THE PATH TO ENGAGEMENT
Your Brain On Awareness

FACULTY SPOTLIGHT
Joe Normandin Ph.D. makes Neuroscience artsy

FELLOWS BY THE NUMBERS
Welcome to the Spring 2016 issue of The Potential, featuring community education.

Georgia State University boasts an especially vibrant neuroscience research and training environment, thanks to the amazing contributions of faculty members, staff, students, and community partners. Not only do we engage in cutting-edge research in a wide variety of basic and applied subfields of neuroscience, but also we support strong professional development opportunities and critical community education endeavors. The B&B Program is essential to all of these, but focuses on community education in this issue of The Potential.

Spurred by long-standing science education initiatives such as the BioBus and the entire education arm of the Center for Behavioral Neuroscience, Georgia State neuroscientists offer numerous K-12, college, and public education programs. For example, we reach broad audiences in our K-12 Classroom Visits Program with the Atlanta Chapter of the Society for Neuroscience, as well as through the new Atlanta Science Festival, where our volunteers translate their research findings into lesson plans for novices or non-scientists. Combined, these reach at least 5,000 learners of all ages and stages each year. We also target elite populations to come learn neuroscience and conduct research with us through the Institute On Neuroscience (ION) for Outstanding High School Students and Teachers, as well as Atlanta’s Neuroscience Education and Training (NIE/WORK) Program. All of our programs emphasize diversity by highlighting the relevance and accessibility of neuroscience to individuals from diverse backgrounds.

Participant feedback suggests that our education and training programs pique curiosity, advance skills and knowledge, elevate positive attitudes about science at Georgia State, and even launch careers. Moreover, our education research reveals that these science education programs are beneficial for our volunteer instructors as well, e.g. volunteers learn to modify their teaching styles on the fly, responding immediately to learner feedback regarding vocabulary levels, concepts of interest, and opportunities to expand on basic lesson plans. Such experience builds our volunteers’ confidence in teaching, diversifies their styles of scientific communication, and achieves goals in community service. Such healthy integrations of research, professional development, and community service help to make our undergraduate, graduate, post-doctoral, and even faculty and staff training environments very lively and robust.

Hands-on, real-world education and training is integral to the age-old practice of experiential learning, which is a concept of increasing emphasis throughout Georgia State. Faculty and staff members all over campus value active teaching and learning, integrated classroom and professional learning environments, and career preparation. As university graduation rates climb at impressive rates, more and more students are reaching the workforce equipped with the professional skills and dispositions they need in order to succeed. Prime examples of undergraduate involvement in pre-professional and community endeavors exist in every college, such as research assistantships and co-operative education programs in the College of Arts and Sciences, student teaching in the College of Education and Human Development, clinical rotations in the School of Nursing and Health Professions, government internships in the School of Policy Studies, and client-based market research in the College of Business. Some of these opportunities are encapsulated in courses known as “Signature Experiences”, whereas others are facilitated through offices such as Career Services, Study Abroad, and the Office of Civic Engagement. It has been an honor for me in particular to support the enhancement and tracking of these opportunities as the Senior Faculty Associate for Special Programs, in the office of the Vice Provost, Dr. Timothy Renick.

Keep up the great work, and don’t hesitate to contact me to volunteer!

Sincerely yours,
Kyle Frantz
Professor, Neuroscience Institute
Senior Faculty Associate for Special Programs
**RECENT & UPCOMING EVENTS**

2015 - 2016

- **SEPTEMBER**
  - Walk to End Alzheimers

- **OCTOBER**
  - Society for Neuroscience Conference

- **NOVEMBER**
  - Professional Development Interview Prep Workshop
  - Distinguished Lecture Series

- **DECEMBER**
  - Seed Grant Deadline

- **JANUARY**
  - Professional Development Workshop Series
  - Distinguished Lecture Series
  - Distinguished Lecture Series

- **FEBRUARY**
  - B&B Retreat

- **MARCH**
  - Professional Development Workshop
  - Call for Seed Grant Applications went out in January. The deadline for Seed Grant Applications is Wednesday, March 23rd at 5:00pm EST
  - 2016 B&B Retreat will feature senior fellow talks, a keynote, and a poster session.

- **APRIL**
  - Robert Williams, Ph.D. will talk about “Relational Leadership & Emotional Intelligence” on March 25th at 11:30am EST.
  - Open to staff, faculty, & students. RSVP only to Liz Weaver at eweaver1@gsu.edu
  - See pg. 3

**Scholars will engage in professional development workshops throughout the summer and will present their research at the end of the summer at a poster symposium.**
Distinguished Lecture Series

One of the ways the Brains & Behavior Program, otherwise known as B&B, promotes research collaborations and dialog is through the Distinguished Lecture Series. These events are held every second Friday of each month and are open to the public.
I went into this interview/mock lecture and pretended we canned. To my surprise, I got a second interview, with a mock I had the breadth and depth of knowledge to teach almost graduate student. So, I started to look at college-level teach in the way I thought it would. I returned to the U.S., and I post-doctoral position at the Netherlands Institute for Neuroscience in Amsterdam. While I had fantastic collaborators and the difference between a hypothesis and a prediction. I'm still teaching, and so bright, they just needed some extra help to get where they wanted to go. This volunteer work with Kyle and Laura helped me to teach science to so many people from so many walks of life. These experiences not only have tremendous personal value for me, but I also believe that scientific literacy is critical to a future where we can make reasoned policy decisions for our society.

What do you think is most important about your work? I'm currently working on a big project as chair of the Atlanta Science Festival at GSU. We've been a big part of the Atlanta Science Festival for the past two years. This year, we know what has worked and what has not worked, so we are focusing our energy to make what's been great in the past into something even more fantastic. I really hope if Introduction to Neuroscience might not be a great course for some students, or perhaps not for everyone and every age group. It's a big responsibility and Dr. Frantz and Dr. Amy Horner-Reber (Biology) are instrumental in putting together this class with me as the Chair Emerita and Co-Chair, respectively. I've also been doing a few smaller things like leading a (very successful) panel at the Petit Science Center! There is something for everyone. 7-175, and every age group. It's a big responsibility and Dr. Frantz and Dr. Amy Horner-Reber (Biology) are instrumental in putting together this class with me as the Chair Emerita and Co-Chair, respectively. I've also been doing a few smaller things like leading a (very successful) panel at the Petit Science Center! There is something for everyone.

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FELLOWS BY THE NUMBERS

48 TOTAL FELLOWS

24% of Fellows used their travel award to present their research nationally & internationally

In 2014, 73% of fellows presented
Total of 69 Presentations

In 2014, 58% of fellows published
Total of 51 Publications

DEPARTMENT BREAKDOWN

Psychology 15
Neuroscience 4
Philosophy 3
Math 4
Chemistry 4
Computer Science 6
Biology 5
Physics 4
YOUR BRAIN ON AWARENESS

by Liz Weaver

LEANING IN

Katie Patrick, second year Neuroscience graduate student, sits across from me with a smile from ear to ear. Enthusiasm might as well be her middle name, because she has a lot of it. Energy and enthusiasm are two really good qualities when you have what Katie has ahead of her. As of a couple months ago, Katie has taken on two big roles: the chair of community engagement for the Neuroscience Graduate Student Association and the Georgia State University representative at the Atlanta Chapter of the Society for Neuroscience (ACSN). In the following year, Katie will lead the charge, with an army of dedicated volunteers, and organize what our neuroscience department has become well known for: 52 weeks of Brain Awareness. With classroom visits, science fair visits, and STEM nights, in addition to collaborating with other Atlanta institutions to provide neuroscience education to the public (see side box #1), you can begin to see what a substantial undertaking this will be for Katie. “It definitely takes time and effort. However, the benefit of sharing what you are passionate about and seeing it be received through gratitude and excitement over the brain, the benefits outweigh the costs. Not to mention, there is constant motivation from a great team of supportive people.” But Katie isn’t the first to hold positions such as the ones above. There have been a stellar list of science educators before her that laid the foundation for what is today one of the nation’s most active neuroscience outreach communities.

A HISTORY OF DEDICATION

In 2000, prior to the formation of the neuroscience institute, the Center for Behavioral Neuroscience (CBN), a state wide consortium of neuroscientists from Emory University, Georgia Tech, Morehouse College & School of Medicine, Spelman and Georgia State University, was hired for 7 years with the potential for renewal. The center was to serve as a multidisciplinary space for research and education with a focus on brain science and its relevance to a multitude of areas. Two new hires here at Georgia State University (the lead institution), Drs. Kyle Frantz and Laura Carruth, were hired both as researchers and to work in the education areas as well as science educators. After all, one of the core missions of the CBN then, and still today, is to be an advocate and leader in science education. To that mission, Drs. Frantz and Carruth vigorously applied and were offered the science education grants. With the invaluable help from organizations such as the Dana Foundation (see side box #2) and hundreds of volunteers of faculty and students, GSU built a science education empire of sorts.

In 2007, through tireless efforts of the CBN and ACSIN, the Atlanta neuroscience community knew they needed more than just one Brain Awareness Week to spread the brain love. Consequently, The DANA initiative Brain Awareness Week (in March quickly became Brain Awareness Month here in Atlanta. Even the governor’s office signs are now adorned with brain awareness month’s avatar (Dr. Jeffress)!

See more at: www.dana.org

#1

This past year, GSU grad students reached in to reach out!

• Neuroscience grad student and B&G Fellow, Kat Sturman worked with Fernbank science museum for their “Science at Hand Day”.

• In addition, recent neuroscience graduate Dr. Elizabeth Jeffress, joined forces with Fernbank’s Science Open Labs to present one of GSU’s most popular interactive neuroscience booths, “Touch a Brain.”

#2

Founded in 1980, The DANA Foundation is a private philanthropic organization committed to advancing brain research and to educating the public in a responsible manner about research’s potential. They promote dialogue between researchers and lay audiences, provide validated information about the latest advances in research through free publications and websites and engage people worldwide throughout the Alliance and International Brain Awareness Week (BAW).

See more at: www.dana.org

#3

Founded by Emory University, the Georgia Institute of Technology, and the Metro Atlanta Chamber, the Atlanta Science Festival is a collaboration among diverse community partners planning a collection of events for young people, families, and adults. It is an annual public celebration of local science and technology. Curious people of all ages explore the science and technology in our region and see how science is connected to all parts of our lives. Scientists and educators from museums, local schools, universities, and companies uncover mysteries and explain discoveries in a variety of hands-on activities. Faculty tours, stimulating presentations, and riveting performances expand our community of science enthusiasts and inspire a new generation of curious thinkers.

With more than 100 individual events each year since the inaugural festival in 2014, they have reached over 75,000 people. Collaborations with 100+ community partners, including school districts, post-secondary institutions, museums, businesses, civic and community groups facilitated the festival’s success. Atlanta Science Festival is the proud winner of the 2015 Technology Association of Georgia STEM Education Award for Post-School Outreach (Excerpt reworded from http://atlantasciencefestival.org/about-asf)

From undergraduate & high school research programs, to teaching teachers, to classroom visits, the science education arm of the CBN set the stage for, what has now become, a culture of community engagement within the Neuroscience Institute here at Georgia State University. In addition, and something Katie looks forward to taking on an active role in, The ACSN plays a critical role in the partnership of science education efforts between three particularly active institutions: Georgia Tech, Emory and GSU.

A BRIGHT FUTURE

Today, while Drs. Carruth and Frantz are still both heavily involved in neuroscience advocacy and community enrichment activities, a lot of day to day work has become institutionalized within the Neuroscience Graduate Student Association (NGSA), CBN, and the ACSIN. Some initiatives from the early days are no longer active. Others have morphed into alternate undertakings. Still others are continuing to operate and thrive.

See below for a couple of the programs that make up the past and present fabric of our unique community:

• The DANA Foundation supported Lending Library, where people can check out brain models and educational gear is a staple program that allows our educators to go into K-12 classrooms fully prepared.

• The Institute on Neuroscience (ION), a summer research experience for high schoolers, has grown and now has a teacher-training component. Teachers have the opportunity to do experiments and write lesson plans under the guidance of university level faculty.

• The Brain Bee, a Society for Neuroscience program brought to Atlanta by CBN, has its roots in good of fashion competition. High school students compete to convey their knowledge of the brain (and it’s a lot) in a spelling bee format. Winners go on to a national competition.

• One of the signature programs originally adapted from an Emory program, BRAIN (Behavioral Research Advancements in Neuroscience) has been an intensive summer research experience for undergrads. Although it has since sunsets its, its offspring of sorts, NET/work (Neuroscience Education & Training program) still carries on CBN’s charge to provide research training for undergrads.

• The Neuroscience Expo was an exciting annual event in which we showcased our scientific outreach efforts and interactive activities. Running for 5 years, this far-reaching public awareness project made its way from the Center of the Atlanta Zoo, Atlanta, engaging tens of thousands of people and volunteers.

• Founded by Emory, Georgia Tech, and the Metro Atlanta Chamber in 2014, The Atlanta Science Festival incorporates several brain-related activities including, but not limited to, hands-on booths such as build-a-brain, touch-a-brain, robo-roach, zombie brains, and the smile booth (see side box #3).

• Finally, there are undergraduate organizations such as the CNS, (Collegiate Neuroscience Society) and NuPiPi (Neuroscience national honors society) who put together noteworthy lectures and expert seminars open to the public as well.
EVERYONE WINS

Every year, it seems like brain awareness activities are growing exponentially, as if Atlanta were the perfect petri dish. Why not do it? It’s a feel good activity, right? Children smiling, people learning, some even going on to spread awareness themselves. In addition, the interactive nature of community engagement provides an avenue towards experiential learning skills across the ranks. However, these rewarding effects aren’t one-sided. Community engagement is mutually beneficial to the people receiving it and the institutions from which it came. Having volunteers in the classroom and graduate students behind the booths afford universities feet on the ground. In other words, it gives institutions direct contact with community partners and school age children. That direct contact and subsequent feedback helps inform brain related pedagogy. In addition, it offers on-site teacher training for graduate students. GSU Lecturer, and long time science educator, Dr. Joe Normadin remembers being a graduate student at GSU and claims that without the numerous opportunities to get engaged through outreach, he “wouldn’t have had the confidence to become an instructor at Georgia State.” Through our programs, Dr. Normandin became proficient in “techniques in teaching active learning curriculum.” Skills, Dr. Normandin admits, he often still uses today while teaching classes such as Intro to Neuroscience...

According to a report on supplies used from the lending library, the numbers from June 2014 - May 2015 are one reflection of the vitality of our neuroscience outreach community here in Atlanta.

- Atlanta Science Fair – 2,800 people reached
- K-12 Classroom visits – 4,715 students reached
- Teaching Undergraduates – 1,000 undergrads reached
- Fernbank Natural History Museum Activities – 2,700 guests reached
- Some 11,000 people were reached in 2015!

“For participant feedback suggests that our education and training programs pique curiosity, advance skills and knowledge, elevate positive attitudes about science at Georgia State, and even launch careers.” - Kyle Frantz

Katie is still in training, but it only takes a few minutes of talking with her to note that her skills are honing in quickly. Most importantly, however, she knows she can reach out to a supportive and highly vibrant neuroscience education community if she needs any guidance or encouragement. In this community and others like it, a lot of work goes in. But the investment gives everyone involved a dividend. Everybody wins.

Brains & Behavior raises awareness too with its annual Alzheimer’s Walk, raising almost $10,000 to date.

For more info on how to get involved in community engagement, contact: Katie Patrick kpartrick1@student.gsu.edu
During the last 100 years, an explosion of knowledge and advances have been made in studying the nervous system. As with any discipline, as new tools became available (Ex: electron microscopy, GFP, etc.), an understanding of the degree of heterogeneity of neuronal subtypes has increased. With the current tools available, we can identify neuron subtypes based upon a variety of factors. These include and are not limited to location, morphology, neurotransmitter type, electrophysiological properties, and more recently gene expression [2]. These properties have furthered scientific understanding as many different neuronal types and subtypes have been identified. However, in the field, there have raised some unanswered questions. Why is there variation in the above mentioned properties from one animal, tissue or even cell to the next? Why is it evolutionarily beneficial to have so many neurons of the same general type in a given region?

Like any complex problem, there is probably more than one answer. However, one of those answers may include a solution that is within reach. Recently, advances in sequencing and cell sorting have allowed for the identification of distinct populations of neurons within a given region of the nervous system. Several studies utilizing next generation single-cell sequencing, have revealed that there are many more neuronal subtypes than previously thought [3]. This is also true within populations of neurons, such as the CA1 pyramidal neurons found in the hippocampus. When this technique was applied to a population of CA1 neurons, clustering analysis of gene expression profiles revealed multiple heterogeneous groups [4]. However, this finding is not limited to the hippocampus. Further exploration via RNA-Seq of the cortex has revealed a multitude of subclases based upon the expression of multiple genes [4-5]. This is indicative that a single marker (such as single gene or morphology) may not be sufficient to accurately identify a specific population of neurons.

In various aspects, this principle of many subtypes in a general class of neurons has been intuitive and in some model systems already known. Invertebrate models have long been known to have many different subtypes of neurons that otherwise would appear to be the same. This is further highlighted by studies in which populations of similar neurons express different profiles of genes to create subtypes among the population. Developmental work in C. elegans and D. melanogaster have highlighted that this can be achieved by the use of common gene regulatory networks [6]. These networks are then modified by the expression of subtype specific transcription factors. In some cases, gene regulatory networks control a common identity among the population (Ex: neurotransmitter type) and are conserved from nematodes to mammals [6, 7]. In C. elegans, the cell lineages are well mapped, invariant and the differences between the subtypes of neurons is well described. Can this ability to describe variation between neurons of a similar group be scaled from C. elegans to other animals?

It seems very reasonable that in the near future we will be able to identify and deduce the functional differences of subtypes in more complex systems than nematodes. I would predict that some, but not all, variation observed in terms of neuron function or properties may be due to multiple unidentified subtypes within the given region/population of interest. Indeed, differences between two neurons that appear to be the same may be the result of subtleties in their gene expression profile, which could distinguish them as separate subtypes. It will be exciting to see this tested in the near future.

Does this mean that an already incredibly complex system is far more complicated than we originally thought? In my opinion, and in the opinion of many others, it most certainly is. However, this reality provides many exciting opportunities for the future. Although, identifying subtypes within [insert your model/brain region of interest] is interesting in its own right, this endeavor can be further explored by asking how many different subtypes there are in a given population and delving deeper into the function of each subtype. Furthermore, we can begin to ask which subtypes are related to different behaviors or connections within the nervous system. These studies can be facilitated by advances in sequencing and genome editing. From my own perspective, this observation of a multitude of subtypes also raises the question of how these different subtypes are determined. Thus, we can further explore the developmental events that lead to their creation.

With the current set of tools available, we can begin to address some of the questions raised about neuronal subtypes in the nervous system. Just as the advancements in the late 19th century and 20th century provided an explosion of new information about the different types and functions of neurons, I believe there is still a wealth of uncharted territory to explore. This will provide exciting opportunities for both established and budding scientists alike.

**References**


