

## **BIOLOGY 8240/8250 PROFESSIONAL SKILLS FOR THE LIFE SCIENCES**

### **Instructors**

Fall David M. Parichy ([dparichy@virginia.edu](mailto:dparichy@virginia.edu), [parichylab.org](http://parichylab.org)). Office hours ad hoc.

Spring Tracy A. Larson ([larson.tracy@virginia.edu](mailto:larson.tracy@virginia.edu), [tracyalarson.org](http://tracyalarson.org)). Office hours TBD.

### **Course description**

Two semester-long two-credit courses that provides training in essential skills for first year graduate students in the Department of Biology. Topics to include choosing research advisors and subjects, scientific writing and editing, time management and strategic project and career planning, best practices in experimental design, data collection and analysis, science communication to professional and lay audiences, conflict avoidance and resolution, and issues pertaining to gender and other biases as well as mental health. Course includes some material relevant to ethics and best practices but does not fulfill NIH requirements for training in the responsible conduct of research.

### **Objectives**

- understand expectations for professional students in the Department of Biology
- enhance skills for time management and strategic planning
- better understand scientific methods and papers
- improve writing and communications skills
- integrate with one another and build connections across the Department of Biology
- familiarity with resources and skills relevant to work-life balance, mental health, conflict resolution

### **Course requirements and evaluation**

- Attendance and engagement (15%): Evaluated through participation and reflections to be submitted on-line at end of each class.
- Assignments (85%): Due by start of each class, late assignments will not be accepted. Work will be scored according to quality and adherence to specifications.

According to Graduate School regulations, a Satisfactory grade requires a letter grade of at least B-, corresponding to a percentile score of 80% for work completed.

### **Readings, resources and assignments**

To be posted and submitted through Canvas.

### **Access and accommodations**

Your experience in this class is important. If you have established accommodations with Student Disability Access Center (SDAC), please communicate your approved accommodations at your earliest convenience so we can discuss your needs in this course and complete any necessary forms. If you have a condition that may result in unexpected absences, please make me aware of this possibility before missing any coursework. If you have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact SDAC and to let me know so we can work suitable arrangements. Finally, please note that we cannot provide an equitable and just atmosphere for learning if we are not protecting one another. For this reason, anyone who is sick is requested to stay home and rely on shared notes, and students who are asymptomatic but have been exposed to someone with Covid-19, influenza, or another transmissible disease are asked to

wear a high quality mask while in class, to protect peers and others who may have compromised immune systems or are otherwise especially vulnerable.

## Schedule

Date	Skills and Subjects	Likely Discussion Topics
	Introduction	course structure and objectives
	Succeeding as a grad student	advisors' views of what works and what doesn't (guests: Laura Galloway, Barry Condron)
	Scientific awareness Data management and preservation	literature alerts; preprints; best practices for organizing and safeguarding electronic files; electronic and other lab notebooks; public repositories; data sharing
	Choosing the right advisor and lab	what to look for, what to avoid, how to evaluate (guests: Andy Aman, Laura Fontenas, Gary Teeters)
	Scientific methods and getting started on research projects	hypothesis testing and discovery science; choosing and evaluating questions and projects; balancing risk, reward, and feasibility; relative roles of advisors and students
	Reading Day — no class	—
	Productivity and time management	balancing professional obligations; setting priorities and block scheduling to meet those priorities (guests: Abbas Ghaddar, Theresa Gibney)
	Writing and reviewing scientific documents	tips and tricks for getting it done; editing and proofreading; giving and receiving critical reviews
	Seeking and obtaining funding	types of funding mechanism; organization and process at NIH, NSF; structures of grants; key features of good grants; differences between grant and other writing
	Intellectual property, commercialization	issues in data ownership, record keeping, patents and product development (guest: Josh Mauldin, Director UVa Licensing & Ventures)
	Planning and executing research projects	developing time-lines and milestones; identifying essential steps, critical paths and contingencies
	Essentials of graphic design	best practices for figures and graphs; image processing vs. data manipulation; color palettes for readability and inclusivity; software tools and resources; introduction to ggplot2
	Research talks I	peer review of rotation talks and abstracts
	Research talks II	presentation of research talks (~2 h)

Research ethics and misconduct

what constitutes conflict of interest or scientific misconduct; ownership of data; avoiding disagreements over authorship, intellectual property; mechanisms for resolving disagreements; introduction to UVa resources (guest: Dave Hudson, UVa Senior Associate Vice President for Research)

**Schedule of assignments (by topic)**

Date	Course Topic	Assignment	Due Dates
	<p>Scientific awareness, formal and informal reviews</p>	<ol style="list-style-type: none"> <li>1. Set-up an alert for your research interests &gt; September 18 through Google Scholar or NCBI, as well as bioRxiv or EcoEvoRxiv. Turn-in your first results along with references of interest formatted for <i>Science</i>, <i>Evolution</i>, and <i>Cell</i> by a citation manager. With two of your peers, choose one ~ September 25</li> <li>2. preprint that you will each review independently. Submit a list of the Biology or Cell Biology &gt; December 4 seminars you attended during the semester and notes taken</li> <li>3. on at least four of them (iPhone or equivalent photo of handwritten notes preferred), to include key findings, at least three questions (highlight if actually asked), and a bullet point list of scientific and stylistic strengths and weaknesses (e.g., considering class material on Sept 25, Nov 13)</li> </ol>	
	<p>Choosing the right advisor and lab</p>	<p>List your personal top priorities in what you want from an advisor and research environment, as well as any characteristics you specifically want to avoid given your own personality, and perceived strengths and weaknesses</p>	<p>&gt; September 25</p>
<p>Using a published paper in your field of interest, selected in consultation with your rotation advisor, outline the overarching question(s), deconstruct hypotheses, predictions and</p>	<p>Scientific methods and getting started on research projects</p>	<p>experiments following from them (including experimental manipulations and controls, and statistical methods). Distinguish between discovery driven and hypothesis testing approaches. Comment on apparent risk of undertaking the work and final reward/impact. Does the work provide a substantive advance, are there major gaps or inconsistencies?</p>	<p>&gt; October 9</p>
	<p>Productivity and time management</p>	<ol style="list-style-type: none"> <li>1. Estimate the hours per week you expect to spend on different broad classes of activities during different stages of your graduate career.</li> <li>2. Provide a block schedule of planned activities for a typical week during this semester.</li> <li>3. Using an activity tracker application, log actual times over a one week period as compared to your planned schedule. Summarize your observations—e.g., did certain things get in the way, or consistently get short-changed? Describe how you might modify your plans or activities to maximize your productivity and well-being.</li> </ol>	<p>&gt; October 16 &gt; October 16 &gt;&gt; October 23</p>

Date	Course Topic	Assignment	Due Dates
	Writing and reviewing scientific documents	<ol style="list-style-type: none"> <li>1. Read Lanham <i>Revising Prose</i> and Greene <i>Writing Science in Plain English</i></li> <li>2. Submit image of hand-written edits of a draft document to be provided on October 9, using standard editorial marks as well as methods described in <i>Revising Prose</i></li> <li>3. Submit your independent review of preprint chosen for peer review (from Sept 11 class)</li> <li>4. After discussion with other reviewers, draft</li> </ol>	<p>~ October 9<sup>SEP</sup></p> <p>&gt;&gt; October 16</p> <p>&gt; October 23</p> <p>&gt;</p>
	Seeking and obtaining funding I, II	<p>Submit downloads or links to:</p> <ol style="list-style-type: none"> <li>1. NIH standard due dates</li> <li>2. SF424 instructions</li> <li>3. A compiled pdf of all forms necessary for an NIH F31 NRSA Predoctoral Fellowship</li> <li>4. NIH documents with review criteria for: F31 and R01 funding mechanisms</li> <li>5. NIH funding opportunity announcements (FOAs) for F31 and R01</li> <li>6. NIH institute(s) and program officer names most aligned with your research interests as well as published "pay lines" for those institutes.</li> <li>7. CSR study section(s) most aligned with your interests and their most recent public roster(s).</li> </ol>	> October 30
	Planning and executing research projects	<ol style="list-style-type: none"> <li>1. In consultation with rotation advisor, choose published paper or paper for assessment.</li> <li>2. Submit an inferred time-line, identifying as milestones the testing of key hypotheses or completion of discovery approaches, as well as writing, submitting and revising the paper; be sure to map out times for experimental approaches, pilot work, resources needing development, etc. Submit revised time-line after consulting with advisor</li> <li>3.</li> </ol>	<p>~ November 6</p> <p>&gt; November 13</p> <p>&gt;&gt; December 4</p>
	Research talks I	<ol style="list-style-type: none"> <li>1. Submit draft abstract on work undertaken in first rotation.</li> <li>2. Bring draft slides and narrative for rotation talk.</li> </ol>	<p>&gt; November 20</p> <p>&gt; November 20</p>
	Research talks II	Public presentation of research talks	

## Schedule of assignments (by due date)

Due Dates	Assignment	Weighting
	Literature and preprint alerts, reference formatting	4
	Personal priorities for advisor, lab	4
	<i>Choose preprint for peer review</i>	—
	Deconstruction of published paper (chosen w/ advisor) to identify questions, hypotheses, approaches; overall evaluation.	8
	Read Lanham, Greene	—
	Hand written edits of draft document	4
	Activities expectations across grad career; Block schedule plan	4
	Block schedule: tracking results, summary	4
	Individual pre-print review	8
	NIH documents and information	8
	Choose publication for time-line deconstruction with advisor	—
	First draft of paper time-line deconstruction	4
	Draft abstract on rotation work	4
	Draft slides and narrative for in-class peer review	4
	Presentation of rotation talk and submission of final abstract	12
	Revised paper time-line deconstruction	4
	List of seminars attended with notes and strengths/weaknesses	8
	Final (consensus) peer review of preprint	5

### BIOL 8250 S2024 — Skills and Subjects Preview

Managing students

Balancing professional obligations

Mastering productivity and time management

Event planning

Cultivating a network

Developing an individual career plan

Developing your professional identity

Communicating science to non-experts

Designing a scientific poster

Managing stress

Overcoming resistance

Providing feedback

Resolving conflicts and misconduct in the research environment

Navigating graduate school

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