Doctoral Training Program in Physiology and Biophysics 2023-2024¹1



¹1 Updated September 13, 2023

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PHYSIOLOGY AND BIOPHYSICS TRAINING PROGRAM VCU SCHOOL OF MEDICINE

<u>Training Program Objectives</u>: This program exposes students to important questions in physiology emphasizing the scientific method in general and biophysical approaches in particular at the molecular, cellular, organ and system levels. Our alumni enjoy diverse careers in academia, government, and industry.

I. Training Program



A. CURRICULUM

<u>1. First Year:</u> **PhD students enter through the Biomedical Sciences Doctoral Portal (BSDP website**:

https://medschool.vcu.edu/education/graduate/bsdp/). The BSDP is a <u>central</u> portal for the School of Medicine, with advisors from each of the School of Medicine's graduate programs. The BSDP Office guides the student for the *first* year of their PhD. Contacts for BSDP include the Assistant Dean for Graduate Admissions (Dr. Roxanne Roberson-Nay) and Program Coordinator (Ms. Mary Rosenthal). BSDP activities include an interdepartmental curriculum, laboratory rotations, and placement into a specific graduate program in the second year.

After admittance and near completion of the first doctoral year (in the BSDP), students interested in pursuing a PhD specifically in Physiology and Biophysics should reach out to the Graduate Program Director, Dr. Roland N. Pittman (roland.pittman@vcuhealth.org).

PROGRAM CONTACTS AND GUIDANCE

Registration in the first year of the BSDP will be guided by the BSDP program coordinator and directors. Once a student enters the Physiology and Biophysics degree program, guidance can be sought from the Graduate Program Director (Dr. Pittman) or the Program's Coordinator (Christina Kyrus, <u>cikyrus@vcu.edu</u>).

DEGREEWORKS SYSTEM – a guide to registration and program requirements.

Likewise, in addition to guidance from the program's coordinators, VCU's DegreeWorks platform is a system that all students should become familiar with. This system can be accessed from your myVCU portal as well as your Banner <u>eServices</u> page. Essentially the system compares your transcript to the program's curriculum bulletin (the version posted at the time of your matriculation/acceptance to VCU). The bulletin lists most of the program's curriculum requirements. DegreeWorks will indicate to VCU central offices how much of your degree you have completed, if your GPA is where it should be, and it has a checklist of a few other requirements necessary to successfully graduate. *Checking this system and*

communicating often with your program coordinator is essential so you do not miss any requirements or internal deadlines.

Program Bulletins for Physiology and Biophysics (for <u>PhD</u> or <u>MS</u>) can be found <u>here</u>.

Generally speaking, students starting in the BSDP program (in the Fall term), and who are interested in eventually completing a PhD degree in the Department of Physiology and Biophysics normally take:

- A didactic lecture course (organized by organ systems) in <u>Graduate Physiology</u> (*PHIS* **501-001**). The course director is Dr. Charles Anderson.
- A basic <u>Biochemistry</u> course (*BIOC* **503**) is also recommended. This is a comprehensive year-long introductory course (*BIOC* **504** in the Spring) that describes basic biochemistry and reviews current concepts of modern cell and molecular biology.
- All graduate students in the Physiology and Biophysics graduate program-participate in the Physiology **Research Seminar each semester**. Doctoral and Masters students are required to take *PHIS 690-901*, and receive credit for attendance of the seminar lecture
 - o *Masters* students only are required to attend all sessions but only need to submit 3 one-page summaries per semester. These summaries are evaluated by the faculty host for the particular seminar speaker.
 - o *Doctoral* students do *not* have to submit summaries, but are required to register each semester for the Preseminar Highlights course, **PHIS 689-901** (*in addition* to the PHIS 690-901 section). PHIS 689-901 earns students credit for the Pre-Seminar Highlights presentations/discussion. The director for this course is Dr. Roland Pittman.
 - o The Pre-Seminar Highlights that Doctoral students are required to attend (PHIS 689-901) meets on the Tuesday prior to the weekly Thursday seminars. At the beginning of each semester, PhD students are required to look at the seminar schedule and select which pre-seminar discussion they would like to lead, presenting a paper related to that week's speaker/seminar. PhD students also participate in an informal luncheon with the guest speaker before the seminar on Thursdays. This is an opportunity to network and learn more about the work, career path, and institutions of the guest speakers.
- First year PhD students who may be interested in joining the Physiology and Biophysics program will also select Directed Research in Physiology (*PHIS 697-801*) as part of the laboratory rotation program. This allows students to become familiar with our laboratories and identify a particular area and lab atmosphere that are attractive for dissertation work (students can also use the **IBMS 620** course to register for rotations in this program). The rotation also allows the Principal Investigator (PI) and lab members to assess the student. Rotations in labs of primary and affiliate faculty must be approved by the Graduate Program Director (GPD) (see below for more details). All BSDP students must pass an online Laboratory Safety course (**IBMS 600**) before starting rotations. During a rotation, students are expected to spend at least 15-20 hours per week in the lab learning basic techniques, performing experiments, reading and discussing scientific papers, attending lab meetings, and other related activities. Students are expected to present their rotation results at lab meetings and give a brief (10-15 min) talk to the "Research in



Progress – Data Club" (see below re **PHIS 695**). This presentation is in addition to an oral or poster presentation scheduled by the BSDP program. Students and PI will communicate frequently in order to monitor progress and adjust lab schedules to meet the student's curriculum needs, while still satisfying research objectives. The rotating student and the lab PI will sign an agreement stipulating their respective commitments to this important endeavor (see Appendix I). Each rotation lasts 10 weeks. In the first year, students may select all three rotations in the Physiology and Biophysics program, or may rotate in other programs in search of a dissertation lab. In the Physiology and Biophysics program, the laboratory host submits a grade of Satisfactory (S) or Unsatisfactory (U) to the Graduate Program Director (GPD) along with a paragraph describing the student's performance during the rotation, pointing out strengths and weaknesses and stating whether he/she would be willing and able to mentor the student for dissertation work. The rotation student also submits a brief description of his/her rotation experience to the GPD, who adds it to the student's file. The GPD weighs this evaluation with the student's rotation presentation at the Research in Progress/Data Club seminars and submits a grade of S or U for each research rotation. By the end of the first year, a student should have identified a dissertation lab by mutual agreement with the laboratory PI. Two or three rotations will normally suffice although a fourth will be allowed if needed. In rotations that extend beyond the formal semester limits (e.g., mid-May to end of June or beginning of July to mid-August) students are expected to spend at least 40 hours per week in the lab (see B. RESEARCH).

In the Spring, BSDP students interested in Physiology and Biophysics usually take:

- <u>Biochem/Cell and Molecular Bio II</u> (BIOC 504), This is the second half of the comprehensive year-long introductory course (*BIOC 503* in the Fall) that describes basic biochemistry and reviews current concepts of modern cell and molecular biology
- <u>And other elective courses -</u> Depending on their research interests and selection of a lab and a Program, students may take a number of electives (see list under Second Year curriculum) in the fall and the spring. This selection as well as specific lab rotations will be made with the help of the student's advisor. A summary of the recommended first year curriculum for those interested in Physiology and Biophysics is listed below.

SUMMARY OF RECOMMENDED FIRST YEAR CURRICULUM

(May vary pending program/academic advisor's advice, also refer to DegreeWorks system.)

<u>G1 – Fall</u> [12.5-15 credits]

Graduate Physiology (PHIS 501) [5] Biochem/Cell and Molec. Bio I (BIOC 503) [5] Research Seminar (PHIS 690) [1], *optional* Directed Research (PHIS 697 or IBMS 620) [2] Laboratory Safety (IBMS 600) [1] Laboratory Opportunities (IBMS 610) [0.5]

G1 – Spring [12-15 credits]

Biochem/Cell and Molec. Bio II (BIOC 504) [5] Molecules to Organisms I (PHIS 606) [3], *if offered* Research Seminar (PHIS 690) [1] Directed Research (PHIS 697 or IBMS 620) [2] Responsible Conduct of Research (OVPR 601, 602, <u>or</u> 603) [1] Other elective course, as recommended.

2. <u>Second Year (G2)</u>: for a summary, see page 24

In order to advance to the second year of studies in Physiology and Biophysics, students must have a "B" average during the first year and must have joined a dissertation laboratory in the program that includes affiliate laboratories. In their second year, students mainly choose from a number of advanced Physiology and Biophysics courses offered usually in an alternating-year sequence and covering specialized topics. Each PhD student is expected to take at least two advanced electives. The choice of elective courses will depend upon the student's interests and is made in consultation with the student's Graduate Advisory Committee (see below). If the Graduate Advisory Committee agrees that an advanced course in another program would be particularly relevant to the student's research, it may substitute for an advanced Physiology and Biophysics course. Some that are typically recommended are:

Summer Courses

- <u>Directed Research</u> (*PHIS 697-801*) 1-3 credits [Pittman] {S/U}
 - PhD students *required* to register for 3 credits (total) to be considered full time students in this term (so their stipend is not interrupted).
 - MS students are permitted to register for 1 credit in the summer term.

Recommended Fall Courses

- <u>Cell Physiology:</u>
 - <u>Cardiovascular and Respiratory</u> (*PHIS 604-001*) 3 credits, {graded}. This course focuses on physiology at the level of individual cells and entire organs and organisms and is structured around the ongoing research activity of the program participating faculty. Given the number of faculty working at a systems level, topics are divided into two courses that are offered in alternate years. In odd years topics in oxidative stress, cardiovascular and pulmonary physiology as well as transgenic mouse models and drug development are presented.
- <u>Scientific Integrity/Responsible Conduct of Research</u> (**OVPR 601, 602, <u>or</u> 603**), 1 credit {S/U} Offered every term, but only one term required. All students required to completed one term of this.
- <u>Research in Progress</u> Data Club (PHIS 695-001), 0.5 credits {S/U/F}
 - Students <u>and</u> post-doctoral fellows present to the department their work-in-progress within 20-30 minutes and entertain questions from the audience (also see below, under Research)
- <u>Research Seminar</u> (PHIS 690-901), 1 credit {S/U/F}
- <u>Research Seminar/Pre-Seminar Highlights</u> (PHIS 689-901), 1 credit {S/U/F}
- <u>Directed Research</u> (*PHIS 697-801*), variable credit {S/U/F}
- Advanced Elective(s) (See below)

Recommended Spring Courses

- <u>Research in Progress</u> Data Club (*PHIS 695-001*), 0.5 credit {S/U}
- Research Seminar and Journal Club (PHIS 690-901), 1 credit {S/U/F}
- <u>Research Seminar/Pre-Seminar Highlights</u> (PHIS 689-901), 1 credit {S/U/F}
- Directed Research (PHIS 697-801), variable credit {S/U/F}
- Advanced Elective(s) (See below)

Recommended Advanced Electives, but your mentor or program director may offer other options. An elective course can be a graduate course in any discipline, as related to your research. (Register and ask questions early, as some courses are offered in odd years or even years only). A few *options* below:

1. <u>Signal Detection in Sensory Systems</u> (*PHIS 615-001*), 3 credits [Lyall – *if offered*, it is in the Spring of odd years] {Graded} An in-depth study of cells and cell systems that serve as sensors of the internal or external environment. Topics will emphasize the physiology, anatomy and biochemistry of mature and developing sensing systems, as well as their plasticity.

2. <u>Cellular Signaling</u> (*IBMS 635*), 3 credits [X. Fang - TBD] {Graded} Semester course; 3 lecture hours. Prerequisites: minimum B grade in BIOC 503/504, or permission of instructor. An interdisciplinary introduction to molecular mechanisms important in eukaryotic inter- and intracellular signaling. Topics covered: Common signaling mechanisms (heterotrimeric G proteins and G-protein-coupled receptors, small G proteins, tyrosine kinases and MAP kinases, and ion channels), Membranes, lipids and ions (calcium signaling, phosphoinositols, and lipid signaling through GPCRs), immune and metabolic kinase cascades (AMP-activated kinase, NFκB, and Jak/Stat pathways), and Programmed cell death.

3. <u>Ion Channels in Membranes</u> (*PHIS 620*), 3 credits [Ramsey – Spring of odd years] {Graded} Detailed presentation of the fundamental biophysical properties of ion channels in membranes including the elementary properties of pores, molecular mechanisms of ionic selectivity, mechanisms of drug block, structure-function relationships, and basis for channel gating. Discussion will encompass modern approaches to ion channel function.

4. <u>Biostatistics</u> (*BIOS 543*), 3 credits. Basic concepts and techniques of statistical methods, including: the collection and display of information, data analysis, and statistical measures; variation, sampling, and sampling distributions; point estimation, confidence intervals, and tests of hypotheses for one and two sample problems; principles of one-factor experimental design, one-way analysis of variance, and multiple comparisons; correlation and simple linear regression analysis; contingency tables and tests for goodness of fit.

5. <u>Cell and Molecular Neuroscience</u> (*NEUS 609*), 4 credits [Bigbee – Fall semester] {Graded} Designed as an interdisciplinary introduction to the cellular and molecular aspects of central nervous system function. The basic principles of neuroscience including neuronal structure, electrical properties of single neurons, cell biology of neurotransmitter release and postsynaptic function will be discussed, followed by intracellular signaling in neurons, gene regulation, transgenic model systems, glia, neuronal development, basic neurochemistry, and molecular and cellular aspects of motor, sensory and integrative function. The course will conclude with lectures on various aspects of neural injury/disease, including traumatic brain injury, Parkinson's & Alzheimer's.

6. <u>Molecular Biology, Genetics and Epigenetics in Psychiatry</u> (*PHIS 691-801*), 4 credits [Maeso – Usually offered Spring of even years, but occasionally in the Fall term] {Graded} The molecular psychiatry course provides interdisciplinary training in a range of basic and translational research methods relevant to psychiatric disorders, including schizophrenia, depression, drug abuse and alcoholism. Students will be exposed to lectures, open discussions and journal clubs that will cover the broad range of subject areas that are considered fundamental to an understanding of complex animal models of psychiatric disorders. The contents of this course are focused on areas that include functional genomics, epigenetics, neuroimmunology, microbiota-gut-brain axis communication, behavioral pharmacology, neuroimaging, and molecular brain imaging. Students from a range of scientific background will thus appreciate the potential and limitations of molecular and preclinical models for human psychiatric conditions.

In order to continue in the Program, **students must maintain a GPA of at least 3.0 in graded courses and** *Satisfactory* **performance in non-graded courses.**

By the Fall Semester of the 2nd year, the candidate will have completed most required and recommended courses (excluding *PHIS 690-901/689-901*, *PHIS 695-001*, *and 697-801*, which are ongoing), selected a dissertation lab, and formed a thesis/dissertation committee. The stage is then set for the Qualifying Exam (see below).

3. <u>Candidacy Years:</u>

Following successful completion of the first two years of the program and the Qualifying Examination (see below), students advance to candidacy for the PhD degree.



During the candidacy years:

- Attendance at weekly Departmental Seminars (*PHIS 690-901*) is required of all full-time students, including the first BSDP year, if the student is rotating in a Physiology lab. The requirement to register for PHIS 690-901 is waived for the semester in which the student plans to defend his/her dissertation.
- In *addition* to PHIS 690-901, Doctoral students are also required to register for **PHIS 689-901** (Pre-Seminar Highlights) each Fall and Spring.
- Participation and attendance in the Research in Progress Data Club course (*PHIS* 695-001) is also required each Fall and Spring.
- All PhD students are expected to be in residence and pursue research during the summers and must register for 15 credit hours in the fall and spring and 3 credit hours in the summer (no more nor less).

It is recommended that PhD candidates who intend to pursue academic careers take the 7-credit set of courses entitled 'Preparing Future Faculty in the Professions' (PFFP; *GRAD 601-606*). This can be done any time during the course of study and would be considered an elective.

Qualifying Examination:

Phase 1 Qualifying Exam (scheduled by the Physiology and Biophysics program) occurs in the Fall semester of the second year and consists of two parts, written and oral. The written part is a **five-page** (Arial 11, 0.5" margins, single spaced) mini-review, the topic selected by the student and dissertation mentor and approved by the GPD. The 5-page limit *includes figures but not references*. The purpose of the mini-review, containing approximately 30 references, is to summarize the background and outstanding questions in a particular field, potentially leading to a dissertation project. Successful mini-reviews may be expanded into publishable reviews or included in the background for the student's dissertation. For the **2023-24 academic year the topic title needs to be submitted to the GPD ideally by Friday, 10/20/23, though the deadline may be dictated by the GPD.** The candidate then has one month to submit the mini-review to the GPD. The GPD distributes the document to a standing Examining Committee, which is the same for all candidates in a given year. While writing Phase 1, students may neither ask for nor receive advice on the scope, form, or specific content of the mini-review, which is to be written solely by the student and neither edited nor proofread by another person. Most students will be taking OVPR 601 (Scientific

Integrity) in the Fall semester of the second year, which addresses plagiarism - All written assignments and exams ought to acknowledge the sources of borrowed material. Even *one* copied sentence from another source constitutes plagiarism if not credited appropriately.

The Phase 1 PhD Examining Committee is composed of senior faculty with combined expertise to critique mini-reviews for a broad range of topics represented in the Program. Within two weeks, the Committee will evaluate the mini-review and two weeks later it will conduct a two-hour oral examination based on it (students whose papers are unacceptable may submit another in the following January). Part 1 is designed to take no more than 2 months (to write, submit, and prepare for the oral examination). The Graduate Program Coordinator helps with organizing the date/time/location of the oral examination for Phase 1. Since the committee will have a copy of the Phase 1 proposal prior to the meeting, students need only give a 10 minute overview/presentation before committee members begin to ask questions. The purpose of the oral examination is to evaluate the student's comprehension of course work and ability to synthesize information, integrate the literature in a particular area, and formulate research questions. If a student does not pass the oral, the committee may (at its option) allow the student to repeat only the oral portion of the exam. A student may be permitted to repeat Part 1 of the qualifying exam no more than once. Part 1 should be completed by the end of the Fall Semester of the second year, or, in the case of a repeated exam, no later than the end of the Spring Semester of the 2nd vear.

Phase 1	Excellent	Good	Average	Below	Poor
				average	
Identifies appropriate background / existing					
information					
Presentation, assessment and analysis of					
supporting evidence					
Develops, communicates & explains answer clearly					
& effectively					
Addresses questions appropriately					
Demonstrates ability to synthesize information					
creatively					

Phase 1 PhD Examining Committee evaluates this part using the following assessment tool:

The Phase 2 Qualifying Exam is administrated by the student's Dissertation Committee. This committee is formed (through GradTrak) in January following the successful completion of the Phase 1 exam, and a meeting is scheduled to discuss plans for the thesis proposal that constitutes the Phase 2 exam. From this point on the formal advisory mechanism for students is through the dissertation committee, while prior to this point this role is served by the GPD. Phase 2 of the Qualifying Examination consists of a written thesis proposal modeled after the NIH F31 or F30 grant application mechanisms (see below), and an oral defense of the proposal. It must be scheduled through the Office of Graduate Education and requires a Dean's representative (important to seek guidance early from the Department's Graduate Program Coordinator, who can take you through the steps).

Before the G₃ Fall semester, each student (with the help of the Graduate Program Coordinator) must arrange a date, time, and location for the committee to meet for the Oral Qualifying Exam. The **2 hour exam must take place prior to the start of the G₃ year** (before late August). Due to the steps involved, it is suggested that the student begin

preparing for the exam immediately after the G2 spring semester ends. Once an exam date has been formalized, the student must input the date, time and location, within GradTrak. This notifies the Graduate Education Office so that a Dean's representative may be secured. A copy of the proposal should be submitted to the GPD <u>three</u> weeks prior to the exam date. Five days later the GPD will notify the student whether the committee members have found the written document acceptable so that the student can proceed to the scheduled oral exam.

NOTE: A sample proposal is available – please email the Graduate Program Coordinator.

A **6-page research proposal** (Arial 11, single space, 0.5" margins) of the anticipated dissertation project is required. It may be submitted at any time during the Spring/Summer Semester of the second year, but not later than the start of the G₃ Fall semester (before mid August). The proposal is based on the student's experimental work in the advisor's laboratory, and it consists of a basic plan for the dissertation research, with the student's own preliminary data supporting feasibility. Mentor input should not extend to editing the document, but discussions on the content are considered part of student training. Eligible students are strongly advised to use the proposal as a basis for the 6-page NIH F₃₁ (or F₃₀ for MD/PhD students) fellowship application (see: <u>http://grants.nih.gov/training/F_files_nrsa.htm</u>).

The oral exam begins with a 20-min presentation by the student of the major points of the proposal and the exam follows with questions asked by the committee members.

Unsatisfactory proposals may be revised and resubmitted once. The reexamination must be completed during the Fall of the third (G3) year and before the end of the semester. Prior approval of the MCV Campus Graduate Committee is required for a student to repeat Part 2 of the Qualifying Examination. After completion of Part 2, the student's Dissertation/Advisory Committee meets at least once every 12 months (usually following the student's presentation at the Research in Progress – Data Club seminars – PHIS 695-001), although it can meet more often to monitor the student's progress. The Graduate Program Coordinator helps to organize these meetings.

Phase 2	Excellent	Good	Average	Below average	Poor
Identification and articulation of the problem					
Expression of background / existing information					
Presentation, assessment and analysis of supporting evidence					
Develops, communicates and explains project plan					
Displays mastery of subject matter					
Addresses questions appropriately					
Demonstrates ability to synthesize information creatively					

Dissertation Committee members will evaluate Phase 2 using the following assessment tool.

Students who do not pass the second attempt at Phase 2 cannot remain in the PhD program.

Thesis Defense and Deposition:

Once the advisory committee agrees that a student is ready to defend his/her dissertation, the PhD candidate is required to give a <u>departmental seminar</u>, in conjunction with the final oral defense.

SOM Guidelines for completion of the graduate degree can be found at: https://medschool.vcu.edu/education/graduate/current-students/ (see section on "Graduate Student Degree Completion").

B. RESEARCH



1. *Laboratory selection and Rotations:* Until a dissertation laboratory is found, PhD students (in Physiology) take Directed Research **(PHIS 697-801)** {S/U} each semester. The GPD assigns the S/U grade based on the mentor's recommendation. Rotations are 10 weeks long. If the student has not identified a lab for thesis work, rotations can continue. The effort in the lab is expected to intensify to full-time as the Spring semester ends. After 2-4 rotations, not all of which must be in labs participating in this program, students should have selected a dissertation

research laboratory from the list of approved primary or affiliate faculty members. Ideally, the student will identify two viable choices for dissertation work before completing the rotation schedule, thus providing a backup in case the first choice does not work out. Students are expected to match into a laboratory by 6/30 of the G1 year but the graduate school will consider allowing summer rotations. Once the student has selected a dissertation laboratory, a Dissertation/Advisory Committee is assembled by the end of the Fall semester of graduate 2 year -G2 (and updated online in GradTrak by the student). This committee consists of 4 graduate school faculty members (in addition to the student's primary lab mentor. Two of the five members must hold primary appointments in departments *other* than Physiology and Biophysics.

2. Research in Progress - Data Club seminars (PHIS 695-001): These sessions are held on 2^{nd} and 4^{th} Mondays (4:00 – 5:00 pm) each month (or otherwise dictated by the course director). All students, postdoctoral fellows, and faculty in the program are invited. Students rotating through labs in the program are expected to give 10 to 15-min presentations of their rotation experience. For all others, each is assigned a date to present; and those seminars consist of 30-min presentations (including question and answer period) discussing their recent results, planned studies, or presentations at scientific meetings. The purpose is to encourage interaction and gain experience giving short presentations (for the current Research Progress - Data Club seminars schedule see the course's canvas page, email the Smith. director or the department's executive assistant (Chris course Chris.Smith@vcuhealth.org). Doctoral students are required to register for this 0.5 credit course "PHIS 695-001, Research in Progress – Data Club" each semester.

The student's Dissertation/Advisory Committee meeting typically occurs in or near the week

of the Research Progress - Data Club seminar presentation (and is organized by the Graduate Program Coordinator). Thus, the PhD candidate's presentation



should occur roughly every 9-12 months, in synchrony with their Committee meetings. After each Dissertation Committee meeting, the Chair of the Dissertation Committee (the student's dissertation advisor) briefly summarizes the student's progress in a standard form reflecting the committee's discussions. All committee members sign the form and submit it to the GPD for inclusion in the student's file. A more extended summary of the student's progress by the thesis advisor is prepared and discussed at the Graduate Program Research Committee meeting (see below).

C. TEACHING

If sought, PhD students who would like an opportunity to serve as a Teaching Assistant (TA) to gain experience *may* have an opportunity to serve as such in the program's undergraduate Human Physiology Lab (PHIZ 206), which is given in parallel with the Human Physiology lecture course (PHIS 206) – this is pending availability. PhD (or MS) TAs may be able to give an introduction to each lab session, supervise laboratory exercises, correct laboratory reports, and participate in the laboratory curriculum development. TAs will be evaluated by a faculty member participating in the



laboratory course, who will write an evaluation of teaching performance to be included in the student's file. The GPD can refer to these files when considering students for future teaching responsibilities or in letters of recommendation. Students with exemplary performance may then also have the opportunity to give selected lectures in the undergraduate lecture course, PHIS 206. Additional teaching opportunities exist for other graduate level courses. NOTE: This PHIZ 206 course is currently conducted mostly as an online course since the pandemic.

II. Program Direction/Administrative Structure

A. GRADUATE PROGRAM DIRECTOR

Dr. Roland Pittman, with the assistance of Dr. Carlos Escalante, serves as the Graduate Program Director (GPD) for the Physiology and Biophysics Graduate Program. Administrative support extending to the administrative needs of students (program requirements, registration, tracking of graduate student deadlines, keeping the student academic folders updated, international student office matters, etc.) is provided by the **program's coordinator, Ms. Christina Kyrus (cikyrus@vcu.edu)**. In addition to administrative matters, Ms. Kyrus can also assist to help arrange annual advisory committee meetings, formally reserve rooms, maintain student files, and attend/organize program related meetings. Students should feel free to reach out to the Program Coordinator first with questions/concerns.

B. GRADUATE PROGRAM TRAINING/RESEARCH COMMITTEE

All training faculty (trainers) in the Physiology and Biophysics graduate program meet at least once per year to review the progress of all students, or submit annual progress reports to the program. The Program Directors present the progress of rotating students who are prospective new students in the program. These meetings aim to acquaint all faculty mentors (and program leaders) with all the students within the program and to monitor their progress. The meetings are staffed by the Program Coordinator.

C. STEERING COMMITTEE

A Steering Committee for the Graduate Program meets annually to review all aspects of

INCLUDEPICTURE "https://www.apps.som.vcu.edu/massey/GetPicture.ashx?ID=1403" * MERGEFORMATINET Roland N. Pittman Carlos Escalante John R. Grider I. Scott Ramsey Committee Chair

D. CURRICULUM EVALUATION

The Program in Physiology and Biophysics evaluates all courses every 3-5 years. In the year of the evaluation and at the conclusion of the course, an ad hoc committee is formed to review course objectives, content, delivery, rigor, and effectiveness. The course review committee is appointed by the GPD and makes recommendations to the GPD and the Department Chair. The course review committee requests a written report and supporting documents from the course director and then meets with the course director, course faculty, and doctoral students. It then prepares a course summary report, describing strengths and weaknesses and recommendations for change. The report is submitted to the GPD, who makes final recommendations for changes and improvements to the Teaching Leadership Committee (TLC), comprised of all course directors in the Physiology and Biophysics program (see below). After TLC approval, the GPD meets with the director(s) of the evaluated courses and the Department Chair to discuss plans for changes.

E. TEACHING LEADERSHIP COMMITTEE

The GPD organizes monthly meetings of this committee. Proposed changes in the Curriculum of the Program must have majority approval by the Teaching Leadership Committee (TLC), which oversees the teaching efforts of the Training Program. The membership is comprised of all current course directors.

III. Training Faculty

A. TRAINING PROGRAM MEMBERS

The training faculty consists of primary (or tenure-track), collateral (or research), and affiliate faculty of the Program. Primary and affiliate faculty maintain research programs mainly funded from the National Institutes of Health and National Science Foundation, while research faculty support the research program of primary faculty. If a faculty member experiences a lapse in funding, he/she cannot accept new students for dissertation work until funding is re-established. Primary training faculty members are those with primary appointments in the Department of Physiology and Biophysics. Names of primary training faculty are listed below. For a description of each faculty member's research program, visit the web site https://physiology.vcu.edu/, and you can search by research expertise: https://physiology.vcu.edu/.



Carlos R. Escalante



Javier Gonzalez-Maeso



John R. Grider



I. Scott Ramsey



Qinglian Liu



Vijay Lyall



Roland N. Pittman



Liya Qiao



Montserrat Samso



Jose M. Eltit



Primary Faculty (Potential Doctoral Student Research Mentors)

<u>Affiliate Faculty</u> (Potential Doctoral Student Research Mentors)

Affiliate faculty have their primary appointments in departments *other* than Physiology and Biophysics but participate actively in the Physiology and Biophysics Graduate Training Program. Membership of affiliate faculty is reviewed each year for level of participation and interest in the program.

B. RESEARCH AREAS

Current Physiology and Biophysics faculty members (primary and affiliate) concentrate in nine areas of research:

- I. Apoptosis and Cell Cycle Control [Dent]
- II. Chemical Senses (Taste and Smell) [Lyall, R. Costanzo]

III. Cardiovascular (Cardiac Ion Channels, Microcirculation, Ischemia/Reperfusion Injury, Atherosclerosis, Hypertension) [Kukreja, Li P-L, Pittman, Salloum, Tseng]

IV. Gastrointestinal (Molecular/Cellular Biology of smooth muscle cells/enteric neurons and Whole Organ Reflexes, such as peristalsis and acid secretion) [Akbarali, Grider, Qiao]

V. Mitochondrial Physiology/ Cardiovascular Diseases [Lesnefsky, Liu]

VI. Molecular Biophysics (Structural/Computational Biology and Ion Channel, Receptor, and Transporter Biophysics) [Escalante, Gonzalez-Maeso, Liu, Ramsey, Samso, Tseng]

VII Physiology of Pregnancy/Pre-eclampsia [Strauss, Walsh]

VIII. Respiratory (Asthma, Cystic Fibrosis) [Rubin]

IX. Wound/Tissue Repair, Head Trauma, Regeneration [Marmarou, R. Costanzo]

X. Neuropsychiatric diseases (Gonzalez-Maeso)

For more information, visit the web site:

C. FACULTY RESEARCH SEMINARS

A collaborative research spirit is nurtured in the program by bimonthly research meetings where faculty members (tenure, research track, and affiliates) present ongoing and planned future research for critical feedback. These meetings have proven invaluable in making each faculty aware of what research questions others are pursuing and the research tools they utilize. This awareness has promoted discussions and collaborations.

D. RESEARCH CORE FACILITIES

Core facilities are defined as research facilities that are open to multiple members within the graduate program and the institution at large. Core facilities aim to make advanced or specialized technologies available to members of the VCU research community for a nominal fee.

- 1) Measurement of intracellular calcium (Director: Dr. Jose Miguel Eltit)
- 2) Cryo-Electron Microscopy (Director: Dr. Montserrat Samso)

Other core facilities around VCU can be located here: <u>https://research.vcu.edu/cores/</u>

IV. Trainee Recruitment, Selection and Retention

A. RECRUITMENT

The Program in Physiology and Biophysics targets four major national meetings: Biophysical Society, American Physiological Society, SACNAS (minority recruitment), and ABRCMS (minority recruitment). The Biophysical and American Physiological Society meetings are well attended by faculty in the program who man a booth to disseminate information about

the program in particular and the VCU School of Medicine at large. The Program also taps into VCU resources (the Honors College, HHMI undergraduates, and HERO programs) including its own Summer Undergraduate Research Program (see below). The Program is committed to diversity in recruitment and enrollment and is actively engaged in School of Medicine initiatives to promote underrepresented minorities.

B. ADMISSIONS



Admission to the PhD programs in the first year is through the BSDP, as described above. After the first year, students matching to laboratories in the Physiology and Biophysics Program are reviewed by the Steering Committee of the Program, which has the authority of an Admissions committee to accept or reject a student.

C. OVERSIGHT and RETENTION

The first year advisor, appointed by the BSDP, is Dr. Roland N. Pittman and Ms. Christina Kyrus *for students interested in Physiology and Biophysics*. During the first year academic progress is tracked closely by the BSDP and is reported to the GPD. After a student has selected Physiology and Biophysics and joined a research group, progress is tracked by his or her research mentor, under the oversight of the Graduate Program Director and Coordinator.

Twice a year the mentor submits a brief written report describing the student's status and progress. These reports are discussed at meetings of the Graduate Program Training/Research Committee, which includes as members all faculty in whose laboratories a student is currently training. **In addition, following completion of the Phase 1 Qualifying Exam, the student should meets with his or her Dissertation Committee <u>at least once a year</u>. Prior to each of these meetings the student should prepare (or update) an Individual Development Plan (IDP) and submit a printed synopsis to his/her Dissertation Committee, to the GPC (Christina Kyrus), and to the Graduate School. (A convenient resource for preparation of the IDP is <u>http://myidp.sciencecareers.org/</u>.)**

D. CURRENT PhD STUDENTS

For a list of current students please visit the Department of Physiology and Biophysics web site.

E. MASTERS PROGRAM

All prospective students for the Master of Science (MS) degree in Physiology and Biophysics **mostly enter through the Premedical Graduate Health Sciences Certificate Program**, or an equivalent program:

https://medschool.vcu.edu/education/graduate/certificate-programs/cert/

The Certificate Program is usually a duration of one year and students must successfully graduate from this program in order to enter our Masters program. Certificate Program students who have interest in applying to our Masters program should email the Physiology and Biophysics Program Coordinator (Christina Kyrus) no later than April 15th of that year, for Summer/Fall entry.

After the Certificate program, a minimum of two semesters (30 credit hours) in residence is required for the Masters Degree. Although most MS students will pursue careers in professional schools, it is hoped that the exposure to research will serve as an invaluable experience that will shape the way in which these students will approach their future studies and careers. Often enough, students pursuing the MS degree become excited by research and decide to pursue a career in biomedical research, instead of one as a health practitioner. For more information on the MS program, visit the Department of Physiology and Biophysics web site: <u>https://physiology.vcu.edu/education/ms/</u>

F. SUMMER UNDERGRADUATE RESEARCH PROGRAM (SURP)

The goal of this program is to recruit academically excellent undergraduate students in order to engage them in research projects during the summer with the goal of interesting them in research. Our hope is that we will enrich the candidate pools for the PhD and MD/PhD programs of the School of Medicine at VCU. The program provides limited support to 1-3

students (a \$2,500 stipend for living expenses and, if needed, additional assistance for housing). The duration of SURP in Physiology and Biophysics is 10 weeks, usually from mid Several other students also join the program without support. May to end of July. Mechanisms to enhance interactions among participating students and faculty include: 1) a breakfast gathering once per week with scientific presentations from members of the Department hosting students, student presentations of progress reports, and group discussion of original papers from labs participating in the program; and 2) departmental social events (happy hours, doctoral student post-defense parties, etc.). At the conclusion of the program, each student presents a poster summarizing his/her results at the "SURP in Physiology and **Biophysics Poster Symposium**".

V. Tracking Plan/Outcomes

Tracking Career outcomes

We track our graduates after they leave our program, in particular the position, publication record, grant proposal history, awards, and career trajectory. We are also evaluating the average time to degree and the attrition rate of the Training Program. A record of the graduates from our program for the past few decades can be seen at [https://physiology.vcu.edu/alumni/].

VI. Research and Training Environment

A. GENERAL



The Graduate Program at the VCU School of Medicine provides two years of full support to all PhD level graduate students. In addition, the Graduate School has an emergency program for one-year of support of students whose mentors experience lapses in funding. Students receive an increase in stipend level (\$1,000) after they successfully complete the Qualifying Examinations and advance to candidacy.

Laboratory space of primary faculty in the program of Physiology and Biophysics is either recently built or newly renovated. The labs are in Sanger Hall and the Molecular Medicine Research Building (MMRB), which opened in the spring, 2009. State-of-the-art facilities exist within the Department of Physiology and Biophysics and the School of Medicine. Institutional core facilities at the MCV campus include Molecular Biology, Imaging, Transgenic Animal, Computational, Nucleic Acid Sequencing, etc.

[see: https://research.vcu.edu/cores/]



B. POSTDOCTORAL FELLOWS

The Program in Physiology and Biophysics actively involves postdoctoral fellows in participating laboratories. They participate in the seminar series (PHIS 690) through pre-seminar highlights, and they attend seminars and luncheons with the guest speakers. Together with doctoral students, postdoctoral fellows may invite guest speakers for the Departmental seminar series and host the guest's visit. In addition, postdoctoral fellows present ongoing work in the Research Progress - Data Club seminars. The Program capitalizes on every opportunity to bring students and postdoctoral fellows together, as their respective research training benefits immensely from close interactions. Finally, interested postdoctoral fellows are offered teaching opportunities in undergraduate, graduate, and professional school courses. The following postdoctoral fellows train currently in participating laboratories:

VII Doctoral Program Time Line

G1 - Fall [15 credits]

Graduate Physiology (PHIS 501) [5] Biochem/Cell and Molecular Bio I (BIOC 503) [5] OR Critical Thinking (BIOC 691-004) [1] Directed Research (PHIS 697 or IBMS 620) [2+] Research Seminar (PHIS 690-901/902) [1-2] Laboratory Safety (IBMS 600) [1] Laboratory Rotations (IBMS 620) [0.5]

G2 – Summer [3 credits]

Directed Research (PHIS 697) [3]

G2 - Fall [15 credits]

From Molecules to Organisms (PHIS 604) [3] Scientific Integrity (OVPR 601) [1] Directed Research (PHIS 697) [variable] Research Seminar (PHIS 690-901/689-901) [1-2] Research in Progress (PHIS 695-001) [0.5] Advanced Elective (see choices below) [3] Qualifying Exam – Phase 1

G1 – Spring [15 credits]

Biochem/Cell and Molecular Bio II (BIOC 504) [5] Research Seminar (PHIS 690-901/902) [1-2] Directed Research (PHIS 697 or IBMS 620) [2+] Other recommended graduate level elective [3+]

<u>G2 – Spring</u> [15 credits]

Methods in Molecular Biophysics (PHIS 630-001) [2] Directed Research (PHIS 697) [variable] Research Seminar (PHIS 690-901/689-901) [1-2] Research in Progress (PHIS 695-001) [0.5] Advanced Elective (see choices below) [3-4] Qualifying Exam – Phase 2

Advanced Electives, suggested (Fall)

Biostatistics (BIOS 543) [3] Cell and Molec. Neuroscience (NEUS 609) [4] Mitoch. pathophys. & Human Disease (PHIS 619) [3] Sensory Sys. Signal Detection (PHIS 615) [3] *odd yr*

G3-G5 – Summer [3 credits]

Directed Research (PHIS 697) [3]

Advanced Electives, suggested (Spring)

Physical Prop. of Macromolecules (BIOC 602) [4] Cardiovascular Physiology (PHIS 612) [3] Ion Channels (PHIS 620) *odd yr* Phys & Pharm of GI Syst (PHIS 691-003) [3] *even yr* Cellular Signaling (IBMS 635) [3] Adv. Molec. Model. Theory/ Practice (MEDC 670) [3]

G3-G5 - Fall [15 credits]

Research Seminar (PHIS 690-901/902) [1-2] Research in Progress (PHIS 695-001) [0.5] Directed Research (PHIS 697) [Variable]

G3-G5 - Spring [15 credits]

Research Seminar (PHIS 690-901/902) [1-2] Research in Progress (PHIS 695-001) [0.5] Directed Research (PHIS 697) [Variable]

LABORATORY ROTATION AGREEMENT

Student Name: Rotation Dates: Rotation Preceptor: Project Title: Who will directly supervise the student?

Hours per week that the student is expected to be in the laboratory (15-20h recommended): (Expectations should include time needed for coursework/studying for exams.)

Were laboratory guidelines/policies (e.g., biohazards, lab notebook) explained to the student? ___Y ___N Has the student been provided with a reading list? __Y ___N Is the student expected to attend lab meetings? __Y ___N Is the student expected to present at lab meetings? __Y ___N Will the student be required to present in a lab meeting before the end of the rotation? __Y ___N

Goals and activities for this rotation: (attach additional sheets if necessary)

At the end of this rotation the student will:

1) Meet with the rotation preceptor and complete the Student Laboratory Rotation Evaluation Form

At the end of this rotation preceptor will:

2) Meet with the rotation student and complete the Preceptor Laboratory Rotation Evaluation Form

We accept these conditions and have discussed the likelihood of space and support should the student consider this lab for their dissertation

Rotation Preceptor Signature

Student Signature

Advisory Committee Meeting Form

Doctoral Program in Physiology and Biophysics – Student Progress Report	
Student must get signatures and submit to Program Coordinator at least ONCE a year (each commit	tee meeting)

Student Name

THIS SECTION MUST BE COMPLETED The following questions should be explicitly answered at the Advisory meeting so that problem areas can be identified as early and productively as possible:

The Advisory Committee met on ____ _____and the outcome is the following: This student's progress has been: [] Excellent [] Adequate [] Problematic []Good Please Rate your level of satisfaction with the student in the following areas: [] Highly Satisfied [] Satisfied [] Mixed Work ethic [] Worried [] Satisfied [] Mixed Record-keeping..... [] Highly Satisfied []Worried Experimental skills..... [] Highly Satisfied [] Satisfied [] Mixed []Worried

Analytical skills	[] Highly Satisfied [] Satisfied [] Mixed [] Worried
Writing/speaking skills	[] Highly Satisfied [] Satisfied [] Mixed
[] Worried	
Conceptual skills	[] Highly Satisfied [] Satisfied [] Mixed [] Worried
Mastery of literature	[] Highly Satisfied [] Satisfied [] Mixed [] Worried

Thesis Advisor	Signature	Date

Please summarize the committee's impressions regarding the student's progress:

What do you recommend to further the student's skill development before the next meeting?

Advisor	Signature	Date
Advisor	Signature	Date
Advisor	Signature	Date
Advisor	Signature	Date
Student	Signature	Date

By signature, we certify that we have met with the student and reviewed/discussed the information on the Progress Form, unless otherwise noted.

COURSE REQUEST FORM

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ave read and agree to abide by the University Honor System, University Code of Ethics, and University Academic Regulations.

TUDENT SIGNATURE_

OVISOR SIGNATURE_

DATE ____

DATE _



Virginia Commonwealth University Office of Records & Registration Division of Student Affairs & Enrollment Services P.O. Box 842520 • Richmond, VA 23284-2520 http://www.vcu.edu/enroll/rar/

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