In just a few short weeks we will be converging on our nation's capital to once again celebrate the work we do with 30,000+ other neuroscientists at the Society for Neuroscience’s Annual Meeting. In the hullabaloo that is SfN, there is a cone of sanctuary within the mass of humanity...the Faculty for Undergraduate Neuroscience events. The descriptions for these events are listed on our website and I hope to see you and your students throughout the meeting and at our FUN activities. Also, when wandering the Poster/exhibitor floor, why not stop by the FUN booth (#’s booths 3422, 3424, and 3426) and see what merchandise we have for sale and chat with other members about the work that we do!

From the president: SFN Resources
Jeff Smith, Current President — Saginaw Valley State University

In this module, students not only learn content about molecular neuroscience but also utilize web-based tools to make predicted outcomes based on experimental protocols. Students are then challenged to develop their critical thinking skills when asked to match their predicted outcomes to an array of empirical results. A still bigger challenge to students' critical thinking skills is posed when they are asked to explain unexpected outcomes, which exist in the empirical data but which also have reasonable explanations.

Gel Scramble: A digital molecular neuroscience lab module
William Grisham — UCLA

This module requires no specialized equipment and can be delivered at any institution that has computers with internet access.

I recently attended a workshop provided by the College of Science and Mathematics at Wright State University. The goal was to inspire different ways of teaching and preparing instructors to design engaging lessons for students. An approach presented and employed for preparing such a lesson was that of backward design. I began by determining the desired learning objectives for students to obtain from the lesson, followed by developing assessments that will be utilized to determine whether students have achieved an understanding of the learning objectives. Lastly, I designed the activities that will be employed to convey the information comprising the learning objectives. During the process of developing the lesson, peer feedback and discussions were ongoing, aiding in the refinement of the lesson. The lesson developed focuses on the Basal Ganglia, and for the activity students are given an interactive box that has been wired to indicate connectivity between Basal Ganglia nuclei, via a scheme of colored lights, such that students will be able to discern which nuclei are connected and if the connection is excitatory or inhibitory. With this assignment, students are able to experimentally determine the anatomical and functional connectivity for the Basal Ganglia circuitry.
Advocacy, FUN, and You

*FUN Governmental Affairs and Public Policy Committee*

As you know, the upcoming Society for Neuroscience (SfN) Meeting is being held in Washington, DC. The FUN Governmental Affairs and Public Policy Committee would like to encourage our membership who will be attending the DC meeting to take advantage of the proximity to Capitol Hill to advocate on behalf of undergraduate science education and research by visiting your Congressional Representatives while you’re in DC. The Council on Undergraduate Research can share their advocacy tips with those of who are currently members of CUR ([www.cur.org](http://www.cur.org)). We’ve attached information to this email that will be of use to you to determine whether your institution has an “enhanced institutional membership” that provides your faculty with membership privileges at CUR. If your institution does not have an enhanced membership, but you would like to consider joining CUR to access the CUR advocacy materials, you may visit them at their website. If you are a member of the SfN, you may also visit the SfN website on advocacy at [www.sfn.org/advocacy/advocacy-tools](http://www.sfn.org/advocacy/advocacy-tools). Our colleagues at CUR have also indicated that they would be willing to host a teleconference or webinar on the advocacy initiative for FUN members who are also members of CUR and who are interested in doing advocacy work during the SfN meeting. We will provide more details on that teleconference when they become available.

The Committee recognizes that FUN members who attend the SfN conference are very busy during the meeting and that carving out time for visits to our Congressional Representatives may not be easy. Your investment in time and energy, by advocating on behalf of the science and science education community, can have significant impact on the direction the Nation takes in supporting the next generation of scientists and educators. Improvement in funding levels for the National Institutes of Health, National Science Foundation, and other federal agencies supporting STEM will happen only if you voice your opinion in support of efforts on Capitol Hill to strengthen science and science education. As a first step, we encourage you to review your schedule and to make an appointment with your representative while you’re in DC. You may find the contact information at [https://www.congress.gov/members](https://www.congress.gov/members). The process for making an appointment is simple and takes very little time. If you decide to do advocacy work during the SfN meeting, would you kindly contact [Kimberley Phillips@Trinity.edu](mailto:Kimberley.Phillips@Trinity.edu) so we may create an invitation list to participate in the CUR-FUN teleconference or webinar?

*Many thanks for considering in engaging in this important advocacy effort,*

Julio Ramirez, Ph.D. (Chair), Amanda Clinton, Ph.D., Kimberley Phillips, Ph.D.
FUN Governmental Affairs and Public Policy Committee

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Three Reasons Why You Should Meet with Your Elected Officials

*Katie Wilkinson — San Jose State University*

This year as a Society for Neuroscience Early Career Policy Fellow I have gotten to see how accessible our legislators actually are and the important role that scientists can serve in public policy. In September, a San José State student, Anusha Allawala, and I visited Representative Zoe Lofgren in her district office. Here are three reasons why you should meet with your elected officials too.

1) **You can give your elected officials a personal story to illustrate the effect of policies in Washington.**

The decrease in science funding has had tremendous effects across the board and you can help your elected officials understand what it means in their district. I asked Anusha to join the meeting because she is currently supported by the US Department of Education’s [McNair Scholars Program](https://www.mcnairconnect.org/), which provides mentorship and funding to low income first generation college students and/or students from underrepresented groups interested in PhD programs. The budget for this program, and many similar programs, has been cut drastically. Anusha was able to tell the Congresswoman how important this program has been in helping prepare her for graduate school. Perhaps Anusha's story (or yours) will end up in a speech someday.
Engaging Undergraduates in Advocacy, continued...

2) You can try to convince your Representative to support your issue or encourage their continued support.

Even though Congresswoman Lofgren has signed Dear Colleague letters in support of increased NIH and NSF funding this year, it is still important to make sure that she is thanked for her support and reminded that science funding is valued by constituents and institutions in her district. If your elected official is not in support of your issue, an in person meeting has the potential to change their mind.

3) You can offer yourself as a resource to make sure that accurate science is used in making public policy.

In preparation for the meeting I learned that Representative Lofgren introduced the Zs to As Act in 1998 that would have pushed high school start times later to align with what we know about the adolescent circadian rhythm. This is a great example of public policy based on science and at our meeting Representative Lofgren told us she had consulted with sleep specialists at Stanford while she was drafting the bill. Scientists are in the perfect position to offer their expertise or network of knowledgeable colleagues to help develop scientifically sound public policy. Most professional societies have an advocacy office that can help you put your elected officials in contact with relevant experts.

Hopefully now you are convinced to set up a meeting with your members of Congress. The SfN Advocacy team can help with meeting logistics and talking points. Please feel free to contact me if you have any questions at katherine.wilkinson@sjsu.edu and visit my blog for more advocacy information: http://blogs.sjsu.edu/sciencepolicy/.

Engaging Neuroscience Undergraduates in Advocacy

Cecilia M. Fox, Lehigh Valley SFN Chapter President — Moravian College

I have a confession to share. Before joining the Government and Public Affairs (GPA) Committee for the Society for Neuroscience over a year ago, I did not give much thought as to how I could serve as an advocate for scientific funding. I mistakenly viewed this as someone else’s responsibility. This “someone else”, of course, was large doctorate-granting institutions that rely more on NIH/NSF financial support than those of us at small, private liberal art colleges.

I remember asking many questions prior to joining the GPA. What will be the time commitment? What will my role and responsibilities be on this committee? And my favorite…. why me? Well, as the lone representative from a predominantly undergraduate liberal arts institution serving on the GPA, I have learned a great deal about how important it is for our undergraduate community to be engaged and critical of our government funding process. In the midst of some very distinguished colleagues who represent large research institutions, I provide a unique perspective.

I have participated in the SfN Capitol Hill Day in Washington, D.C. on two occasions. What an enlightening experience! To meet with our elected representatives and their staff for the purpose of sharing the importance of our work as well as the need to support research endeavors at all stages (including the undergraduate level), was an important opportunity. When faced with only a few minutes to speak with a representative, I discussed the significance of undergraduate research. I shared how our colleges feed the pipeline for future physicians, scientists, educators, etc. I also discussed the negative impact that diminishing resources will have on the future generation to pursue such admirable and essential professions.

This past July, Senator Tom Harkin, the Iowa Democrat who leads the Senate panel that oversees the NIH, introduced legislation ensuring that the NIH’s budget would not drop below the current $29.9 billion. The bill also proposed that Congress increase the NIH’s budget by up to 10% for the next two years, and 5% each year for the next five years. By
Undergraduate Research in the Liberal Arts:
Interdisciplinary Collaborations Provide a Multitude of Benefits
Amber M. Chenoweth — Hiram College

As a junior faculty member at a small liberal arts institution, and with a liberal arts education myself, I am well aware of the value of undergraduate research opportunities to provide our students the experience expected to be competitive for graduate school and careers upon graduation, though equally aware of barriers to proper support and resources. These barriers are more evident as U.S. colleges and universities must cut budgets to account for decreases in state and federal funding, while outside funding resources are challenging to obtain due to significant decreased budgets of federal granting agencies, such as the NSF and NIH. Further, as current FUN president, Dr. Jeff Smith, pointed out in the Summer 2014 FUN newsletter, the market is only getting more competitive for our students. We are all feeling the effects of this situation, and we must become more creative in developing ways to provide meaningful and beneficial research experiences for our undergraduate neuroscience students.

This creative approach is a familiar mode for liberal arts institutions. We have a long history of being innovative, of making a lot from very little. Some argue that this is the core of a liberal arts education – thinking critically and creatively, and in multi- and interdisciplinary ways. As an example, I share with you an experience I had within my first two years at my institution.

I received a modest start-up package when I accepted my position, but I knew I needed to be smart with my purchases to stretch those dollars to support my rat research lab. Numerous companies produce fine laboratory software and equipment, but those would have consumed my entire budget and provide only a couple key pieces of equipment. My experience as a liberal arts undergraduate taught me that a trip to local hardware and electronics stores and a weekend combining Plexiglas, nuts, bolts, and wires would free me from having to rely on the expensive equipment. Likewise, why spend thousands on software when the Computer Science Department is next door?

The timing was perfect. My colleague in computer science was developing a course on mobile device applications, as this was at the leading edge of smart phones and tablets taking over the electronic marketplace, and he planned to work with a few students that summer to pilot the course. We discussed the tablets they planned to use, and the size and capabilities matched nicely with the interactive touchscreen display my lab needed. After a few bewildered looks at the local electronics store when describing that rats would be using the devices and I wanted the best screen protectors they had, we were ready to begin.

I discussed the goals of the project with my students – What do we want the rats to do? What information do we need on a start screen? What stimuli should we use? How did we want to store data? – and when all the people in the psychology/neuroscience group were on the same page, we met with the computer science group. The first meeting was a crash course for his students on how to interact with a client, a crucial skill for any budding computer programmer, with specific criteria identified by the end. The computer science students went off to work, and, as Tom Petty said it best, the waiting really was the hardest part. Yes, I could have purchased the expensive software and started the project three months earlier, but I wanted to see what my colleague’s students could produce. Our patience was rewarded twofold – tailor-made software and a rewarding hands-on experience for all of the students. Moreover, having our own in-house tech support was invaluable – and yes, utilized several times at the start.

The students learned lessons beyond the underlying disciplines of computer science, psychology and neuroscience. My students learned how to articulate and operationalize their project goals and methodology down to the smallest details, a skill useful in settings beyond the research lab. My colleague’s students learned a type of programming to enhance their resumes, and began developing their skills of working with clients. One of the computer science students later decided to complete a minor in Psychology.

This experience demonstrated the inherently interdisciplinary nature of the field of neuroscience, and confirmed my

Continued on next page...
decision to work in the liberal arts with undergraduate students. My job is to develop and enhance my students’ critical thinking abilities, with neuroscience and psychology as vehicles. The opportunity to work on a collaborative research project and develop the skills needed in future careers and/or graduate school can make the most lasting impact in that regard. Further, I realized that I am lucky to work in the type of institution that I do, where interdisciplinary courses are not only encouraged, but also a core requirement for our students. They may grumble at first about having to take a minimum of two interdisciplinary courses, one of which must be team-taught, but closer to or after graduation many students report that those are among their most meaningful courses. This emphasis on interdisciplinary collaboration makes it possible for the experience I described to occur. Our students may choose to focus on a single major, but once they leave our little college on the hill and begin their career paths they must be prepared to interact with individuals with diverse backgrounds and skills. Providing our students opportunities to engage in these kinds of collaborations while we have them now develops critical thinkers that may enter several STEM fields in the future. And if I managed to collaborate with a colleague, innovate a little, and save some money in the process... all the better.


Engaging Undergraduates in Advocacy, continued from page 3...

2021, the agency’s budget would rise to $46.2 billion (http://www.harkin.senate.gov/). The Senate Commerce, Science, and Transportation Committee, which oversees the NSF, released draft legislation calling for a 40 percent increase for the NSF budget by 2019. During last spring’s Sfn Hill Day, neuroscientists were asking for support of at least $32 billion for NIH and $7.5 billion for NSF in FY2015. Though funding seems to be moving in a positive direction, we are not where we need to be.

As much as I am delighted to share my voice in this conversation, this voice needs to be louder. In our Lehigh Valley Sfn (LVSfN) Chapter, brain awareness outreach and service learning are strong components of many of our undergraduate experiences. Becoming responsible citizens and leaders for the common good are part of the ethos of many of our liberal arts LVSfN colleges. So, it seems fitting to develop our neuroscience undergraduates into advocates for such an important and relevant cause.

In the LVSfN, we started with small steps. Last fall, Moravian College’s neuroscience club sponsored an “Advocacy Day” on campus. Students walked around with iPads and had laptops available in our Student Union linked to an electronic website so students, faculty and staff could sign electronic petitions that were sent to the representatives in the state of Pennsylvania (http://www.sfn.org/advocacy/advocacy-network/advocacy-action-center-new). To express their appreciation, the neuroscience undergraduates handed out gummy brains for every signature acquired!

Since this event was so well received, the LVSfN sponsored an “Advocacy Day” for all participating colleges in the LVSfN the following spring. Hundreds of signatures were collected that day and our representatives took notice. This fall, Representative Charles Dent came to the Moravian College campus and met with several of our undergraduates. He visited our labs and developed a greater understanding of the important research that undergraduates pursue. It was a very positive experience for everyone involved. We are hoping to continue these conversations with more representatives in the future.

Every spring, we partner with local organizations to hold one of our largest Brain Awareness events. This takes place outdoors in the month of April. We will be extending invitations for more representatives to meet with our undergraduates and those in the community who are strong advocates for scientific funding at this event. We are also planning to invite representatives to our next LVSfN Undergraduate Research Conference to be held at Lehigh University next year. Finally, I have even been in conversation with a few colleagues on developing a course focusing on scientific advocacy and social responsibility.

So, as you can see, there are several ways to engage undergraduates in a dialogue centered on scientific advocacy. It is critical that these young scholars become involved in this conversation since they will receive the benefits of such action. For more information and suggestions about how your students may become involved, please visit http://www.sfn.org/advocacy/advocacy-tools
Using Focus Groups in program Assessment and Development

Samantha S. Gizerian — Washington State University

Program assessment and assessment-based program change rely on the fundamental assumption that the faculty who develop and teach the courses in the program are the best people to assess the effectiveness of the program and make any necessary changes. Program faculty typically have both the expert-level knowledge and the means to make change in a program’s curriculum, however it is not clear that they are the only group with relevant knowledge.

As experts in their field, and in some cases as pedagogy experts, faculty can suffer from unconscious biases resulting in an expert “blind spot,” or inability to recognize difficulties experienced by novice learners because of the large amount of information that the expert has scaffolded\(^1\). That difference in perspective has applicability to course and program design. Therefore, our program has deliberately included student feedback about the program as a whole into our annual assessment activities.

Students’ feedback is essential in measuring instructor and program effectiveness. Traditionally, programs utilize course evaluation and exit interview surveys to gauge student opinion. However, students suffer from survey fatigue and feel as though their opinions don’t matter\(^2,3\), leading to low participation in survey-based evaluations. Anecdotally, our previous exit survey had a lifetime participation rate below 50%, rendering it impossible to garner useful data. We sought to overcome these difficulties by inviting students to participate in a focus group that allowed them a chance to be heard and make more of a statement about their experiences than is possible on a Likert scale.

Table 1: Summary of Neuroscience program changes in response to student feedback 2011-2014

<table>
<thead>
<tr>
<th>2010-2011 Course</th>
<th>Credits/semester</th>
<th>Title</th>
<th>2014-2015 Course</th>
<th>Credits/semester</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurosci 138</td>
<td>1</td>
<td>Freshman Seminar</td>
<td>Neurosci 138</td>
<td>1</td>
<td>Neuroscience Seminar</td>
</tr>
<tr>
<td>Neurosci 301</td>
<td>3</td>
<td>Exploring the Brain</td>
<td>MBioS/Neurosci 201(^1)</td>
<td>3</td>
<td>Communication of Scientific Discovery</td>
</tr>
<tr>
<td>Neurosci 404</td>
<td>4</td>
<td>Neuroanatomy</td>
<td>Neurosci 404</td>
<td>4</td>
<td>Neuroanatomy</td>
</tr>
<tr>
<td>Neurosci 403</td>
<td>3</td>
<td>Cellular Neurobiology</td>
<td>Neurosci 430(^3)</td>
<td>3</td>
<td>Principles of Neurophysiology</td>
</tr>
<tr>
<td>Neurosci 430</td>
<td>3</td>
<td>Principles of Neurophysiology</td>
<td>Neurosci 403(^3)</td>
<td>3</td>
<td>Cellular Neurobiology</td>
</tr>
<tr>
<td>Neurosci 490</td>
<td>1</td>
<td>Senior Project (independent study)</td>
<td>Neurosci 490(^4)</td>
<td>3</td>
<td>Senior Capstone (typical class)</td>
</tr>
</tbody>
</table>

\(^1\)These courses have been developed to directly respond to student identification of content gaps in the curriculum and are awaiting final approval by WSU. \(^2\)This course was put in place in response to student requests for more elective choices in the department. \(^3\)The order of Neurosci 430 and 403 was altered in order to avoid needing to review biophysics in Neurosci 403 to increase the amount of cellular/molecular content. \(^4\)The Senior Project course added neuroscience-in-society content and now fulfills WSU’s capstone requirement. F= Fall, S= Spring; 1\(^{st}\) – 4\(^{th}\) indicate year at WSU.

Continued on next page...
Focus group interviewing was developed in the mid-20th century as a way to gauge audience response to radio programming. The moderator guides the conversation so that both the individual responses of the interviewees and group discussion can be utilized to gain information about the perceptions of the participants. Focus group interviewing results in consistent but more detailed responses when compared to surveys as well as a broader range of inputs because participants draw from each other’s answers. Our program partnered with WSU’s Office of Assessment of Teaching and Learning to take advantage of their expertise in developing the questions and facilitating the focus group.

In each of the three years that we have held a focus group with our graduating seniors we have had high rates of participation. Recurring themes of concern have emerged: more exposure to primary literature and laboratory techniques, instruction in critical thinking, more applicability to real world situations, and improved program logistics. Students have also supplied a number of feasible suggestions addressing these concerns. Our results have already led to the redesign of two courses and the development of three additional courses, as well as changes in the order that classes are offered. Moreover, student feedback has prompted program faculty to address long standing “gaps” in our curriculum, during which students were only taking large, prerequisite courses and feeling disconnected from their major (see Table 1). Future focus groups will evaluate the changes made thus far and will continue to be a central part of our program assessment.

References:


Top Reviewed at ERIN

- Pathway Quizzes in Neuroanatomy by Suzanne Stensaas, University of Utah — Reviewed by William Grisham (“Good review of pathways, should be valuable to students…”)
- You Look Familiar: Unearthing the Face Within by Doris Taso, Caltech—Reviewed by Richard Olivo (“Vivid demonstrations of individual cells responding to faces but not to body parts, hands, gadgets, or fruits…”)
- Nernst-Goldman Equation Simulator by Steven Wright, University of Arizona; Michael Branch, University of Arizona - Reviewed by Carlos Aizenman (“I love this simulator…”) and Bob Rosenberg (“I was able to answer student ‘what if’ questions graphically using this simulator…”).

Read the full reviews on Erin: http://erin.sfn.org

Want more resources? There are over 600 curated records in ERIN, the online database of Educational Resources in Neuroscience. All activities are focused on undergraduate education and beyond.

Have a recommendation for next issue’s featured resource? Submit it to ERIN.
How to Help Students Become Outstanding Student Researchers

Janice E. Thornton and Michael D. Loose — Oberlin College Department of Neuroscience

For many faculty members, the scientific research that they do in their labs also has a strong teaching component. That is, as part of their own research, they also teach the undergraduate student researchers who work with them how to do scientific research. Undergraduate students often come into a research lab not knowing quite what to expect. Scientific research labs have a culture all their own and there are often many unwritten aspects to the culture. Students want to do a good job but are not sure exactly how to best achieve that goal. We have found it useful to go over some guidelines for how to be a great research student with the students early in the process. We hand these guidelines out to every new student researcher and discuss them at one of the first research lab meetings of the semester. We offer two somewhat different versions. Feel free to pick and choose and adapt to your own style and expectations.

**How to be an outstanding student researcher. By M. Loose**

1. Know what your goals are for doing research. Think carefully about why you are looking for a research opportunity.
2. Know what to do

   **Six easy steps to being a strong contributor to a lab**

   Or

   **How to think deeply about a subfield of science while demonstrating independent thought and self-motivation.**

*Before you arrive in the lab:*

1) Start by saying what you already plan to read before you ask for advice on additional, appropriate reading materials.
   - In general, think of possible answers to your questions before you ask them and offer your thoughts when you are asked.

2) Ask to be assigned to a specific project/experiment.
   - Explain why you want this.

*When you are in the lab:*

3) Arrive early, always volunteer, stay late.
   - Research is not a 9-5 job.
   - Research is for motivated people.
   - Get trained and then do stuff, don’t just watch.

4) Do “good” science.
   - Take *extraordinary* care and be *extremely* precise.
   - Follow protocols exactly... make no changes... none.
   - Record what you do; actions, observations, questions, etc.
   - Understand what you do. Ask many “why questions” about techniques and protocols.

*Continued on next page...*
Outstanding Student Researchers, continued...

At night or after your lab work is done:

5) Understand the hypotheses being tested and the big picture they fit into.
   - Read articles in the field. Guideline: Read one article a night.
   - Reread articles from the lab. With experience they will mean more to you.
   - Talk to co-workers about the project.

6) Think of possible improvements.
   - Set time aside for this. Literally, schedule this twice a week.
   - Come up with suggestions for improved techniques, improved experimental designs and
     brand new experiments.

How to be an outstanding student researcher. By J. Thornton

Read the background literature. Understand the research area you are working in. Ask the advisor for relevant literature. Take notes on it. Find some articles on your own.

Be conscientious, reliable. Attend all scheduled meetings and do all the lab jobs assigned to you, in a timely fashion. It’s OK to work slowly when learning a new technique. Listen to instructions and take careful notes; we all have faulty memories. Double and triple check your work. Follow protocols exactly.

Work hard and do more than your share. Volunteer to do any tasks that need to be done. Go above and beyond what is expected. Be willing to do the ‘scut work’, e.g. wash dishes even if they are not yours. Keep the lab clean. Help develop written protocols for the lab. If everyone does more than their share, everything will run smoothly. If something runs out notify someone and/or make out an order form to replace it.

Keep a complete and accurate lab notebook. Someone in the future should be able to easily read your lab notebook and determine what you did and be able to replicate it.

Always keep your mind engaged. Make sure that things make sense. If they don’t, then ask questions. Be a brain not a drone. Always think about potential problems so you can avoid them. Assume your advisor will make some mistakes (we are all human). Be aware and knowledgeable so you can catch them (and be gracious when you do). Think about how an experiment or procedure could be improved. What would be the next step? Could things be done more efficiently? Learn as much as you can.

Be independent. Use the resources available to you, including other students, books, journal articles, etc. Try to problem solve on your own...but then double check with your advisor to make sure you came up with the correct solution.

Don’t be too independent. Ask questions! Don’t assume you have to know everything. Check in often with your advisor so he/she knows what you are doing, so you can get feedback, etc.

Generate ideas of your own. Learn about the research area and then generate your own ideas. What do you think would be a good next step and why?

Help others and learn from others in the lab. You will learn more, build stronger relationships, and you might need their help some day. Ask to shadow other researchers in the lab to learn all you can.

Be enthusiastic. Enjoy what you are doing. Express it. Be appreciative. Express it.
In the fall of 2013, I was tasked with introducing a weekly lab component for my 200-level Cell and Molecular Neuroscience course at Skidmore College. My very loose plan for the lab course was to use it to teach students the techniques used most often in my research laboratory—specifically, mammalian cell culture, Western blotting, immunocytochemistry and fluorescence microscopy. A colleague referred me to an article in the Journal of Undergraduate Education by Michele L. Lemons (2012) at Assumption College (1). Michele had clearly outlined a cell culture neuroscience lab featuring an independent laboratory module titled "Mystery Cell" project in which students used techniques taught early in the term to carry out a research plan in which they deciphered whether their unknown cell line had a neuronal or glial lineage. This idea fit with the goals for my course, and I adapted it to meet our specific curricular and institutional needs. Additionally, I assessed student perceptions of specific laboratory and non-laboratory research competencies pre- and post-independent lab module to measure the effectiveness of the independent portion of the lab. The purpose of this article is to share the outcomes of student's perceived competencies in multiple research techniques following their participation in the independent research module.

**Goals of the course:** The Cell and Molecular Neuroscience lab course was designed to introduce Skidmore neuroscience students to the research experience and to build off of the foundation established in their introductory neuroscience lab by allowing them independence in the planning and set up of their experiments. Specific curricular goals were to provide students with structured learning of methodology and techniques in cell and molecular neuroscience; experience in the design of a research plan; opportunity to gather, interpret and present data; and participation in both sides of the peer review process.

**Structure of the lab course:** The semester was divided into three major modules: Training, Independent Research and Data Presentation. During the first module, students were trained in cell and molecular methodology. Learning of each methodological skill was assessed through observation and competency check-lists. During this time, students were given an unknown-to-them cell line (Neuro2a, astrocytic, Schwann, or Daoy cerebellar line) that they sub-cultured twice weekly and harvested as needed to complete the required methodology.

The second module consisted of the design and implementation of a research plan to determine the lineage of their "mystery cell line". Students hypothesized which line they had and designed three experiments that would test their hypothesis. To this end, students presented their experimental design plan to the class for feedback and during the remainder of the module, implemented the experiments they proposed, gathered data, and presented that data to their classmates who gave them on-going feedback. Each week, students were asked to formalize their results and future week's project plans in writing. The formality of this process required students to plan each aspect of their experiment prior to conducting it.

The third module was the presentation phase in which students analyzed their data and drew conclusions. Their work was presented as a written report and oral presentation. Furthermore, each student peer-reviewed an oral presentation and a rough draft of a classmate's lab report.

**Assessment of learning outcomes:** Anonymous assessments of students were conducted through self-report surveys that were administered prior to the Training phase (pre-course survey), immediately following the Training phase and prior to beginning of the Independent Research phase (mid-course survey) and immediately following the Data Presentation phase (post-course survey). All three surveys used a Likert scale ranging from 1 to 5 indicating strong disagreement to strong agreement of a prompt that read "I understand (and am comfortable with)...". Survey items consisted of 8 laboratory skills and 7 non-laboratory skills (Fig. 1-3). The post-course survey featured an additional questionnaire with the prompt "The independent research component impacted my understanding of..." (Fig. 3).

Self-report of students' competencies with multiple laboratory principles and methodology improved following their participation in the independent laboratory module (Fig. 1, left of the dashed line). Self-report of students' competency with multiple non-laboratory skills and methodology displayed upward trends following their participation in the independent laboratory module (Fig. 1, right of the dashed line), indicating that although students received training in these
Learning outcomes,

skills prior to enrollment in this course, further exposure through the independent lab module was effective. Furthermore, a long-term goal of the Cell and Molecular Neuroscience course, which will become second in sequence of neuroscience-specific core requirements, is to standardize the foundation of neuroscience majors prior to their enrollment in upper-level electives. To that end, the standard error of the means for each laboratory and non-laboratory competency was plotted (Fig. 2, left and right of the dashed line, respectively). A reduction is shown in the standard error of most student survey results following completion of the independent lab module, indicating standardization of common skills and competencies among majors prior to enrollment in upper-level electives. Additionally, students were asked to evaluate the impact of the independent module on laboratory and non-laboratory competencies. Students rated the impact of the independent module highly across all competencies (Fig. 3).

Although the surveys are a useful tool in gauging students’ perceived learning, there are obvious limitations to their use. In particular, students were aware of the general purpose of the assessment through the IRB approval forms and a brief discussion in class. Their knowledge of the study may have influenced their selections. As an additional comparison, overall semester grades were plotted from two semesters of the course, the Fall 2012 semester in which I taught the course without a lab, and the Fall 2013 semester in which I taught the
Learning outcomes, continued...

course with the lab (Fig. 4). The percent of "A's" increased in the semester that featured a lab component (Fig. 4). Moreover, there was an overall increase in GPA (Fall 2012 = 89.0 +/- 5.2; Fall 2013 = 92 +/- 3.7), albeit with some overlap. It should also be noted that the number of students enrolled in the course without a lab was three times greater than the number of students enrolled in the course with a lab, potentially indicative of self-selection of students who wanted to learn cell and molecular lab techniques.

**Overall:** The independent research module was a success with students in Cell and Molecular Neuroscience and there is strong indication that the module increased their learning of laboratory and non-laboratory research techniques. I am currently teaching the lab for a second time and maintaining the modular format, although the specific research projects will be tweaked from "Mystery Cell" to a project in line with my research. Ultimately, other neuroscience faculty who teach Cell and Molecular Neuroscience at Skidmore could adapt the lab component to suit their specific research interests, yet maintain the independent research component.

I'd like to thank Michele Lemons for publishing her course curriculum and I'm grateful to FUN and JUNE for providing us with these portals of curricular expertise. *All students in Cell and Molecular Neuroscience provided IRB consent prior to the implementation of the surveys.*

**Reference:**


Get in on the Discussion: FUN’s Listserv is fun_mail@lists.funfaculty.org

The FUN listserv is for members to debate and discuss issues, ask questions to the community, and post news/comments of interest to the general community.

- To post a message to all the list members, send email to fun_mail@lists.funfaculty.org. **Link files rather than attach, as attachments are scrubbed to prevent inbox overload.**
- You can subscribe to the list, or change your existing subscription here. Too much in your inbox? Switch to Digest mode to get a single email once per day/week summarizing listserv posts.
- To see the collection of prior postings to the list, visit the [FUN Mail Archives](#).
From the President, continued from page 1...

In preparation for our adventures at SfN, here are a few links that you and your students might find useful. This past summer, FUN partnered with SfN and the CNDP to prepare a webinar for those attending the meeting. The Making the Most of the Annual Meeting is for students of all ages, so you might what to share the link with yours! There is also the "Getting the Most out of SfN: The Annual Meeting and Beyond" on Saturday, November 15th from 1-2pm in WCC 207A, if you want to see the "live action" version of our presentation. Also, another helpful tool for the young neuroscientists that might be attending the meeting for the first time was produced by Beth Fischer and Michael Zigmond from the University of Pittsburgh. They have prepared a really nice guidebook for students that covers many aspects of both the attendee and presenter's role at professional meetings.

Additionally, since this year’s meeting is in Washington DC, it provides us with a unique opportunity to reach out to our government officials and share with them how important it is that they support research and science education at all levels. The FUN Public Policy Committee has developed some resources to help plan for and engage with our elected officials. Julio Ramirez, Amanda Clinton, and Kimberley Phillips have prepared a resource to help you in this process. There are articles in this very newsletter addressing issues about neuroscience advocacy, so make sure to review those as well. Also, if you receive funding (or would like to!) from the National Science Foundation or National Institutes of Health make sure to stop by their booths and meet with the program directors. Let them know how important it is that they support (or have supported your) research efforts at all levels and that the resources that they provide are an integral part of what we do with undergraduates in neuroscience....they cannot hear this enough!

Finally, as my time as president of this amazing group of scholars nears its end, I would like to take a moment to thank you all for your efforts to continue to support and grow FUN. We are truly a grassroots organization! Everything you see, hear, do, and experience through FUN is due to the hard work of the impassioned membership. This very newsletter would not be possible if it was not for the efforts of Amanda Clinton, Amy Jo Stavnezer, and Katherine Steinmetz. Nearly 200 of us had an amazing time at the FUN annual workshop (materials and information about the event can be found here) thanks to the efforts of Jean Hardwick, Bruce Johnson, Eric Wiertelak and many others! We will have nearly 175 posters presented by our students at our social at this year’s meeting that was organized by our past president, Noah Sandstrom. 23 of those students will receive FUN travel awards through the effort of our president-elect, Lisa Gabel’s, leading the review process of 67 applications. The booth will be a hub of activity again due to the efforts of Kurt Illig and his support team! None of these, or any of the other events, resources, activities that FUN provides, would be possible without YOUR help. So thank you all for your continued support of our organization! I am excited to see how Lisa Gabel (our incoming president!) continues to nurture and grow FUN with the other new officers that will begin their terms at the end of this year’s meeting. I am deeply honored and grateful to have been the president of this amazing organization. I thank you all for allowing me to be part of this dynamic and inspirational group and I look forward to celebrating our efforts when we meet in DC!

Gel Scramble, continued from page 1...

explanations. Some estimates hold that at least half of all experiments of any kind produce unexpected results, and unexpected results can be responsible for enlightening discoveries. Thus, as educators, we should also train students to deal with unexpected results rather than just focusing on experiments that "work."

Materials required to teach this module at their home institution, including images, PDFs of handouts and laboratory instructions, grading keys and rubrics, Powerpoint slides, etc, can be obtained at https://mdcune.psych.ucla.edu/modules/gel
**Faculty for Undergraduate Neuroscience**

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<th>Date</th>
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<tr>
<td>11/6/2014</td>
<td>FUN Business Meeting, 7-8pm, Marriot Marquis, LaDroit/Shaw Rooms</td>
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<tr>
<td>11/17/2014</td>
<td>Faculty for Undergraduate Neuroscience Social: Social, Awards, &amp; Poster Presentations, Renaissance Washington DC, Grand Ballroom. <a href="#">Program of Abstracts</a></td>
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<td>11/16-11/19/2014</td>
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*Bob Calin-Jageman, Dominican University*

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**Call for Submissions: January 1 for spring newsletter**

Make your voice heard! Submit to the next issue of the FUN newsletter.

We welcome submissions on any topic suitable for the FUN membership including:

- **Editorial** – an opinion piece on an issue or topic relevant to the advancement of FUN’s mission.
- **I wish I’d known then** – advice you wish you’d been given related to teaching neuroscience, career development, managing research or other topics relevant to FUN membership.
- **Resource Pointers/Reviews** – summary and review of a teaching resource you find useful (book, article, video, website, etc.).
- **Ask FUN** – a question on which you seek feedback from the FUN community (e.g. grading dilemma, managing work-life balance, etc.).
- **Other** – other submitted articles directly relevant to FUN membership may be solicited or accepted for publication.

Please submit your article via email to the current newsletter editor at [newsletter@funfaculty.org](mailto:newsletter@funfaculty.org)

- Submissions should be in a common word-processing format (e.g. Open Office Writer, MSWord, rtf format, etc.). Font should be size 12 New Times Roman.
- Please carefully proofread before submitting, as there will be no copy-editing or proofing stage.

The statements and opinions contained in newsletter articles are solely those of the individual authors and contributors and not of FUN. FUN does not endorse, warranty, or approve of any products being reviewed or advertised in the newsletter.