FUN Newsletter

Too much FUN to handle...

Faculty for Undergraduate Neuroscience

June, 2014 Volume 2, Issue 1

Inside this issue:

From the president: Future neuroscientists?

Jeff Smith, Ph.D., Current President— Saginaw Valley State University

My initial intention for submission to the summer edition of our bi-yearly newsletter was to compose a simple, "From the desk of the president..." type of essay, highlighting our excellent programs (such as the student travel award, equipment loan program, brain awareness week poster award, etc) and encouraging all to consider attending the upcoming FUN workshop in Ithaca, August 1-3. However, lately I have been thinking about issues facing our students as we mentor them into neuroscience and how, by encouraging them to pursue their interests and follow their passions, we may be placing them on a path that might not lead to the same successes and opportunities that we, the past generations of scientists, have had.

Before I begin to outline my concerns and challenges, let me first assure you all that I fully subscribe to the "follow your passion and your vocation will present itself to you"

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Bug Brains: Invertebrate nervous systems for outreach

David R. Andrew, Pert Postdoctoral Fellow — University of Arizona

When most people think about neuroscience research, insects and other invertebrates are not the first animals that come to mind as research subjects. Indeed, the fact that insects and other invertebrate animals even *have* nervous systems is often a revelation to non-neuroscientists (and, unfortunately, some young aspiring neuroscientists). Yet, there are innumerable examples where the study of nervous systems in insects and their invertebrate kin have provided invaluable insights into fundamental principles of neuroscience. These animals can also provide a creative, engaging, and cost-effective way to educate the public about neuroscience research through interac-

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FUN Educators of the Year Award Statement

Michael G. Ruscio, Ph.D. & Chris Korey, Ph.D. — College of Charleston

Thank you to members of FUN for the unexpected honor of being named FUN Educators of the Year. It is truly humbling to be recognized in this way by an organization that is full of equally accomplished educators. We feel extremely fortunate for the encouragement and guidance we have received from our FUN colleagues over the years; not only in regard to our study abroad program, but to our overall career development. FUN has been a source of inspiration for both of us. We also owe a debt of gratitude to our collaborators in Germany and the intrepid and enthusiastic students who we have been fortunate enough to get to know through this program. Perhaps the most gratifying aspect of receiving this award is its recognition of what has become one of the most enjoyable and rewarding endeavors we have undertaken as academ-

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FUN with Grant Writing: A Semester-Long Organismal Neurobiology Project

Robin E. White, Ph.D — Westfield State University

In Spring 2014, I taught an upper-level neuroscience course titled "Organismal Neurobiology" at Westfield State University. The first half of the course focused on human neuroanatomy, while the second half covered animal models of neurological disease. During this class, the students were required to write a grant in the form of a National Institute of Health Ruth L. Kirschstein National Research Service Award (NRSA), a common grant for both graduate students and post-doctoral scholars. This semester-long project was a great learning experience for the students, and I wanted to share it with the FUN community.

The Assignment

This multifaceted project gave students the opportunity to research a topic, conduct hands-on research in the laboratory, and write a grant proposal describing follow-up studies. As a result of this assignment, students were able to design, implement, and analyze hands-on research in the laboratory and write a follow-up grant proposal (summative assessment). By constructing the grant proposal, students were able to demonstrate his/her understanding of the entire research process. Furthermore, the 7-page limit of the grant required students to practice accurate and concise scientific writing.

The written portion of the grant comprised 20% of the final course grade. The rubric summary (elements that contribute to an NRSA) is described in Table 1. Throughout the semester, students were required to turn in non-graded drafts of each of the components, allowing me to make comments and suggestions before the students were graded. If a student failed to turn in a draft, 5 points were deducted from the final grant grade.

Table 1. Project components and percentage of grade.

Component	Percentage
Biosketch	5
Specific Aims	15
Significance/Background	15
Preliminary Data	30
Research Approach	25
Budget	10

Projects

Students were free to pick any neurobiology topic of interest. Examples included: Alzheimer's Disease, epilepsy, Parkinson's Disease, and Autism. Students then had the choice of collecting data in 3 different ways: 1) cell culture experiments using neuronal cell lines, 2) gene quantification using *in situ* hybridization images from the Allen Brain Atlas (gene mapping) or, 3) data mining of publicly available microarray data from the Gene Expression Omnibus (Figure 1). All image analysis of cell culture experiments and gene mapping were completed using freely available NIH ImageJ software. Below are examples of each type of project:

Cell Culture: Assessing the effects of caffeine on astrocyte cell survival by administering multiple doses of caffeine to C6 cells and using propidium iodide to identify dead cells.

Gene Mapping: Determining the expression of disease-associated genes, such as PINK1 in Parkinson's Disease, in the developing and adult mouse brain.

Data Mining: Measuring expression of phagocytosis-associated genes in studies on autism.

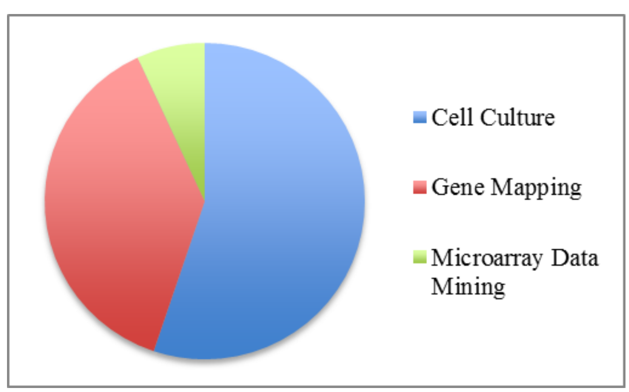


Figure 1. Proportions of students working on project types.

After collecting preliminary data, students wrote the Research Approach to propose future experiments. Students were encouraged to design experiments using research techniques regardless of cost or equipment availability. For ex-

FUN with Grant Writing Continued...

ample, one group of students conducted a cell death assay in the cell culture laboratory and proposed to further explore the topic using a transgenic mouse model.

Student Feedback

Seventy-nine percent of the students responded to an online survey about the class and grant. When asked to what extent the grant project improved their skills, students reported a moderate improvement in Research Design, Research Techniques, and Ability to Read and Interpret Scientific Literature, and a slight improvement in Writing (Figure 2). In closing, this was an excellent project that I plan to implement the next time I teach the class, and I look forward to seeing the ideas that arise!

Acknowledgements: I would like to thank my BIOL0333 students for their hard work, and Dr. Jennifer Hanselman and Dr. Kurt Lucin for submission feedback.

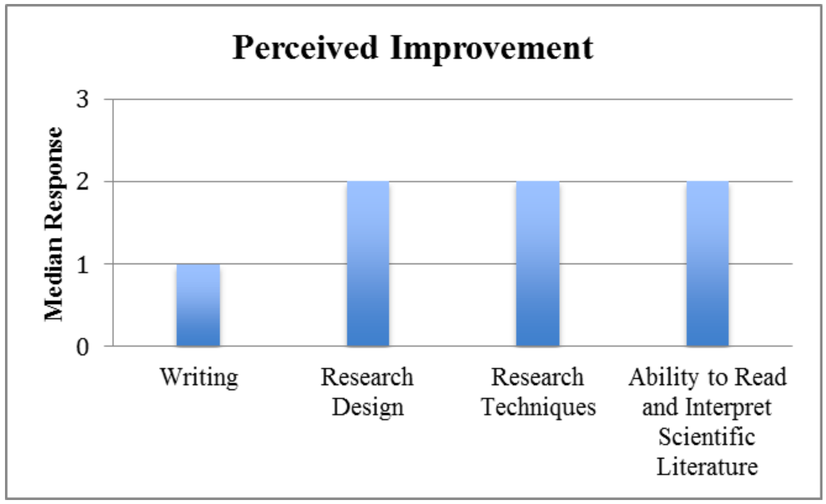


Figure 2. Median responses to the question "To what extent did the grant improve your skills in the following areas?". 0 = No Improvement, 1 = Slight Improvement, 2 = Moderate Improvement, 3 = Significant Improvement.

Top Reviewed at ERIN

- A Map of the Brain: Allan Jones at TEDxCaltech online here
    - **Strength**: Beautiful imagery, good historical perspective of imaging, appropriate discussion of techniques that can be used to image the living and postmortem whole brain and brain tissue. Merges into a nice discussion of what the Allen Brain Institute is trying to accomplish
    - **Weakness:** Since it is a TedX talk, detail is lacking in places (the histological techniques, understanding the genetic data), but the video would make a good introduction to brain mapping and genetic neuroanatomy.
    - Review provided by Joe Burdo, Ph.D. — Boston College
- A Patient guide to deep brain stimulation, Mayfield clinic online here
    - **Strength**: Although video clips don't foster deep learning, this one certainly sparked a lot of discussion. Students were fascinated by the procedure and a bit taken aback by the footage of the actual surgery (including the hole being drilled through the skull). The length is only 4 minutes, so this can easily be used as a prompt for a writing assignment.
    - Review provided by Bob Calin-Jageman, Ph.D. — Dominican University

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.

Nu Rho Psi: The National Honor Society in Neuroscience

G. Andrew Mickley, Ph.D., Executive Director of Nu Rho Psi — U

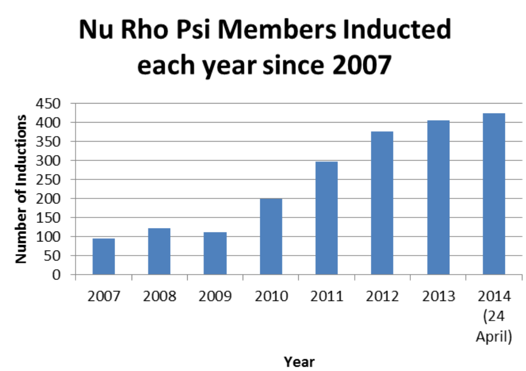
Brief history and mission of *Nu Rho Psi*:
Nu Rho Psi is the National Honor Society in Neuroscience, founded in 2006 by the Faculty for Undergraduate Neuroscience. We are now an independent, tax-exempt [501(c)(3)], non-profit, grass-roots, organization comprised of neuroscientists like you.

The purpose of *Nu Rho Psi* is to: (1) encourage professional interest and excellence in scholarship, particularly in neuroscience; (2) award recognition to students who have achieved such excellence in scholarship; (3) advance the discipline of neuroscience; (4) encourage intellectual and social interaction between students, faculty, and professionals in neuroscience and related fields; (5) promote career development in neuroscience and related fields; (6) increase public awareness of neuroscience and its benefits for the individual and society; and (7) encourage service to the community.

Current status of *Nu Rho Psi:*
The honor society has grown steadily since the first members were inducted in 2007. We now have over 2000 members and 43 chapters at colleges and universities across the U.S.

Nu Rho Psi is governed by a National Council elected by our members. The National Office is located at Baldwin Wallace University and day-to-day operations are managed by a small part-time staff.

Benefits to *Nu Rho Psi* members:
Students who become members of *Nu Rho Psi* are selected based on their superior scholarly accomplishments as well as their excellent work in research. Members receive membership certificates and lapel pins as an indication of the honor they have earned. *Nu Rho Psi* offers competitive travel awards for members to attend and present their research at the annual Society for Neuroscience meeting. *Nu Rho Psi* also offers competitive small grants to facilitate our members' senior theses or summer research projects. Grants and other awards are available to *Nu Rho Psi* Chapters that foster educational and community outreach opportunities. *Nu Rho Psi* membership is for life and it is often a springboard for the networking and collaboration of like-minded colleagues throughout the U.S. We also mentor our members through publications (e.g. *The Nu Rho Psi Guide to Graduate School in Neuroscience*) and other outreach activities of the Society.



How to start a *Nu Rho Psi* chapter:
Nu Rho Psi is a federation of local chapters, each with their own Constitution and By-laws consistent with those documents for the national organization. Membership in *Nu Rho Psi* is granted only through our chartered schools and any accredited college or university in the U.S. may apply for a *Nu Rho Psi* charter. The application process is aimed at determining the likelihood that the school has the curriculum, resources and desire to foster development of the neuroscience education of their members. Questions about *Nu Rho Psi* and the charter application process may be directed to the Executive Director, G. Andrew Mickley: amickley@bw.edu.

His Holiness the 14th The Dalai Lama, was inducted as an honorary member of Nu Rho Psi on 2 March 2014 at Macalester College. The Dalai Lama has been a long-time advocate of the use neuroscience in the study of mind. In this picture he displays his Nu Rho Psi membership certificate presented by Dr. Eric Wiertelak, President of Nu Rho Psi, and his students.

Modeling Neural Phenomena through Stop-Motion Clay Animation: A Class Activity

Paula M. Johnson & David S. Leland — University of Wisconsin-Eau Claire

At the University of Wisconsin-Eau Claire, introductory neuroscience is a course that satisfies general education and lab course requirements. Usually co-taught by biology and psychology professors, there are a variety of lab activities, from dissection to visiting an EEG lab. One activity implemented by Dr. Leland and his teaching assistants in spring of 2013 was a "Neuro Claymation" project. Students created short videos using modeling clay and stop animation to depict neural phenomena (e.g., exocytosis). This activity is creative, hands-on, and requires teamwork.

Half-sections of 12 students each formed 4-member groups: 1 photographer, 1 positioner, 2 clay shapers. Each group selected a neuroscience concept or process and created a storyboard (minimum 6 images) for review and approval. Students used one lab session (110 min) to do modeling and photography. Typically, students used 80 to 90 minutes of the first session to capture images. They created shapes using non-hardening oil-based modeling clay and cutting tools. Geometrically shaped cutout tools are especially useful for depicting molecules such as ligands and receptors. Images were collected using Logitech Webcam Pro 9000 cameras and free PC software (MonkeyJam, http://monkeyjam.org). During a second lab session (110 min), images were imported into iMovie for editing, text overlays, narration, and other sounds or music. Finalized videos were submitted online.

The resulting videos represented a variety of phenomena including the action potential, drug action at receptors, split-brain experiment findings, and prenatal brain development. As part of an end-of-semester survey, students rated the project on how good/bad they believed it was at enhancing their learning and/or getting them engaged with the material (Likert scale: 1 = very bad, 5 = very good). Of 61 respondents, 77% rated the project as good or very good ($M = 4.0$, $SD = 0.8$). Thirty-eight students provided written comments, the vast majority of which were positive. Most described the project as "fun" and many specifically appreciated how it provided a very different means of engaging the material (e.g., "tangible example," "good change of learning medium," "unique way to apply the concepts," "excellent way to help us solidify certain aspects of neuroscience"). Three respondents wrote that the activity was not worthwhile; most critical commentary focused on logistical issues such as time constraints and the complexity of the relevant technology.

Students appreciated the creative outlet and change of routine afforded by the Neuro Claymation project. A number of students explicitly recognized (in written and/or verbal comments) the value of slowing down and thinking through each step of one complex phenomenon at the level required to depict it using stop animation. Feedback on videos was provided in written form to each group privately. While pointing out errors more publicly can be a sensitive matter, many students said that they would like to see the other groups' videos, so it may be worth planning from the outset to have a screening and review of the videos so that everyone can enjoy and learn from their peers' efforts.

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.
- 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

Bug Brains, Continued...

tive, inquiry-based outreach activities.

Each year the University of Arizona hosts an Annual Insect Festival, where members of the university's research community and other enthusiasts bring their passion for insects and other interesting arthropods to the public at large (http://www.arizonainsectfestival.com). This free and open event annually draws thousands of visitors, young and old alike, to the university for a one-day fair organized into thematic booths that highlight different aspects of the importance of insects to our daily lives. Since the festival's inception, the Department of Neuroscience has hosted a "Bug Brains" booth with several displays and activities (described below) geared at acquainting the public with the significance of insects in neuroscience and biomedical research. The booth is planned and organized by a collaborative team of postdoctoral researchers and graduate and undergraduate student volunteers. This event is a great opportunity for undergraduate neuroscience students to volunteer and share their excitement about science with a diverse and energetic audience (Pearce & Srivatsan, 2011). The majority of festival attendees are children, and as such our booth is designed to engage the audience with hands-on, interactive activities. Unlike outreach events directed at K-12 school visits, however, there are also a large number of adult attendees, so the impact of this event extends to a wide range of ages and interests. Although this event provides a unique and rather specific opportunity for interactive neuroscience outreach, the activities we employ can easily be adapted for use in different venues.

Our "Bug Brains" booth… acquaints the public with the significance of insects in neuroscience and research.

Activities

The following examples represent a sampling of the activities we've employed. In most instances these activities can be developed with relatively little cost in a minimally equipped laboratory. The specific insect species used for many activities can vary depending on seasonal and regional availability of wild-caught specimens. Many standard laboratory species, such as the fruit fly *Drosophila melanogaster* or the hawk moth *Manduca sexta*, can be obtained from laboratory supply companies.

Brain Zoo: The cornerstone of our exhibit is a collection of dissected insect brains that we endearingly call our "Brain Zoo." We display these preparations in small, sealed vials and provide large magnifying glasses and dissecting microscopes so participants can get a closer view. We collect and dissect a variety of insects (e.g. cockroaches, grasshoppers, bees, butterflies or moths, beetles, large ants, etc.) to illustrate that they each have similar parts (i.e. optic lobes for vision, olfactory lobes for smelling, an esophageal foramen for passage of the gut) for similar purposes. It is fun for participants to attempt to match the brain with a picture of the appropriate animal. In addition, we have a collection of vertebrate brains that we compare and contrast with the insect brains. One of the goals of this activity is to illustrate that insects, like larger animals, can see, smell, taste, and feel the world by using their nervous systems. This is a very interactive activity that has innumerable possibilities for discussion of insect nervous systems.

Dissections and histological preparations: We are fortunate to have a large collection of histological slides of various insect brains for this activity. We set up a compound microscope so participants can observe a high-magnification view of insect brain cells *in situ*. People are generally amazed at the intricacies of the nervous system when viewed at magnification. We use this activity as an illustration of how insect neurons are similar to vertebrate neurons and how they differ.

SpikerBox: The SpikerBox, created by Backyard Brains (www.backyardbrains.com), is a great way to illustrate that insect nerves conduct electrical impulses (Marzullo and Gage, 2012). This affordable and versatile mini-amplifier allows participants to hear and see action potentials from the leg of a roach or other suitable insect upon mechanical stimulation.
Drosophila melanogaster specimens: The fruit fly *Drosophila melanogaster* is arguably the most important and pervasive insect model system for a variety of scientific disciplines, including neuroscience. A simple culture vial of these ani-

Bug Brains, Continued...

mals with wandering larvae and active adults is enough to start numerous conversations with young students and adults alike about the utility and importance of this little fly for biomedical research. The idea that these little (some might say pesky) flies share the majority of their genes, particularly those involved in the nervous system, with humans is truly remarkable. There are many ways that different mutants can be used for creative outreach applications. Pulver and Berni (2012) provide an approachable introduction to this system, including some possible nervous system mutants for activities.

References:

Marzullo, T.C. and G.J. Gage. 2012. The SpikerBox: A low-cost, open-source bioamplifier for increasing public participation in neuroscience inquiry. PLoS ONE 7(3):e30837.

Pearce, A.R. and M. Srivatsan. 2011. Volunteerism is key to offering successful neuroscience outreach with limited resources. JUNE 9(2):A62–A65.

Pulver, S.R. and J. Berni. 2012. The fundamentals of flying: Simple and inexpensive strategies for employing *Drosophila* genetics in neuroscience teaching laboratories. JUNE 11(1):A139–A148.

Teaching Award, Continued...

ics: developing international neuroscience opportunities for undergraduates.

The inception of our study abroad program came through existing collaborations between the Faculty for Undergraduate Neuroscience and the German Schools of Neuroscience (a consortium of graduate programs in Germany). That initial connection, developed by Mary Harrington and Eric Wiertelak, was centered on the German Schools of Neuroscience poster award that was given at the annual FUN Society for Neuroscience undergraduate poster session. The undergraduate winner of this prize toured German Neuroscience programs with their research advisor during the summer. Based on the success of this program we approached Lutz Steiner, Medical Neurosciences in Berlin Program Director, with the idea of a “FUN Abroad” summer program that more directly engages US undergraduates with the German research community. The product of these discussions was a four week summer study abroad program, run through the College of Charleston Center for International Education, that we began in 2011: Neuroscience Seminar in Germany. We spend two weeks at the Munich Center for Neurosciences – Ludwig-Maximilians-Universität (MCN-LMU) and two weeks at Charité - Universitätsmedizin in Berlin. Enrollment is open to any current undergraduate student in North America. The program showcases the cutting-edge research at these universities and provides a view into the rich history of medical and behavioral neuroscience in Germany. Through laboratory exercises, site visits, and interactions with German graduate students and post-doctoral research associates, the program expands the students’ understanding of collaborative science and scientific opportunities in research that may exist abroad.

Beyond the practical and logistical implementation of this program our aim was to address broader issues, as they relate to study abroad programs in the sciences. With increasing globalization, there is a growing focus on international studies and the development of intercultural skills, often incorporated into strategic plans or mission statements of many colleges and universities. Study abroad in the neurosciences holds the promise of creating connections and collaborations among students and faculty in a field that is becoming increasingly interconnected and global. However, a major challenge is that rigorous or restrictive curricular demands on neuroscience students can discourage them from pursuing a study abroad experience. There are fewer study abroad opportunities in neuroscience compared to other disciplines, and a full semester abroad is often at the expense of undergraduate research opportunities at home. The goal of our course is to address such challenges and create a unique and productive study abroad opportunity for neuroscience students. After completing this program a number of students have broadened their perspectives for career plans. Several course alumni have applied to graduate schools in Europe or for semester-long programs. Ideally, it is this international perspective we hope to foster through our program’s creation of globally oriented neuroscience students

From the president, continued...

philosophy tethered to the "work hard...good things will come" and "the cream will always rise to the top" mantras. But my concerns about how to help students make informed decisions about their professional development have become more significant in the recent years. So much so that I would imagine that many of our members are struggling with the same concerns and that there might be a need for us to come together with a "vision for undergraduate neuroscientist development" that we could move forward with, as a group.

My initial concern deals with a seemingly disconnected relationship between what we "think" we need and what our actual "needs" are in science. The most recent budget request from the Office of the President included 3.1 billion (large number, yes, but only a small percentage of the 2.9 trillion total budget request) in support of programs that enhance science, technology, engineering, and mathematics (STEM)[1]. But not all STEM needs are equal - across the four letters that contribute to the abbreviation, that is. Seventy-one percent of new STEM jobs will be in the computing "T" industry, 16% in engineering "E", 7% in the physical sciences and 4% in the life sciences "S", and the math "M" opportunities make up the remaining 2%. The projected estimated need for the "science" occupations in STEM disciplines through 2018, (i.e. all jobs available in life/physical sciences) make up only 13% of all STEM jobs[2]. In addition, of all the projected STEM jobs, only 24% of them require a graduate degree[2]. Again, do not take the information I am presenting as an "anti-STEM programs" perspective. I simply argue that we need to understand that STEM, in terms of vocational opportunities, actually looks more like sTEm as compared to STEM. I believe MORE support is required to promote STEM proficiencies at all levels of formal education, but my current questions/concerns are directed toward the development of the next generation of scientists; that is, the producers of science, not the consumers.

Too much growth has occurred so that there are too many scientists and too little support for those investigators

A recent PNAS article titled, "Rescuing US biomedical research from its systemic flaws"[3] that was authored by several well-respected scientists – and this was really the article that broke this camel's back -- outlined the doom and gloom of the future of gainful employment for new scientists. The key thesis of this report was that the current funding system in the biomedical sciences is flawed and unsustainable. Too much growth has occurred so that there are too many scientists and too little support for those investigators. They state that the assumption of growth of the science enterprise can be maintained indefinitely is incorrect. The problem is amplified due to the necessity of having trainees (apprentices) in their established laboratories to perform the principle investigators research. So for every investigator, there are numerous additional young investigators being produced and released into the system, each previous apprentice now either looking for a position so that they may establish their own laboratory (and hire their own apprentices). If no position can be found, they then wash out of the current scientific system and seek employment outside of their chosen field. As the generations have proceeded, fewer and fewer new scientists find their way to their "dream" (i.e. any gainful employment where their degree/experiences align with their position) jobs in science and more are finding employment in non-science "alternative" vocations. Note: the use of the word "alternative" is in quotes because in most cases the "alternative" is not a decision made by the person, but is due to no other options being available to them.

The authors of the PNAS article make several recommendations to try to balance/control this uncontrolled growth. The first and most logical (at least from the authors' perspectives) is to increase funding. These additional funds would greatly expand and grow science...leading to a greater need for apprentices, and (admittedly, by the authors) we are right back where we started: too many graduates, not enough opportunities. The second recommendation is to no longer pay graduate students using monies received from research grants. Instead, make the students compete for their own training grants and fellowships. Of course, though it was not pointed out by the authors, there would then be far fewer students due to the limited funds for training grants and fellowships. The few that win the support should have more options as to what they would want to do for their education and be less bound to any particular laboratory. So who would perform the established PIs' research? Post-docs, techs, and so on but NOT the students. Who would

From the president, continued

teach? Who would "mentor" the apprentices...the next generation of scientists (Spoiler alert! They provide us with their vision of the future of science, see the next paragraph)? Their third recommendation is to broaden the "career paths" for students, again identifying "alternative" (yes, in quotes again) vocational opportunities outside of their specific training and goals (i.e. send them away from science, to something else, when they are done with them).

I think in their world, the current leaders of this charge to change the approach of scientific funding and development have a very clear model of the future of science. Their fourth and fifth recommendations are to increase pay, but limit terms, for post-doctoral positions and to increase the use of "staff scientists." Both of these changes will reduce the need for graduate students and, therefore, eliminate the need for the apprentice (yep, the post-docs and staff scientists would perform the PI's science). The laboratory would then be the domain of those who do science, not those that train the scientists of the future. There would be an increase in the overall costs of doing science, but there would be fewer, smaller laboratories and none of the stress associated with student development issues. Sounds much like an industry model to me, not an academic one. A path that many have predicted science was on, and one that would lead to fewer investigators, greater quantity of data, less discovery...That is, mediocre - yet very expensive - science.

When my students come to me with problems, I suggest to them to move from complaining about the issue to coming up with solutions to the problem. When I apply the same pressure on myself in this particular situation, I cannot come up with an easy "solution." Well, that is not necessarily true. I tell myself, my current students, and my past students all the same thing: "If you work hard, good things happen" and "The cream rises to the top, eventually." I agree that this is not a solution, but it is a way to balance what I would want to happen for my students with the reality of the situation (for both myself and my students).

My question for the membership of FUN, my charge if you will allow for such a thing, is to think about what our role in this system should be. What should we be telling/working with/inspiring our students to work toward? How much of the doom and gloom should we share with them? Should ***discouragement*** be part of our teaching and research philosophies? I will be posting this essay on our listserv where we can begin to have an open discussion about these issues. Please feel free to share your thoughts, ideas, counter-arguments, vision for change, whatever you would like to add to the conversation. It is my hope that through these conversations (and additional conversations at the upcoming FUN workshop in Ithaca, August 1-3) we might begin to forge an approach that helps shape the way we mentor our students.

The Faculty for Undergraduate Neuroscience has been on the frontlines for many years when it comes to issues associated with student growth and development in the neurosciences. We have produced, at least, the majority of students that seek graduate training in neuroscience. We are part of the "problem," at least a major component, contributing to the source of well prepared and interested neuroscience graduate students (if you call that a problem). We should play a role in how the future of how our science should look, for our own good and the good of our students. Our unbiased/biased insights should at least provide alternative perspectives to the current alternatives, maybe just to bring an alternative approach that may be in the best interest of the whole rather than the few. I hope these thoughts and ideas inspire our group of great minds to work together and develop new ideas that can help move science forward in a manner that is best for the whole of society.

What should we be telling/working with/inspiring our students to work toward?

1) http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_STEM.pdf
2) Carnevale, A. P., Smith, N., & Melton, M. (2011). STEM: Science Technology Engineering Mathematics. *Georgetown University Center on Education and the Workforce*.
3) Alberts, B., Kirschner, M. W., Tilghman, S., & Varmus, H. (2014). Rescuing US biomedical research from its systemic flaws. *Proceedings of the National Academy of Sciences*, *111*(16), 5773-5777.

Faculty for Undergraduate Neuroscience

Date	Event
07/23/2014 -07/25/2014	Eighth Annual Summer Workshop on 'Hardware and Software Experiments for Teaching Undergraduate Neuroscience', 23-25 July 2014
08/01/2014 -08/03/2014	The 2014 FUN Workshop
11/15/2014 –11/19/2014	SFN 2014

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Katherine Steinmetz, Wofford College

Amy Jo Stevenezer, College of Wooster

Bob Calin-Jageman, Dominican University

Call for Submissions: October 1 for fall 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

- 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.