

# GRADUATE PROGRAM IN ANIMAL SCIENCES HANDBOOK

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UNIVERSITY OF  
MARYLAND

JUNE 15, 2021 UPDATE

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University of Maryland  
ANSC Graduate Office Animal Sciences Center,  
Room 1415A • College Park, Maryland 20742-2311 •  
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# Graduate Program in Animal Sciences

## Introduction

The Graduate Program in Animal Sciences is an interdisciplinary and interdepartmental program administered by the Department of Animal and Avian Sciences (ANSC). It involves faculty from the Department of Animal and Avian Sciences and the Department of Veterinary Science, Virginia-Maryland College of Veterinary Medicine, faculty from other on-campus programs, and scientists from nearby institutions, including U.S.D.A.'s Beltsville Agricultural Research Center, the Patuxent Wildlife Center, and the National Zoological Park.

The Program offers graduate study leading to the Master of Science and Doctor of Philosophy degrees in Animal Sciences. A Director selected from amongst the faculty on a term basis administers the Program. Presently, Dr. Carol L. Keefer, Professor, Department of Animal and Avian Sciences, is the ANSC Graduate Program Director. Dr. Keefer's email address is [ckeefer@umd.edu](mailto:ckeefer@umd.edu). Currently, there are ~20 members of the graduate faculty. The Graduate Program office is located in Room 1415A in the Animal Sciences Center. Its email address is [ansc-gradprogram@umd.edu](mailto:ansc-gradprogram@umd.edu).

***<https://ansc.umd.edu/graduate>***

## Admission into the Graduate Program

The Graduate Program in Animal Sciences (ANSC) admits students on a competitive basis from around the world. For selection, the primary criteria are the merits of the candidate as evidenced by the overall evaluation of the documents in the application package. Where possible, a candidate may be invited for a visit to the campus and an interview by the Program faculty. A strong background in animal or poultry science or one of the biological sciences, e.g., nutrition, physiology, biology, biochemistry, cell-molecular biology, genetics, microbiology, immunology, virology, or their sub-disciplines is required.

Applicants should familiarize themselves with the requirements, policies, and procedures of the University of Maryland Graduate School. They may do so by referring to the [Graduate School](#) Catalog.

The application package should contain the following:

1. An online application with the vital data on the candidate
2. Statement of Goals summarizing the candidate's goals, intentions, and experiences
3. Results of the General Record Examination (GRE) - General Aptitude Test (optional for 2022 applications)
4. Transcripts of all previously attended post-secondary colleges and universities
5. Three letters of recommendation
6. Certified copies of previously earned diploma(s) and degree(s) and,
7. In the case of international students, results of the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS)
8. The application fee of \$75; an application without the fee cannot be considered
9. All documents should be submitted electronically through the official UMD application portal.

A minimum grade point average (GPA) of 3.0/4.0 in undergraduate study is required for consideration of an application. When an institution uses a different scale, the Program Office or, in the case of international students, the Office of International Education Services will normalize the grade point average to a scale of 4.0. For international applicants, a minimum score of 96 on the TOEFL and 7 on the IELTS is a requirement of the Graduate School to be admitted without provisional status, providing sub-scores also meet the minimums. Please see Graduate School website for specifics on minimum sub-scores (<https://gradschool.umd.edu/admissions/english-language-proficiency-requirements>). The Program may request advice from the Office of International Education Services on the quality of education of the institutions previously attended by a candidate and the overall credentials of an international applicant. For teaching assistantships, international applicants should have subsection scores that meet or exceed the minimum for full enrollment. Preference is given to students that have a TOEFL speaking subsection score of 26 or higher or an IELTS speaking subsection of 8 or higher.

Applicants must indicate the need for financial assistance or provide documentation of adequate financial support for their studies. There are several types of financial support available within the Program. These include fellowships given to the Program by the Graduate School and graduate

teaching and research assistantships available within the Program. It is highly advised that the applicant should, wherever possible, identify one or more faculty in the Statement of Goals and Intent who can serve as a potential advisor to guide research in his/her area of interest. A profile of individual faculty and their ongoing research programs can be viewed on both the [Faculty webpage](#) and [Research webpage](#).

The Graduate Program no longer mails out paper applications. All candidates are directed to apply online through the [Graduate School](#). The applicants are advised to follow all the instructions; incomplete applications will delay consideration. Payment of your application fee of \$75.00 must be made on-line in order for your application to be submitted. Your application will not be processed until you pay your application fee and it is authorized. If you are unable to pay online please see the graduate school website listed above for guidance on submitting payment. The Graduate Education Committee starts to review applications on a rolling basis after the deadline for the fall and spring semesters (see [deadlines](#) under admissions on the [Prospective Students](#) page). The Director then considers the candidates who have been recommended positively by the committee for acceptance. In consultation with the Chair of the Department of Animal and Avian Sciences, and if funds are available, an assistantship offer is made to the accepted candidate. Simultaneously, the Dean of the Graduate School is notified for issuance of the letter of admission. In general, the Dean concurs with the decision made at the Program level and sends a formal letter offering admission to the candidate. For international applicants, after the Dean has issued the letter of admission, the Office of International Education Services is notified to process the Immigration and Naturalization Form I-20 and mail it to the candidate as well as to the U.S. Embassy in the country of the candidate. Upon presentation of the I-20 papers to the U.S. Embassy or its regional consulate in his/her country, a visa is issued to the student for travel to the U.S.A.

### **Graduate Education Committee**

The Graduate Education Committee (GEC) consists of five faculty members. Committee members must be Associate or Regular Graduate Program faculty. Four members are appointed by the Chair of the Department of Animal and Avian Sciences in consultation with the Director. One member may be recommended for appointment by the Associate Dean of the Virginia/Maryland Regional College of Veterinary Medicine. The Director of the Graduate Program in Animal Sciences serves as the fifth member and as Chair of the committee. The members serve a three-year appointment on a staggered basis but may be reappointed. The committee has the following responsibilities:

1. Develops curriculum and policy; obtains approval of the faculty and implements the same.
2. Serves as the admissions committee to screen and evaluate completed applications and recommends candidates to the Director for admission and for financial assistantships.
3. Approves the Graduate Advisory Committees of the students.
4. Reviews the progress of the students individually on an annual basis; approves all matters of an academic nature such as a change of advisor or member of the Graduate Advisory Committee, attendance at seminars, and other matters of a disciplinary nature.
5. Evaluates all students on a competitive basis and selects one student each, for the annual "Most Outstanding M.S. Student" and the "Most Outstanding Ph.D. Student" of the Year Awards.

## Master of Science Degree Requirements

1. For the degree of Master of Science (M.S.), the Graduate School requires each student to complete a minimum of 30 semester hours:
  - a. Six hours of thesis research credit (ANSC 799)
  - b. 24 credit hours of coursework, and
  - c. a written and defended thesis
2. Of the 24 credits hours required in graduate courses, no less than 12 hours must be earned in courses related to the major subject selected from the ANSC research focus areas. A minimum of 6 credit hours must have an ANSC designation and no less than 12 must be from courses numbered 600 or above. Please note that this requirement refers to coursework, **not** research credits (ANSC799)
3. Students must maintain an overall grade point average (GPA) of 3.0 or better in courses taken for graduate credit, otherwise they are placed on academic probation by the Graduate School and they may be dismissed from the Program.
4. In addition to the Graduate School requirements, the following Program requirements apply to students pursuing an M.S. degree:
  - a. Satisfactory completion of a graduate level course in Statistics, typically BIOM 601, and either a course in Research Bioethics or completion of the Responsible Conduct of Research (RCR) – CITI Program provided through the Division of Research.
  - b. The Graduate Education Committee also strongly encourages all Animal Science Graduate Program students to have completed a 400-level or above course in Biochemistry prior to or during their graduate program.
  - c. Completion of either ANSC624 Recent Advances in Animal and Avian Sciences or ANSC625 Developing Presentation Skills. (See ANSC Seminar requirements described below in Additional ANSC Requirements).
  - d. If Special Problems (ANSC 699) are selected, no more than two such credits can be part of the 24 required course credits.
5. Formation of a Graduate Advisory Committee by the end of the first semester that serves to guide and advise the student throughout the student's graduate studies. Masters Advisory Committees must consist of a minimum of three members, two of which must be Regular Graduate Faculty at College Park (tenured or tenure-track). The Chair must be from ANSC. See [our list of forms](#) for the Advisory Chair and Committee Form.
6. The Advisory Committee and the student must meet before the end of the second semester to approve the student's Plan of Study (proposed schedule of courses), signed by the student and his/her Advisory Committee. By this time the student should also have completed a thesis research proposal, which is approved by his/her Advisory Committee (see forms in Current Students on website). Because the Plan of Study represents the course work contract between the student and the Program, the student is expected to update and refile the Plan of Study if changes become necessary.



7. Completion of a thesis, which will be presented in a public seminar and then defended by an oral examination, as per regulations of the Graduate School. Notice must be posted one week before the seminar and the notice sent electronically to all the graduate students and the faculty in the Program.
8. The examining committee will reach one of the following decisions:
  - a. Pass, with a recommendation to pursue the Ph.D.
  - b. Pass, with a recommendation that the M.S. degree be terminal.
  - c. Fail, with the recommendation that the candidate should not be re-examined.
  - d. Fail, with a recommendation that the candidate be re-examined at a later date.

### **Doctor of Philosophy Degree Requirements**

The Doctor of Philosophy degree is granted to a student only after sufficient evidence of high achievement in scholarship and creativity and demonstrated ability to engage in independent research.

1. A minimum of 12 research dissertation credits (ANSC899) is required. The degree is not awarded for the completion of course requirements no matter how successfully that may have been completed.
2. Students must maintain an overall grade point average (GPA) of 3.0 or better in courses taken for graduate credit, otherwise they are placed on academic probation by the Graduate School and they may be dismissed from the Program.
3. In addition to the Graduate School requirements, the following program requirements apply to students pursuing a Ph.D. degree:
  - a. All PhD students must meet the MS coursework requirements either through a completed MS degree in Animal Sciences (US accredited university) and/or by taking additional coursework during their PhD program. See requirement No. 2 under Master of Science Degree Requirements.
  - b. Satisfactory completion of a graduate level course in Statistics, typically BIOM 601, and either a course in Research Bioethics or completion of the Responsible Conduct of Research (RCR) – CITI Program provided through the Division of Research.
  - d. The Graduate Education Committee also strongly encourages all Animal Science Graduate Program students to have completed a 400-level or above course in Biochemistry prior to or during their graduate program.
  - c. All doctoral students must take a total of two credits of seminar. See section - Additional ANSC Requirements – for details.
  - d. If Special Problems (ANSC 699) are selected, no more than two such credits can be part of the 24 required course credits.
4. During the student's first semester, the student and his/her advisor will recommend at least four additional members of the graduate faculty to serve on the student's Advisory Committee (See Resources and Forms).

- a. Doctoral Advisory Committees must consist of a minimum of five voting members, three of which must be Regular Graduate Faculty at College Park (including the Chair and the Dean's Rep).
  - b. Two must be ANSC faculty (the Chair and at least one other).
  - c. The individual who will act as Dean's Rep must be indicated on the form. Typically for ANSC committees the Dean's Rep is a voting member, if not, then be sure to have a fifth voting member (Regular Graduate Faculty). The Dean's Rep cannot be an ANSC faculty member but must be from another department/program on the UMD-College Park campus.
  - d. Other committee members must have Graduate Faculty status at UMCP. Up to two scientists from outside institutions who hold Special Graduate Faculty status may be appointed to the Graduate Advisory Committee. See the [forms page](#) for the Advisory Chair and Committee Form.
5. Before the end of the third semester, the student will also submit to his/her Advisory Committee a dissertation research proposal (See Forms <https://ansc.umd.edu/graduate/current-students#forms> ).
  6. Teaching experience is mandatory for all students during their Ph.D. program (equivalent to 8-10 hours of effort per week during a single semester). Graduate students not already on a teaching assistantship will be placed on at least a half-time teaching assistantship during the semester in which they fulfill this requirement. International students must be able to exempt or pass the ITA evaluation in order to complete this requirement.
  7. After no more than five semesters (after approximately 80% of the Plan of Study has been completed), the student must pass the Admission to Candidacy Examination, which consists of both written and oral components and is administered by the advisory committee.
    - a. Prior to the exam the student will meet with their committee and establish three academic focus areas to be covered. See GOA Expectations Form.
    - b. Please note that after students advance to candidacy, the Registrar's Office automatically enrolls them in 6 credits of ANSC899 each fall and spring semester until they graduate. This means that students might not have enough tuition remission leftover if they are still interested in taking courses. The student needs two subsequent semesters after advancing to acquire the required 12 credits of ANSC899.
  8. For the written examination, each member of the Graduate Advisory Committee submits one or more questions in the animal sciences area, defined in the broadest sense.
    - a. The student is well advised to meet individually with every member of the committee and receive general guidance.
    - b. It is expected that the individual members of the committee will submit questions that can be reasonably answered in a three-hour period.
    - c. The mentor/major advisor receives the questions in advance and conducts the examination within a preannounced one-week period.
    - d. The student answers the question(s) for one member of the Graduate Advisory Committee on a given day.



- e. The examination may be open or closed book, as stipulated by the examiner.
  - f. The student is expected to follow the Honor Code of the University and return the completed examination to his mentor.
  - g. The individual components of the written examination are evaluated by the members of the committee who submitted their question(s).
9. After the written examination, the major advisor/mentor will schedule an oral examination. It is expected that a major part of the oral examination will focus on questions and issues arising out of the written examination, the ongoing dissertation research of the student, and, to a lesser extent, the general knowledge and background that is deserving a pass for advancement to candidacy for the Ph.D. degree.
  10. Following the oral examination, the Advisory Committee must reach a decision regarding advancement to candidacy. The committee may recommend one of the following:
    - a. Passing the student with no conditions.
    - b. Passing the student with conditions, stating how and when these conditions must be met.
    - c. Failing the student.
  11. The student is responsible for submitting the associated forms; GOA expectations, GOA Assessment, and application for Admission to Candidacy, to the ANSC graduate program office.
  12. After completion of the research, the student will write a scholarly dissertation as per rules of the Graduate School. The dissertation will be presented in a public seminar.
    - a. The Nomination of a Dissertation Examining Committee form should be submitted to the Graduate School **at least six weeks before the date** of the expected dissertation examination. The dissertation examination cannot be held until the Graduate School approves the composition of the Dissertation Examining Committee. Typically the Dissertation Examining Committee is comprised of the same faculty members who served as the Advisory Committee.
    - b. The student and advisor suggest a potential Dean's Rep on the Nomination of Dissertation Committee Form. The form and Dean's Rep must be approved by the Dean of the Graduate prior to the examination. The role and duties of the representative are defined by the Dean. His/her primary role is to oversee and ensure that the examination is conducted fairly and as per guidelines of the Graduate School.
    - c. Announcements of the date, time, and location of the examination, as well as the candidate's name and the dissertation title, will be disseminated **five working days** in advance to all members of the Graduate Faculty and graduate students within the graduate program in which the candidate's degree is to be awarded. Mass-distribution methods, such as e-mail or a faculty/student newsletter can be used. **Review all policy requirements as described in the Graduate Catalog.**
  13. Dissertation defense examination follows a public seminar. The examination is a closed meeting. This examination will focus primarily on questions and issues arising out of dissertation research. It is expected that at this point there will be minimal necessity to test

the student on background areas that should have been covered in formal courses and the written and oral comprehensive examinations.

## Additional ANSC Requirements

### ANSC Seminar

The Graduate Program holds a regular seminar during the academic year and special seminars during the summer period. Additionally, a number of related graduate programs on the campus also hold weekly and special seminars. The seminar requirements in ANSC are given below:

1. M.S. students are required to take a total of one credit of seminar. This credit can be from either ANSC625 (formerly ANSC698D) *Developing Presentation Skills* (one credit) early in their studies or one credit of ANSC624 (formerly ANSC698C) *Recent Advances in Animal and Avian Sciences* at some point after the first year of study. Placement in either seminar option will be at the discretion of the student and his/her advisor.
2. Ph.D. students are required to take a total of two credits of seminar, one of which must be ANSC624. The ANSC seminars should be taken in non-consecutive semesters. Registration for seminars outside of the ANSC Program must be discussed and approved by the student's Dissertation Advisory Committee in advance and documented with the Program Office for record keeping in the student's folder.
3. The Seminars will be graded on the standard A/B/C/D/F grading system.
4. The Seminar course will feature outside speakers scheduled approximately once a month, invited either by students or faculty. These seminars will cover the most recent advances in animal sciences by leading scientists within or outside the United States. They will be about 40-45 minutes long, with ample time for discussion and, as schedules allow, one-on-one interaction between the students and the speaker. Students are strongly encouraged to take advantage of this opportunity as they seek opportunities for additional graduate work (M.S. students) or postdoctoral research (Ph.D. students) and avenues for further professional advancement.
5. The regular and adjunct faculty within the program will be scheduled into ANSC624 to give a seminar on their ongoing research every 3-4 years.
6. Students are expected to attend the weekly seminar in ANSC or another related graduate program during the academic year, regardless of whether they are signed up for credit. This may be monitored at the discretion of the instructor-in-charge.

### Responsible Conduct of Research (RCR) Training

All graduate students are required to complete RCR training. Courses such as BISI712 *Responsible Conduct of Research for Biologists* meet this requirement. Alternatively, CITI Training for RCR may be completed online. It is highly recommended that students complete this training within their first academic year. If a student completes the online training in their first year, it is recommended that

they also consider taking one of the courses offered on campus subsequently, as the classroom discussions are more comprehensive than the online training and also provides graduate credit.

#### CITI Training for RCR:

1. Log on to the [CITI training website](#) to complete the training. You will be able to create your own user name and password as this is not linked to your UMD ID. Be sure to select University of Maryland College Park as your institution when you register (otherwise the site will request payment) and select the track that is most appropriate for the research you are conducting. If you cannot complete the training in one sitting, you may save and finish at a later time (you can stop and start as many times as you need).
2. After you complete the CITI training, be sure to print a copy of your certificate of completion (either electronic or printed copy) and give it to the ANSC Graduate Office.

#### **Grading Policy for ANSC 799, 898, and 899**

University policy states the S-F grading system must be used for master's thesis (ANSC799) and doctoral dissertation (ANSC899) research. A grade of S indicates satisfactory progress towards the completion of the thesis or dissertation; a grade of F indicates failure to make satisfactory progress. A grade of F will trigger a review to determine whether the student's enrollment should be terminated. Determinations of satisfactory progress occur at the graduate program level.

A grade of I (incomplete) may be assigned if the advisor is unable to determine that the student is making satisfactory progress. The grade of I should be used sparingly and only after the advisor has spoken with the student about concerns regarding satisfactory progress.

For 799 and 899 there are no incomplete contracts. Advisors should change grades of I to S when the student has demonstrated satisfactory progress, or to F if the advisor determines the student is incapable of making satisfactory progress. Upon successful completion of all degree requirements and the award of the degree, any remaining I grades for 799 and 899 will automatically be changed to S.

The S/F grading system should also be used for pre-candidacy (ANSC898) research. This grading system for 898 has been designated by the ANSC graduate faculty. Please remember to check at the end of the semester that your mentor has entered a grade for your research credits. If s/he forgets, then a NG (no grade) will be entered. You will then need to have your advisor sign a form, which must be processed through the department and the graduate school, to get the NG corrected; it is better to remind them at the end of the semester that you are taking research credit and that they should enter a grade.

In computation of cumulative averages, a mark of S will not be included. Please note that 799, 898, and 899 courses are not used in the calculation of GPA, whether or not the A-F grading system is used. For more information, see the [Academic Record webpage](#).

## Graduate Student Deadlines

<b>Program Deadlines</b>	
By the End of the 1st Semester	<ul style="list-style-type: none"> <li>• Advisory Chair and Committee Members Form*</li> </ul>
By the End of the 2nd Semester	<ul style="list-style-type: none"> <li>• Plan of Study Form (MS and PhD)</li> <li>• MS Thesis Research Proposal</li> <li>• Proposal Coversheet Form*</li> </ul>
By the End of the 3rd Semester	<ul style="list-style-type: none"> <li>• PhD Dissertation Research Proposal and Proposal Coversheet Form*</li> </ul>
By the End of the 5 <sup>th</sup> Semester	<ul style="list-style-type: none"> <li>• Completion of PhD candidacy exam</li> </ul>
By Mid-April, annually	<ul style="list-style-type: none"> <li>• Student's Annual Progress Report</li> <li>• Advisor's Annual Evaluation (Signed by advisor and student)</li> <li>• Report of the Graduate Advisory Committee Meeting</li> <li>• Student's updated CV</li> <li>• Unofficial Transcript</li> </ul>
<b>Graduate School Deadlines</b>	
All Graduate Degree Candidates:	<ul style="list-style-type: none"> <li>• Must submit electronically the Application for Graduation to the Registrar's Office for graduation that semester. Please note that this deadline is <b><u>very early</u></b> in the semester.</li> </ul>
<b>Doctoral Students:</b>	<ul style="list-style-type: none"> <li>• Must submit Nomination of Dissertation Committee Form* to the Office of Registrar, 1113 Mitchell Bldg. <b>at least 6 weeks before</b> the scheduled defense.</li> </ul>

	<ul style="list-style-type: none"> <li>• Must submit electronically dissertation, Thesis and Dissertation Publication Form, and the Report of Examining Committee Form* to the Office of the Registrar, 1113 Mitchell Building.</li> </ul>
<b>Master's Thesis Students:</b>	<ul style="list-style-type: none"> <li>• Nomination of Thesis Committee Form* to the Office of Registrar, 1113 Mitchell Bldg. <b>at least 6 weeks</b> before the scheduled defense.</li> <li>• Must submit Approved Program Form*</li> <li>• Must submit electronically Thesis, Thesis and Dissertation Publication Form, and the Report of Examining Committee Form* to the Office of the Registrar, 1113 Mitchell Building.</li> </ul>

\*Submit all Graduate School forms through the ANSC Graduate Program. Please note some forms are ANSC program specific (send only to the ANSC Graduate Program) and some are Graduate School specific. If you do send a form directly to the Graduate School, be sure to send a copy of the form to the ANSC Program. Otherwise, we will not be able to keep track of your progress and cannot provide support if the form is lost by the Graduate School. Forms can be obtained here - [FORMS](#)  
The Graduate School deadlines can be found in the [Graduate School Calendar](#) and the [Graduate Catalog](#).

### **Guidelines for the Submission of Thesis and Dissertation**

- Thesis and dissertation should be electronically submitted to the graduate school [here](#). The new edition of the Thesis and Dissertation Style Guide is located on the [Graduate School website](#).
- The latest edition of the [Graduate School Catalog](#) contains comprehensive information on programs, courses, policies, and protocols of the Graduate School and has direct links to the often-used sections that contain details regarding graduate education at the University of Maryland, College Park. This information includes (but is not limited to) the following policies:

- Graduate School Policies: Academic Policies, Registration Policies, Master's Degree Policies, Doctoral Degree Policies, Policies for Graduate Assistantships, General Policies, Appointments
- Duties, Time Commitments, and Compensation
- Tuition Remission and Benefits
- Codes of Conduct

## Graduate Student Rights and Responsibilities

See: <https://academiccatalog.umd.edu/graduate/policies/school-policies/#text>

The Graduate School has prepared guides in order to provide you with information about graduate rights and responsibilities, course policies, other policies related to graduate study, and relevant on campus resources. Please the Graduate School catalog policies section:

<https://academiccatalog.umd.edu/graduate/policies/>

See also Graduate Student Services: <https://academiccatalog.umd.edu/graduate/policies/school-services/>

### Graduate Assistants

Please note the following:

- Your services will be required during the entire period of your appointment, with the exception of official [University holidays](#).
- Your responsibilities will require an average weekly time commitment of 20 hours a week, (for a regular assistantships) working for the department by teaching and/or working for your advisor. This is in addition to your course work and your own research project. You are required to abide by all the requirements of the ANSC Graduate Program as summarized in this handbook.
- Benefits of this appointment include up to ten credits of tuition remission per academic semester and four credits over the winter term and participation in the employee's health benefits program. The assistantship does not, however, cover the cost of mandatory fees.
- In addition to fulfilling their responsibilities and making adequate progress in the program, students must maintain **full-time graduate student status** (i.e., register for 24 graduate units each Fall and Spring semester) to keep their assistantship. Please note that graduate units do not equal credit hours – see [Registration Policies](#) – Designation of Full-time Status in the Graduate Catalog.



## **Advising and Mentoring**

Given the diverse scope of research activities in several focal areas, at the time of admission the Program tries to match candidates with one or more faculty who would be best suited to the background and research goals of the selected applicants. In the letter offering a graduate assistantship (teaching/research), the Director and the Chair of the department providing the assistantship assign an appropriate faculty member who would serve as the student's advisor at the start of education in the Program. As stated elsewhere, the Dean of the Graduate School sends the official letter of admission to the selected applicants.

There is a period of several months between the offer of admission and actual enrollment of a student into the Graduate Program. After a candidate has accepted the offer, the Director puts him/her and the faculty advisor in touch with each other. This is designed to encourage interaction between the two parties and explore mutual research interests early on and before the arrival of the student. The Program realizes that a student may find that his/her research interests do not match the initial advisor and may want to select another advisor with the approval of the Graduate Education Committee and the Director of the Program.

All graduate students, whether working for the M.S. or Ph.D. degree, are advised to finalize their advisor before the end of their first semester. The student and the advisor together propose a Graduate Advisory Committee and submit the specified form for approval by the Graduate Education Committee and endorsement by the Director before the end of the first semester of entry into the Program.

The student and the advisor work out a project for research toward the M.S. or Ph.D. degree as soon as possible. A Research Proposal and a Plan of Study must be presented to the student's Graduate Advisory Committee for approval and routed to the Graduate Education Committee at the end of the second semester for MS students and the end of the 3rd semester for PhD students. After the Graduate Education Committee has endorsed the Research Proposal and the Plan of Study, the documents become a record in the Program Office. It is recognized that sometimes a Research Proposal may require a major shift in direction to provide a productive lead. In such circumstances, a revised proposal, duly approved and endorsed by the above committees, should be deposited in the Program Office. It should be emphasized that a delay or delinquency in the submission of the Plan of Study and the Research Proposal within the stipulated time may adversely affect and risk the student being put on Academic Probation. Should this happen, the student will be notified and asked to remove the deficiency within one semester or risk dismissal.

It is worth reminding that, more often than not, a research project takes longer to complete than initially anticipated. The student and the advisor, along with the Graduate Advisory Committee, should continually monitor the progress and work diligently to achieve the goal side by side with fulfillment of all other requirements for completion of the degree. It is at this point that the advisor assumes the responsibility of a mentor.

The role of a mentor is a matter of much philosophical discussion; suffice it to say that it represents the epitome of a true relationship between a guru and a disciple at the highest order. It is a very individualistic relationship and may be summarized in a variation of the words of Anne Todd as thus:

“The mentor is a critical friend. He/she supports, enables and facilitates the personal and professional advancement of the student/trainee. The two act as a link, or interface with other professionals engaged in the fulfillment of the goals of the student/trainee. The mentor sets high professional standards and ethics as a ‘role model’ for the aspiring student/trainee.” Indeed, a graduate student may have more than one mentor, e.g., members of his/her Graduate Advisory Committee or even other professors in the Program. After the ‘rites of passage’, today’s student may be tomorrow’s colleague for the mentor. Ideally, it should build into a life-long relationship between the two. Today’s protégé will be tomorrow’s mentor!

### **Graduate Assistantships and Policy on their Award**

Research in animal sciences entails concerted commitment and experimental work. Students are normally not admitted into the Program unless they have a sponsor/fellowship, their own finances to support them, or an assistantship which can provide for subsistence, tuition, and university-subsidized health insurance. The following is a summary of the salient features of the policy within the Department of Animal and Avian Sciences:

- The ANSC department’s teaching and research assistantships have been pooled to create uniform 9.5-month graduate assistantships;
- All recipients must contribute to the departmental mission in a teaching-related activity;
- Proficiency in both written and spoken English is an important issue for the admission of international students;
- Candidates reviewed by the Graduate Education Committee for financial support are ranked by the Department Chair and the Director and considered for assistantship after consultation with the Business Manager for budgetary provision;
- M.S. students will receive support for two years, Ph.D. students for four years. The department may support a graduate assistant for an additional year at 50 percent of the stipend. The research advisor will provide support beyond that from his/her grants or the student may seek external fellowships/scholarships or dissertation fellowships from the Graduate School.
- Assistantship duties can cover a broad range of assistance needs in the department. The Chair in consultation with the Undergraduate and Graduate Program Directors assigns assistantship duties. All Ph.D. students are required to assist in teaching duties for one semester as a requirement.
- Graduate School policies on assistantships:  
<https://academiccatalog.umd.edu/graduate/policies/policies-graduate-assistantships/#text>

## Statement of Mutual Expectations

Graduate Students & Graduate Assistants: When a new graduate student joins the ANSC Graduate Program, the advisor and the graduate student will meet to review and confirm expectations including a summary of required duties and activities. This summary should include how research expectations may be affected by course work and/or teaching duties.

- The advisor-graduate student Research Assistant Statement should be reviewed yearly and updated, as needed.
- Teaching Assistants will meet with the instructor of their assigned class prior to the beginning of the semester to complete a Mutual Expectations Statement regarding their duties during that semester.
- To facilitate the discussions, a Statement of Mutual Expectations (SME) for Research Assistants and Teaching Assistants can be found on the ANSC Current Graduate Students website [[link](#)].
- Completed Statements of Mutual Expectations are to be submitted to the ANSC Graduate Program office ([ansc-gradprogram@umd.edu](mailto:ansc-gradprogram@umd.edu)). Please include your last name in the file title, e.g., RA\_SME\_Name.doc or TA\_SME\_Name.pdf.

## Grievance Procedure

Graduate Assistants are, first and foremost, graduate students pursuing an education. The opportunity to work closely with faculty and undergraduate students in teaching, research, or administrative environments is an integral part of that education. The University is committed to ensuring that graduate assistant assignments are productive, enhance student qualifications, meet funding support and workload goals, and are consistent with the educational objectives of the student and his or her program.

The University of Maryland is an academic and collegial community. Regular and clear communication between Graduate Assistants and their advisors and supervisors is essential to maintaining an effective educational environment. Occasionally, problems may occur. A Graduate Assistant who experiences problems related to workload is encouraged to consult with his or her advisor or supervisor. Should the need arise, a Grievance Procedure is detailed in the Policies section of the Graduate School Catalog:

<https://academiccatalog.umd.edu/graduate/policies/school-policies/>

## Annual Review of Graduate Students

The Graduate Education Committee (GEC) shall conduct a review of all students annually, near the end of the spring semester, to evaluate student progress toward the desired degree. Each graduate student will provide the following documents to the Director's office by mid-April (an email reminder will be sent):

- A Student's Annual Progress Report on their research project and program benchmarks
- Advisor's Annual Evaluation, co-signed by both the advisor and the student.
- Report of the most recent Graduate Advisory Committee meeting
- Student's Updated CV
- Unofficial Transcript.

The manner of the review will be determined by the GEC, but students should be aware that they might be asked to appear for an interview to answer questions regarding their progress and/or prepare a written report regarding their progress. The purpose of the review will be the following:

- To determine if the student is making satisfactory progress toward the desired degree.
- To determine if a change in graduate student status is warranted.
- To determine if requirements as presented to the student in the Handbook are being met (participation in seminars, filing of a Plan of Study and Research Proposal, etc.).

Students on grade probation should be aware that the Program will not use grades or credits from ANSC699 earned while on grade probation in calculating the GPA for removal from grade probation.

The student and the advisor will be informed in writing of any review findings that result in a change of student status.

Any student whose overall grade point average falls below 3.0 will be placed on academic probation by the Graduate School. Students may also be placed on probation by the program for failure to make satisfactory progress toward the intended degree or for failing the comprehensive/prelim examination for the Ph.D. degree. The student and the mentor will be informed in writing to remove the academic probation. Failure of the student to correct the reason for probation status during the following semester will result in dismissal.

## Annual Symposium

Each year during the first week in June, the department holds a Graduate Student Presentation Day (also known as 'The One-Day Wonder') when graduate students in the Department of Animal and Avian Sciences can show off their research findings to the department, campus, and local research institutions. This also gives students the opportunity to practice their presentation skills in front of a knowledgeable audience. All graduate students are required to give an oral presentation or a poster of their research. However, only those students presenting a completed piece of research and who will also be presenting this research at a scientific meeting will be eligible for travel awards.

In the past, the department has awarded \$500 for first place and \$250 for second place in each of the oral and poster presentation categories. In addition, those students presenting poultry research are eligible to compete for the Shafner Award, which awards travel money of \$500 for first place and \$250 for second place in the combined categories of oral and poster presentations. Again, as with the department awards, students are only eligible for the Shafner Award if they plan to present the research at a scientific meeting. Students cannot win awards in both the department and Shafner Award categories, and again, the money can only be used to support travel to and accommodation at a scientific meeting.

### **Most Outstanding Student of the Year**

Starting in 2003, the Graduate Program established the 'Most Outstanding Student of the Year' award program. In 2004, the program was expanded to separately give awards to the most outstanding student in M.S. and Ph.D. degree categories. The current levels of the award consist of an unrestricted cash prize of \$400 and \$600, respectively for the two programs, and a Citation. The Graduate Education Committee selects the winner of the award at the time of the Annual Review of all graduate students in May each year. The Program Office provides the following documents to the members of the committee on every student:

- A copy of the Curriculum Vitae (CV) of each student in the Program.
- The master control sheet summarizing the overall performance and progress of the student.
- The transcript summarizing the grades in all the courses taken to date.
- The annual self-evaluation completed by the student.
- The annual evaluation of the student by the mentor.
- The report of the thesis/dissertation advisory committee.
- Abstracts of papers presented at scientific meetings (if provided by student in the annual review material).
- Other professional recognitions and awards such as prize(s) for papers presented at professional conferences (provided by student in the updated CV).
- Manuscripts accepted or papers published from thesis/dissertation research and any other meritorious features in a student's dossier (as provided by the student in the updated CV).

Prior to the review in person with each student in the Program, the members of the GEC score individual students privately on a scale of 1.0 to 5.0, with 1.0 being the highest score. After the GEC has interviewed and reviewed all the students, each member of the committee is asked to rank the top three students in both M.S. and Ph.D. in the Program, based on their earlier review scores and on the interviews. After discussion, the most outstanding student is selected. The winner's name is forwarded to the Chair of the Department of Animal and Avian Sciences with a short report highlighting the achievements of the student. Throughout the deliberations and until the

announcement, the name of the winner is kept confidential. The Chair announces the winner and publicly recognizes the winner at the awards presentation session during the Annual Symposium.

The funds for these awards are derived from an endowment in the Department of Animal and Avian Sciences. As the endowment increases and grows in the future, it is anticipated that a portion of the earnings will be spun off to give a small scholarship to the winner to supplement the financial assistantship for recruiting outstanding candidate(s) into the Program. The supplement may be used in any way, e.g., purchase of books and supplies, payment towards security deposit for housing, or any other personal needs.

## Regulatory Issues

### **Animal Care and Use**

Campus and federal requirements very clearly stipulate that any research project involving human subjects or animals must be approved by the appropriate campus committee **PRIOR** to the initiation of the research.

The campus committee that governs the use of animals for teaching and research purposes is the Institutional Animal Care and Use Committee (IACUC). Approval by the campus committee is also a stipulation for grant applications to USDA, NIH, NSF, and other granting agencies that require at the time of grant submission or at the time the grant is funded that any projects involving humans or animals be approved by the appropriate campus committee. Further, **NO** vertebrate animals may be used under campus auspices without prior approval of the IACUC. Examples of animal activities requiring IACUC approval include the following:

- Animal research conducted on campus or on MAES facilities.
- Animal research conducted in the field by UM faculty, graduate students, or staff under the auspices of the campus.
- Animal research conducted by UM graduate students at other institutions (e.g., USDA, NIH, Patuxent Wildlife Center) as part of completion of a graduate degree.
- Animal research conducted at another institution as part of a joint contract with a UM faculty member.
- Animal activities used in the teaching of UM undergraduate and graduate courses.

Compliance with IACUC and its regulations is **MANDATORY**. Therefore, it is imperative that the graduate student discusses both department and university requirements and policies/procedures with their research advisor well in advance of proposed animal-related projects or course requirements for animal use in order to obtain the appropriate approvals.

Prior to graduation, all Animal and Avian Sciences graduate students must attend the UM Animal Users Training Program. Students who plan to conduct research with animals are required to attend the program prior to planning their animal research. The program is a one-day lecture offered in the



fall and spring semesters (or when needed) by the Director of Laboratory Animal Care. Prior to submitting an Animal Use Protocol Form for review by the campus IACUC, the student should visit with the Director of Laboratory Animal Care to make sure all forms are filled out correctly and that all information is up-to-date. Dr. Angela Black is the department's Veterinarian and oversees animal research in the Animal Wing. It is also important that the student makes an appointment with Dr. Black prior to submitting a proposal to make sure that facilities will be available and that the protocol contains appropriate documentation for use of drugs or pain relievers if this is required for research.

For more information concerning the Animal Care and Use Program, the student may call 301-405-4921 or visit the website at [www.umresearch.umd.edu/iacuc/index.html](http://www.umresearch.umd.edu/iacuc/index.html). The necessary forms, guidelines and regulations, and dates when the IACUC meets to review proposals are given here. The student should note the submission deadlines for each month's review of proposals and make sure to submit their proposal before this date. Please note that requirements and reporting methods may change, students/advisors are responsible for being aware of current regulations.

### **Radiation Safety and Chemical Hygiene in the Laboratory**

All students, upon arriving in the department, must take part in either seminars or online training courses offered by the Department of Environmental Safety, Sustainability & Risk (ESSR) for work in the laboratory. Not all the training courses are required, so students should consult with their advisor or laboratory technician to find out what types of laboratory hazards they will encounter and how to work safely in the lab environment. Prior to working in the lab, the advisor or technician should have students read and sign the Laboratory Safety Checklist sheet, which affirms that they have been made aware of and fully recognize the lab hazards, where to get help, how to dispose of various materials appropriately, and who to contact in the case of an emergency. Further information can be obtained from Nikki Thompson, the department's Compliance Officer ([nthomps1@umd.edu](mailto:nthomps1@umd.edu)) or the [ESSR website](#). Here students can find dates when seminars are held, online training courses, and forms.

It is recommended that students first read the information for Laboratory Workers on the ESSR website prior to undertaking any procedures in the lab. The site also contains information and training videos documenting handling and disposal procedures for radioactive materials and biological wastes (bacteria, viruses, etc.). If students are in doubt about any hazardous procedure or material, it is best to consult with the lab technician, advisor, the department's Compliance Officer, or the website prior to proceeding further. Always be SAFE and SURE!

**Responsible Conduct of Research (RCR) Training:** All researchers must complete RCR training. This includes all graduate student performing research. See description on page 10.

## Other Resources

### Motor Transportation Services

Many graduate students will be teaching assistants one semester out of the year, and in some courses it may be necessary for them to rent a vehicle to transport students on field trips. The Motor Transportation Services Unit of the Department of Business Services offers a wide variety of [transportation-related services to the University](#). You can go to [their website](#) to rent a vehicle or to find out about:

- University Vehicle
- Information and Policies. A student must be at least 18 years of age to drive a University vehicle.

### Facilities on the Campus of the University

The Department of Animal and Avian Sciences and the nearby Gudelsky Veterinary Center housing the Department of Veterinary Medicine, Virginia-Maryland Regional College of Veterinary Medicine, have extensive facilities consisting of faculty research laboratories, an animal holding area, a campus farm, an aquaculture facility, and the outlying research farms. Additionally, the department maintains two computer laboratories—a teaching laboratory with 30 workstations and a smaller laboratory exclusively for the use of graduate students on a 24hour basis.

The research laboratories comprise nearly 28,000 square feet for bench work, averaging over 1,000 square feet per faculty member. Over 2,800 square feet of cold room and 2,000 square feet of freezer room are integral components of the research laboratories. The laboratories are fully equipped with state-of-the-art modern instrumentation and equipment for the entire range of research carried out by the faculty, e.g., research in biochemistry, cell-molecular biology, physiology, nutrition, behavior, virology, immunology, microbial pathogenesis, etc. Individual laboratories are fully self-standing units, yet there is free exchange between laboratories having shared and collaborative interests. All the laboratories and offices are networked to the campus server for direct Internet access.

Nearly 15,000 square feet of space is dedicated for animal holding in the Animal Wing of the Animal Sciences Center. This facility is capable of handling all kinds of animals, for example, rodents, birds, fish for aquaculture, and large animals for research in separate rooms. In addition, an aquaculture facility capable of handling larger fish is located adjoining the Gudelsky Center. The Animal Wing is under the care of staff and is supervised by a professional veterinarian. Other facilities are available to the faculty and students as part of the Central Core Facilities on the campus. Please check those websites to determine what resources are currently available.

## **Research Facilities Off-Campus**

### **University of Maryland/USDA-Beltsville Animal Biotechnology Facility**

An 11,000 square feet cooperative facility for research in animal biotechnology was established at the Beltsville Agricultural Research Center. It includes laboratories specifically designed for research in cloning and transgenic biology. It has its own self-standing laboratories and animal facilities for rodents and avian. ANSC faculty engaged in nuclear cloning, stem cell and transgenic biotechnology would use this facility to investigate genes of significance for the growth, development, and physiology of domestic animals.

### **Central Maryland Research and Education Center, Clarksville, Maryland**

This 925-acre dairy and horse research center, located ~25 miles from the campus, houses 200 head of Holstein dairy cattle, including 110 milking cows, 90 head of young stock, and 20 horses. ANSC faculty engaged in nutrition, reproduction, physiology, herd health, behavior and management research conduct their experiments at this facility.

### **Applied Poultry Research Laboratory, Upper Marlboro, Maryland**

This 202-acre facility is located approximately 20 miles from the campus. It is used for conducting research in nutrition, physiology, and behavior. There is another Poultry Behavior Research facility on the campus farm adjoining the Animal Sciences Center.

### **Wye Beef Cattle Research Center**

This 450-acre facility is located on Maryland's Eastern Shore near Queenstown. It has 250 Registered Beef Angus Cows plus young stock and bulls that are direct descendants of Wye Angus herd. The facility is used to support research associated with beef cow-calf management, pasture management, and growth physiology

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## Overview of Research Areas (see [website](#) for updates)

### Genetics and Cell Biology

The primary thrust of the Genetics and Cell Biology Group is to illuminate the molecular and cellular basis of complex biological systems using a multi-organismal and multi-faceted approach. The group comprises faculty that span across multiple disciplines with research focuses in basic and translational research and with implications for animal health and diseases and the environment.

Key problems being addressed by this group include the following:

- Nutrient-gene interactions that influence nutrient partitioning
- Cell biology and genetics of nutrient homeostasis
- Molecular basis for the maintenance of pluripotency and cell lineage determination
- Molecular dynamics of lipid secretion
- Genetics and endocrine regulation of growth and metabolism
- Statistical genomics, bioinformatics and gene regulatory networks
- Developmental biology, embryonic patterning, and cell migration
- Molecular mechanisms of protective memory in mucosal infections
- Interactions between nutrition and the immune system
- Selection theory and quantitative genetics

### Reproduction and Development

The Reproduction and Development faculty possess a wide range of scientific expertise that, in many instances, spans multiple core research areas. Through both basic and applied research, our faculty continues to make important contributions to the fields of animal agriculture and the biomedical sciences. Key questions being addressed by this group include the following:

- Etiology of implantation failure and early pregnancy loss through an understanding of placental development.
- Development of self-renewing, pluripotent cell lines.
- Reproductive physiology and cryobiology.
- Signaling pathways and gene expression regulating neural crest induction, migration and differentiation.
- Molecular, cellular and genetic regulation of animal growth and reproduction by the neuroendocrine system.
- Neuroendocrine and behavioral regulation of reproduction.
- Brain-pituitary-gonadal axis regulation of reproduction, including the development of sex specific characteristics.

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## **Nutrient Utilization and Metabolism**

The Nutrient Utilization and Metabolism faculty possess expertise in both basic and applied research approaches to systemically address important nutritional issues facing animal agriculture at the local, state and national levels. Key issues being addressed by this group include the following:

- Optimization of dietary energy, nitrogen and phosphorus use by ruminants and poultry to decrease impacts on the environment.
- Improve survival and growth of chicken embryos and post-hatch chicks.
- Develop mathematical models of whole-animal nutrient utilization for research investigation and to improve predictions of animal performance.
- Nutrient-gene interactions that affect milk composition.
- Reduce methane emissions by ruminants.
- Utilization of traditional and novel forages by horses and beef cattle.
- Establish best feeding practices for insectivorous birds.

## **Pathobiology and Infectious Diseases**

The major task for this pathogen-host interacting group is to decipher how hosts launch efficient immunity against infections, thus information obtained will be useful for the development of vaccine and control of infectious diseases. This group include faculty with expertise covering multiple disciplines in both basic and translational research. Key projects including the following:

- Regulation of inflammatory cytokines on memory CD8 T cell generation.
- Interaction of metabolic pathways with those of inflammatory cytokines in CD8 T cell activation.
- Development of cross-protective vaccine against swine influenza.
- Epigenetic study of chicken response in Marek's disease virus infection.
- Dynamic mechanism of host-virus interaction.
- Epigenetics of CD4+ T cell and CD8+ T cell in response to virus infection.
- Beef quality and epigenetics.
- Computational epigenetics and statistical genomics in animal health.
- Construction of a novel vaccine of animal against the colonization of foodborne bacterial pathogens.
- Control of foodborne bacterial colonization in animals using natural products and mechanism of antimicrobial activity of the components.
- Prevention of cross contamination in food and products in processing and preservation.

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## ANSC Faculty

**Graduate Faculty in the Department of Animal and Avian Sciences** – see website for updated information <https://ansc.umd.edu/people/faculty>

- ❖ **C. Roselina Angel** ▪ Email: [rangel@umd.edu](mailto:rangel@umd.edu) ▪ Phone: 301-405-8494 ▪ Research Interest: Avian Nutrition
- ❖ **Debabrata Biswas** ▪ Email: [dbiswas@umd.edu](mailto:dbiswas@umd.edu) ▪ Phone: 301-405-3791 ▪ Research Interest: Food Borne Bacterial Infections and Safety
- ❖ **Andrew Broadbent** ▪ Email: [ajbroad@umd.edu](mailto:ajbroad@umd.edu) ▪ Research Interest: Determination of the mechanism of viral immunosuppression in animals and its role in the spread of zoonotic infectious diseases
- ❖ **Amy Burk** ▪ Email: [amyburk@umd.edu](mailto:amyburk@umd.edu) ▪ Phone: 301-405-8337 ▪ Research Interest: Equine Nutrition
- ❖ **Rachel Dennis** ▪ Email: [rdennis@umd.edu](mailto:rdennis@umd.edu) ▪ Phone: 301-405-5923 ▪ Research Interest: Behavioral Neurophysiology
- ❖ **Iqbal Hamza** ▪ Email: [hamza@umd.edu](mailto:hamza@umd.edu) ▪ Phone: 301-405-0649 ▪ Research Interest: Cell Biology and Genetics of Micronutrient Metabolism
- ❖ **Youngeon Jin** ▪ Email: [ygiin@umd.edu](mailto:ygiin@umd.edu) ▪ Phone: 301-405-0372 ▪ Research Interest: Apical junctional complex in gastrointestinal homeostasis and disease
- ❖ **Carol L. Keefer** ▪ Email: [ckeefer@umd.edu](mailto:ckeefer@umd.edu) ▪ Phone: 301-405-3933 ▪ Research Interest: Reproductive Biology and Embryology
- ❖ **Byung-Eun Kim** ▪ Email: [bekim@umd.edu](mailto:bekim@umd.edu) ▪ Phone: 301-405-3977 ▪ Research Interest: Cellular and Molecular Nutrition/ Metal Metabolism
- ❖ **Richard Kohn** ▪ Email: [rkohn@umd.edu](mailto:rkohn@umd.edu) ▪ Phone: 301-405-4583 ▪ Research Interest: Animal Nutrition Management
- ❖ **Li Ma** ▪ Email: [lima@umd.edu](mailto:lima@umd.edu) ▪ Phone: 301-405-1389 ▪ Research Interest: Population Genetics and Mechanisms of Complex Diseases
- ❖ **Tom Porter** ▪ Email: [ansc-chair@umd.edu](mailto:ansc-chair@umd.edu) ▪ Phone: 301-405-1366 ▪ Research Interest: Molecular and Cellular Endocrinology of Animal Growth and Development
- ❖ **Eduardo Rico** ▪ Email: [jerico@umd.edu](mailto:jerico@umd.edu) ▪ Research Interest: Nutrient metabolism and health in ruminants and other livestock
- ❖ **Mohamed Salem** ▪ Email: [mosalem@umd.edu](mailto:mosalem@umd.edu) ▪ Phone: 301-405-4243 ▪ Research Interest: Omics approaches to enhance muscle growth and aquaculture production
- ❖ **Andrew Schiffmacher** ▪ Email: [aschiffm@umd.edu](mailto:aschiffm@umd.edu) ▪ Research Interest: Development of organoid model systems from livestock species
- ❖ **Jiuzhou “John” Song** ▪ Email: [songj88@umd.edu](mailto:songj88@umd.edu) ▪ Phone: 301-405-5943 ▪ Research Interest: Statistical Genomics and Bioinformatics
- ❖ **Nishanth E. Sunny** ▪ Email: [nsunny@umd.edu](mailto:nsunny@umd.edu) ▪ Phone: (301) 405-1379 ▪ Research Interest: Nutritional Biochemistry and Metabolism
- ❖ **Lisa Taneyhill** ▪ Email: [ltaney@umd.edu](mailto:ltaney@umd.edu) ▪ Phone: 301-405-0597 ▪ Research Interest: Developmental Biology/Embryonic Patterning
- ❖ **Zhengguo Xiao** ▪ Email: [xiao0028@umd.edu](mailto:xiao0028@umd.edu) ▪ Phone: 301-405-6258 ▪ Research Interest: Immunology