5) AND Math 1156 Calculus for Biological Sciences (5) or Math 1151 (5)
5. Physics 1200 (5) AND 1201 (5)

Honors or more advanced versions for any of these courses are acceptable.

Part B. Core Requirements (the core comprises at least 19 credit hours of the 30 credit hour major):

1. **Biochemistry 4511** (4) OR
   Biochemistry 5613 (3) AND Biochemistry 5614 (3)
2. **Mol Gen4606** Molecular Genetics (4).
3. **Mol Gen 5607** Cell Biology (3) or Mol Gen 5607E (4)
4. **Mol Gen 5608** Genes and Development (3) or Mol Gen 5608E (4)
5. **Mol Gen 5645** Quantitative, Population and Evolutionary Genetics (2)
6. **Mol Gen 5601** Molecular Genetics Lab **OR Mol Gen 5602** Cell and Developmental Biology Lab
   (Note: MG5601 and MG5602 are 4 semester credits in the autumn and spring semesters, 3 semester credits in the summer session).

   Both lab courses require either Mol Gen 4606 or Mol Gen 4500 as a prerequisite. Mol Gen majors may substitute 3 semester credit hours of Undergraduate Research (generally Mol Gen 4998 or 4998H) for the Mol Gen laboratory requirement. These three credit hours of independent research must be taken over two semesters. If you plan to do independent research in a lab outside of Molecular Genetics, speak to your faculty advisor PRIOR to registering in order to confirm that the credits will count towards the major.

Part C. Electives requiring only MG4606 or MG4500 as prerequisites * (choose at least 3 electives from the following list; electives plus the core must total at least 30 credit hours):

Mol Gen 2220H Introduction to Molecular Life Sciences: Research Opportunities and Career Options (1)
Mol Gen 3300 Plant Biology (3)
Mol Gen 3436 Plant Physiology (3)
Mol Gen 4503 Molecular Genetics Writing Project (1) Mol Gen 4591S DNA Fingerprinting Workshop (1)
Mol Gen 4700 Molecular Cell and Developmental Biology (Note that this course is designed for students in the Molecular Genetics minor and in other biology majors, however this course may be appropriate for Molecular Genetics majors who are concerned about their preparation for MolGen5607 or MolGen5608. In select cases, this course may be taken prior to 5607 or 5608 and count as an elective in the MolGen major. Any Molecular Genetics major interested in this option must receive permission from their faculty advisor BEFORE enrolling in MolGen 4700.
Mol Gen 4703 Human Genetics (2)
Mol Gen 4998 (or 4998H) Undergraduate Research and/or Mol Gen 4999 (or 4999H) Thesis Research (up to 3 semester credit hours can count towards the 30 credit hour major requirement, and if taken across two different semesters can count EITHER as one of the three required electives OR as a substitute for the Mol Gen lab requirement. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major.). Note that Molgen 4999 or 4999H hours that satisfy a thesis requirement can NOT be substituted for the lab requirement OR count as an elective)
Mol Gen 5193 Individual Studies (1-3) (No more than 3 semester credit hours of 5193 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major)
Mol Gen 5194 Group Studies (1-3) (No more than 3 semester credit hours of 5194 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major)
Mol Gen 5300 Cancer Genetics (2)
Mol Gen 5632 Insect Molecular Genetics (2)
Mol Gen 5650 Analysis and Interpretation of Biological Data (3)
Mol Gen 5797 Study at a Foreign Institution (1-15) (No more than 3 semester credit hours of 5797 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the major.)
Mol Gen 5798 Study Tour: Domestic (1-15) (No more than 3 semester credit hours of 5798 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the major.)

*** Note: MG2220H, MG3300, and MG3436 *do not require* MG4500 or MG4606 as a prerequisite**

Part D. Electives requiring additional prerequisites. Please consult the course catalog (https://portal.erp.ohio-state.edu/psp/ihosuct/PUBLIC/PUB/c/COMMUNITY_ACCESS.OSR_CAT_SRCH.GBL) or meet with your molecular genetics advisor for more information. Typically, completion of the Mol Gen Core (Mol Gen 4606, 5607, 5608, and 5645) is a prerequisite for most 5000 Mol Gen courses.

Mol Gen 5623 Genetics and Genomics (2)
Mol Gen 5630 Plant Physiology (3)
Mol Gen 5700 Systems of Genetic Analysis (3)
Mol Gen 5701 DNA Transactions and Gene Regulation (4)
Mol Gen 5705 Advances in Cell Biology (2)
Mol Gen 5715 Developmental Genetics (2)
Mol Gen 5733 Human Genetics (2)
Mol Gen 5643 Plant Anatomy (3)
Mol Gen 5735 Plant Biochemistry (3)
Mol Gen 5795 Special Topics in Molecular Genetics (1-3)
Mol Gen 5796 Current Topics in Signal Transduction (1 or 2)
Mol Gen 5800 Organelle Biology (2)

Part E. Electives offered by other departments that can be used towards the molecular genetics major (please consult the course catalog for prerequisites). *

Biochem 5621 Introduction to Biological Chemistry Laboratory (4)

EEOB 4520 Comparative Physiology (3)

Micro 4000 General Microbiology (4)
Micro 4100 General Microbiology (5)
Micro 4140 Molecular Microbiology Lab (3)
Micro 5081 Microbial Genetics (3)
Micro 5082 Molecular Microbiology Lab (3)
Micro 5122 Immunology (2)
Micro 5161H Bioinformatics and Molecular Microbiology (3)

Neuroscience 4050 Neurogenetics (3)

Psychology 5602 Behavioral Genetics (3)

* Note: Other elective courses may be substituted with permission of major advisor.

Molecular Genetics Undergraduate Major with a Plant Cellular and Molecular Biology (PCMB) Specialization

Part A. Required Prerequisites (do not count toward the 30 hour major)

1. Bio 1113 (4) AND 1114 (4)
2. Chem 1210 (5) AND Chem 1220 (5)
3. Chem 2510 (4), 2520 (4), 2540 (2), and 2550 (2)
4. Math 1149 or Math 1150 Pre-Calculus (5) AND Math 1156 Calculus for Biological Sciences (5) or Math 1151 (5)
5. Physics 1200 (5) AND 1201 (5)

Honors or more advanced versions for any of these courses are acceptable.

Part B. Core Requirements (the core comprises at least 20 credit hours of the 30 credit hour major):

1. Biochemistry 4511 (4) OR
   Biochemistry 5613 (3) AND Biochemistry 5614 (3)
2. Mol Gen 4606 Molecular Genetics (4).
3. Mol Gen 5607 Cell Biology (3) or Mol Gen 5607E (4)
4. Mol Gen 5608 Genes and Development (3) or Mol Gen 5608E (4)
5. Mol Gen 3300 General Plant Biology (3)
6. Mol Gen 3436 Introductory Plant Physiology (3)

Part C. Electives requiring only MG4606 or MG4500 as prerequisites * (choose at least 3 electives from the following list; electives plus the core must total at least 30 credit hours):

Mol Gen 2220H Introduction to Molecular Life Sciences: Research Opportunities and Career Options (1)
Mol Gen 3300 Plant Biology (3)
Mol Gen 3436 Plant Physiology (3)
Mol Gen 4503 Molecular Genetics Writing Project (1)
Mol Gen 4591S DNA Fingerprinting Workshop (1)
Mol Gen 4998 (or 4998H) Undergraduate Research and/or Mol Gen 4999 (or 4999H) Thesis Research with a plant focus (up to 3 semester credit hours can count towards the 30 credit hour major requirement, and if taken across two different semesters can count EITHER as one of the three required electives OR as a substitute for the Mol Gen lab requirement. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major.). Note that Molgen 4999 or 4999H hours that satisfy a thesis requirement can NOT be substituted for the lab requirement OR count as an elective)
Mol Gen 5193 Individual Studies (1-3) with a plant focus (No more than 3 semester credit hours of 5193 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major)

Mol Gen 5194 Group Studies (1-3) (No more than 3 semester credit hours of 5194 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major)
Mol Gen 5601 Molecular Genetics Lab or Mol Gen 5602 Cell and Developmental Biology Lab with a plant module (3-4)
Mol Gen 5623 Genetics and Genomics (2)
Mol Gen 5645 Quantitative, Population and Evolutionary Genetics (2)
Mol Gen 5650 Analysis and Interpretation of Biological Data (3)
Mol Gen 5797 Study at a Foreign Institution (1-15) with a plant focus (No more than 3 semester credit hours of 5797 or 5798 can count towards the major)
Mol Gen 5798 Study Tour: Domestic (1-15) with a plant focus (No more than 3 semester credit hours of 5797 or 5798 can count towards the major)
Mol Gen 5795 Special Topics in Molecular Genetics (on a PCMB topic) (1-3)
Mol Gen 5800 Organelle Biology (2)

*** Note: MG2220H, MG3300, and MG3436 *do not require* MG4500 or MG4606 as a prerequisite**

Part D. Electives requiring additional prerequisites. Please consult the course catalog (https://portal.erp.ohio-state.edu/psp/ihosuct/PUBLIC/PUB/c/COMMUNITY_ACCESS.OSR_CAT_SRCH.GBL) or meet with your molecular genetics advisor for more information.
Typically, completion of the Mol Gen Core is a prerequisite for most 5000 Mol Gen courses.

Mol Gen 5630 Plant Physiology (3)
Mol Gen 5643 Plant Anatomy (3)
Mol Gen 5735 Plant Biochemistry (3)

* Note: Other elective courses may be substituted with permission of major advisor.

BS/MS in Molecular Genetics

A combined BS/MS Degree in Molecular Genetics is an opportunity for qualified undergraduates in Molecular Genetics to begin the Master's program in Molecular Genetics during their senior year, with the possibility of completing the Master's degree the following year.
Students who are accepted in to the Molecular Genetics BS/MS Program are allowed to double count up to 10 semester credit hours of classes toward both the undergraduate and graduate degrees.

If you are interested in the pathway, please talk to your Molecular Genetics major advisor!

Eligibility

Students must meet all requirements set by the Graduate School for combined BS/MS programs. These requirements can be found in in Section VIII.1 of the Graduate School Handbook (http://www.gradsch.osu.edu/8.1-combined-programs.html) and include the following criteria:

- Senior level standing in Molecular Genetics
- Completion of 90 undergraduate credit hours
- Minimum 3.5 cumulative GPA in all previous undergraduate work (this is a Graduate School requirement).
- Application for admission to the Molecular Genetics Master's program (indication that you want to complete a BS/MS degree) Admission by the Molecular Genetics Graduate Studies Committee and the OSU Graduate School

Molecular Genetics Undergraduate Major
Sample Semester Program **

Year 1			
Biology 1113	4	Math 1149 or 1150	5
Biology 1114	4	Math 1156	5
Chemistry 1210	5	A&S Survey	1
Chemistry 1220	5	GE/Free Electives	3
		Year 1 Total	**32**
Year 2			
Mol Gen 4606*	4	Physics 1200	5
Chemistry 2510	4	Physics 1201	5
Chemistry 2520	4	GE/Free Electives	7
Chemistry 2540	2		
		Year 2 Total	**31**
Year 3			
Mol Gen 5607	3	Biochemistry 4511	4
Mol Gen 5608	3	Chemistry 2550	2
Mol Gen 5645	2	GE/Free Electives	7
Mol Gen 5601 or 5602	4		
		Year 3 Total	**30**
Year 4			
Major Elective I	1-4	Major Elective III	1-4
Major Elective II	1-4	GE/Free Electives	19
		Year 4 Total	**28**

GRAND TOTAL: 121 Semester Credit Hours

**** Please note, this is a "sample" program, the timing of your individual plan may vary.**

+Mol Gen 4606 is offered autumn and spring semester
Lab courses: Mol Gen 5601 (autumn); Mol Gen 5602 (spring)
Mol Gen major elective courses vary in the number of semester hours from 1-4

Molecular Genetics Undergraduate Minor*

Required prerequisites

❏ Biology 1113 and Biology 1114
❏ Chemistry 1210 and 1220
Honors or more advanced versions of these prerequisite courses can be substituted.

Required Core Courses

One of the following courses:

❏ Mol Gen 4500 (3) or Mol Gen 4500E (4)
❏ Mol Gen 4606 (4)

At least two of the following courses:

❏ Mol Gen 5607 (3) or 5607E (4)
❏ Mol Gen 5608 (3) or 5608E (4)
❏ Mol Gen 4700 (3)
❏ Mol Gen 5645 (2)

Elective Courses

(Core plus electives must total at least 14 semester credit hours; no more than 3 semester credit hours can be graded S/U and count towards the Minor)

❏ Mol Gen 2220H (1)
❏ Mol Gen 4503 (1)
❏ Mol Gen 4591S (1)
❏ Mol Gen 4703 (2)
❏ Mol Gen 4998 or 4998H (1-5)
❏ Mol Gen 5193 (1-3)
❏ Mol Gen 5194 (1-3)
❏ Mol Gen 5300 or 5602 (3-4)
❏ Mol Gen 5601 or 5602 (3-4)
❏ Mol Gen 5632 (2)
❏ Mol Gen 5650 (3)
❏ Mol Gen 5623 (2)
❏ Micro 5161H (3)
❏ Micro 5081(3)

❏ Alternative elective(s) may be approved by MG advisor

* A minimum grade of C- is required in each course in the molecular genetics minor

Link to more information on the Molecular Genetics minor

Plant Biology Undergraduate Minor

Required prerequisites

❏ Biology 1113 and Biology 1114
❏ Chemistry 1210 and 1220
Honors or more advanced versions of these courses are acceptable.

Required Core Course

❏ Mol Gen 3300 General Plant Biology (3)

Elective Courses

(Electives must total at least 11 semester credit hours; no more than 5 semester credit hours can be graded S/U and count towards the Minor)

❏ Mol Gen 3436 Introductory Plant Physiology (3)

❏ Mol Gen 4503 Molecular Genetics Writing Project **on** a plant topic (1)

❏ Mol Gen 4998 or 4998H Undergraduate Research (in a plant lab). Up to 4 semester hours can count towards the minor.

❏ Mol Gen 5193 Individual Studies on a plant topic (Up to 3 semester hours can count towards the minor).

❏ Mol Gen 5194 Group Studies on a plant topic (Up to 3 semester hours can count towards the minor).

❏ Mol Gen 5601 Molecular Genetics Lab or 5602 Cell and Developmental Biology Lab **with** a plant module (3-4)

❏ Mol Gen 5623 Genetics and Genomics (2)

❏ Mol Gen 5630 Plant Physiology (3)

❏ Mol Gen 5643 Plant Anatomy (3)

❏ Mol Gen 5735 Plant Biochemistry (3)

❏ Alternative elective(s) may be approved by Mol Gen Plant advisor

The minor program must be approved by a Plant Biology faculty advisor from the Department of Molecular Genetics.

* A minimum grade of C- is required in each course in the molecular genetics minor

Molecular Genetics 4503: Molecular Genetics Writing Project

1. Who should take Mol Gen 4503?

Mol Gen 4503 is appropriate for students who wish to develop their writing skills while conducting library research on a topic of interest to them.

2. How do I enroll in Mol Gen 4503?

To enroll in Mol Gen 4503, you must first obtain permission from a faculty member who is willing to supervise you. You should first match your interests with one or more faculty. The faculty and their interests are listed in the Molecular Genetics Undergraduate Handbook or from the departmental web site (http://molgen.osu.edu/). After you have chosen one or more faculty as potential Mol Gen 4503 advisors, you should make appointments to visit them and discuss the potential project. After a faculty member has agreed to advise you, you will need to go to the Molecular Genetics Office (112 Biological Sciences Building) and obtain the call number that corresponds to the advising faculty member.

3. After I enroll in Mol Gen 4503, what will I do?

What will be expected of you will depend, to some extent, on the supervising faculty member. A paper (normally 10-15 pages double spaced) and a 15 minute oral presentation are required in all cases. The oral presentations are often given at lab meetings of the supervising faculty's lab group. Generally it is good to make an appointment with the supervising faculty member as early as possible in the semester so that you can clarify requirements and schedule. In most cases, you will be expected to carry out a thorough literature search of your topic, prepare an outline for the paper and one or more draft versions of the paper before preparing and submitting the final version. You should meet with the supervising faculty member at each stage to discuss your progress and have her/him critique your outline and drafts.

If you have questions, or a problem develops, you may contact your major advisor:

Research Opportunities for Undergraduates in Molecular Genetics

Undergraduate students in Molecular Genetics have many exciting career options. Many of our graduates go on to medical, dental, veterinary, or other professional schools. Some pursue graduate degrees in order to qualify for university faculty appointments or research positions in industrial or government laboratories. Other graduates go directly to positions in biology-oriented businesses such as biotechnology, pharmaceuticals, or agriculture.

Biologists are increasingly able to analyze and manipulate the genetic material of important organisms. This includes, for example, the ability to sequence DNA and move genes between different organisms. Now, more than ever before, rigorous and modern programs in life sciences must include an intensive laboratory experience.

While in the past every biologist had to know how to use a microscope, today's students must be familiar with methods such as recombinant DNA techniques. For the student with hands-on experience in modern laboratory techniques, access to all the career choices mentioned above is more open.

The Department of Molecular Genetics has created an academic program that emphasizes the laboratory experience in two ways.

1. Junior and senior students take at least one of two laboratory courses involving rigorous and intensive training in Molecular Biology and Molecular Genetics (**Mol Gen 5601**) and in Cell Biology and Developmental Biology (**Mol Gen 5602**). Additionally, our students are encouraged to take non-departmental (elective) laboratory courses offered in Biochemistry and Microbiology. These formal courses are general in the sense that students are exposed to a wide variety of techniques and exercises.
2. Our students are encouraged to work in one of our research laboratories for credit under **Mol Gen 4998/4998H**. This research experience allows the student to focus on a specific area of the field and gives exposure to modern research techniques. Students are encouraged to contact MG faculty regarding research opportunities early in their academic career, e.g., in their sophomore year.

The most frequently asked question is ***"Why should a student spend their time and effort on an undergraduate research project?***" There are several answers to this question:

1. A research experience helps the student decide between career options. Undergraduate research experience exposes the student to the real world of experimentation and inquiry. While most students will find research exciting, others will find the bench work tedious and decide it is not their optimal career objective, yet still be enriched by the experience.
2. A research specialty is a mark of distinction that increases competitiveness for the best professional and graduate schools, admissions to which are fiercely competitive. Research experience can provide evidence to admissions committees that the student has done more than merely pass classes with high marks. Tangible signs of success -- such as the student's name on a scientific publication or abstract, an honors thesis, or obtaining scholarships or awards for research – will be very attractive on your application. Even without these, expertise gained in specialized techniques can be listed on your resume.

3. Working in a laboratory allows the student to get to know the faculty and vice versa. Unfortunately, some students receive a degree and never get to know any faculty members outside of the classroom. Our faculty members have national and international reputations in the scientific community. Their letters of recommendation are an important component of successful applications to graduate school or potential employers.
4. Some students will seek work as laboratory technicians. Because of the costs in both and money required to train new employees, biotechnology and pharmaceutical companies tend to favor applicants with hands-on laboratory experience.
5. Finally, most students find that performing original research and making new scientific findings is exciting and intellectually gratifying.

Getting Started:
As noted above, the faculty of the Department of Molecular Genetics conducts research in genetics, molecular biology, cell biology and developmental biology. They approach scientific problems from the molecular to the population level in a number of different research areas using viruses, fungi, protists, plants and animals, as well as human beings. However, because at the molecular level all organisms are founded upon a uniform genetic plan, these diverse systems and organisms allow students the opportunity to explore essentially any aspect of the biology of plants and animals.

A student interested in this research experience should browse the department web site (**http://molgen.osu.edu**) for information about ongoing research projects in the labs of our faculty members. After reviewing this information, the student should confer with their advisor about their top selections, and/or visit those labs of greatest interest to discuss the possibility of doing research there. Once a faculty member agrees to supervise a student, the student can enroll in one-to-three credit hours per semester of **Mol Gen 4998/4998H**, Undergraduate Research in Molecular Genetics, for working in the laboratory. At least initially, the student will regularly meet with the faculty research advisor and their graduate students to receive the training necessary to implement the project.

The training period can last from one to several semesters, during which time the student will accumulate credit hours toward their degree (only 3 semester hours of Mol Gen 4998/4998H may be counted toward the Molecular Genetics major, though more can be used toward degree completion). In most cases, after the student is trained in a variety of practical aspects of the discipline, they become a valuable and productive member of the laboratory staff and may continue more independent in additional semesters. The goal for the student should be to obtain sufficient data to warrant a publication in a respected journal. Students can also pursue a written thesis (see "**Thesis Research for Molecular Genetics Students**" below).

Students are particularly encouraged to consider a summer research experience. This can be particularly fulfilling, because it allows students to immerse themselves in a research project full time. Scholarships and fellowships are available to support undergraduate summer research projects. Information on funding sources can be found at the Molecular Genetics (https://molgen.osu.edu/research-scholarship-opportunities) and Undergraduate Research Office (https://ugresearch.osu.edu/find-opportunities/fundforcurrentresearchers) websites.

Thesis Research for Molecular Genetics Students

Students also have the opportunity for their research projects to culminate in a written thesis that leads to graduation with Research Distinction in Molecular Genetics. Generally, students complete two semesters of **Mol Gen 4998/4998H** before committing to this path. Students who wish to write a thesis must apply for graduation with research distinction through the College of Arts and Sciences, and must be enrolled in **Mol Gen 4999/4999H** (Thesis Research in Molecular Genetics) during the semester the thesis is defended. The ability to graduate with research distinction requires a 3.0 minimum GPA and 4 hours of **Mol Gen 4999**. The ability to graduate with honors and research distinction requires honors standing and 4 hours of **Mol Gen 4999H**. After successfully completing the thesis

-- and with approval from the Arts and Sciences Committee -- the student is eligible for "Graduation with Research Distinction in Molecular Genetics," or "Graduation with Honors and Research Distinction in Molecular Genetics." Graduation with distinction is a mark of excellence that documents the student's aptitude for research.

Because of the protracted training period of one-to-three semesters (or more), it is necessary for students who wish to write a thesis to begin their research well before their senior year. We recommend that students make initial contacts with potential research advisors early in their academic career. This contact can even occur before students begin their molecular genetics core courses, e.g. early in their sophomore year. This early start allows ample time for an initial training period during which the student can receive credit for **Mol Gen 4998/4998H** toward the major. It also provides the students with the opportunity to do summer research prior to planning the thesis and enrollment in **Mol Gen 4999/4999H** during the semester the thesis is written and presented.

Summer research experience is especially important for students interested in writing a thesis, because it provides a significant period during which the student can dedicate their time to their research project without the distraction of heavy coursework. A number of scholarships are available to undergraduate researchers for summer support, and in some cases, the faculty advisor may be able to provide support. Interested students should contact the Undergraduate Research or Honors offices for recent information regarding funding sources for undergraduate research. Information on funding sources can be found at the Molecular Genetics (https://molgen.osu.edu/research-scholarship-opportunities) and Undergraduate Research Office (https://ugresearch.osu.edu/find-opportunities/fundforcurrentresearchers) websites.

The honors program in Molecular Genetics is a research-experience based curriculum, and honors students are particularly encouraged to participate. Although undergraduate honors research is not required for graduation, the Department strongly emphasizes the importance of this research experience.

A WARNING ABOUT GRADES: It is absolutely essential that students perform to their best abilities in the classroom. On one hand, undergraduate research is an attractive part of the educational process; on the other hand, working in a lab takes one away from other endeavors, such as free time and study time. Because grades are important, we advocate that students with marginal grades (below a 3.0 GPA) spend their time improving their course performance rather that devoting the time to research.