

The EC Review

Dan Manvich & Brittany Copp, Executive Committee Student Reps

Another academic year has flown by us, and your Executive Committee representatives are eager to report on all the latest Program news.

The recruitment process for the incoming class of 2007 was a phenomenal success! For the second consecutive year, our Neuroscience Program filled the *exact* number of available slots. In total, 16 new students will be joining us this fall semester. Very special thanks must go out to our Admissions Committee members – Beth Buffalo, Ping Chen, Andrew Escayg, Amy Lee, Thomas Wichmann, Pete Wenner – student representatives Meag Ward and Mike Kelley – co-chairs Leonard Howell and Shawn Hochman – and of course, the tireless Sonia Hayden. Great work everybody, let’s



Dan Manvich

keep this trend going!

Our new students will be arriving at Emory in the midst of two exciting curriculum additions, recently approved by the Curriculum Committee and Executive Committee. Richard Kahn (Biochemistry) will be spearheading a new grants-writing course, tentatively titled

“Hypothesis Design and Scientific Writing”, set to debut in the spring semester for the class of 2006. Dr. Kahn has had experience creating a similar course for the Biochemistry, Cell & Developmental Biology (BCDB) Program within the GDBBS. However, this new course will be offered exclusively to our Neuroscience students. Dr. Kahn summarizes the two major

goals of the course as follows: “to teach fundamental skills involved in the formulation of a testable hypothesis and research plan, and to develop the writing skills needed by all graduate students in the biomedical sciences that will allow them to effectively communicate those ideas.” Over the course of the semester students will write an NRSA-style grant, culminating in a faculty-run study section set to analyze each individual proposal. The course will replace the Advanced Seminar that students would normally take during their spring semester of 2nd year. In effect, Advanced Seminar will now only be



Brittany Copp

(Continued on page 6)

Fresh Faces

Give a warm welcome to the unprocessed, Grade A students arriving to our HOT campus. Welcome to the ATL!

Catie Capello	Animal Sciences	University of New Hampshire
Debra Cooper	Psychology	Duke University
David Ehrlich	Neuroscience	Brown University
Sara Freeman	Biology	University of Virginia
Lucy Guillory	Psychology	University of Georgia
Eileen Kessler	Psychology	Smith College
Damon Lamb	Computer Engineering	University of MD (M.S. University of Chicago)
Megan Lyle	Psychology	Davidson College
Christopher Makinson	Biology	Wake Forest
Lisa Matragrano	Biology & Marine Science	University of Miami
Jeanne McKeon	Neuroscience	Smith College
Rebecca Meyer	Biology	Creighton University
Elaine Pranski	Biology & Psychology	Washington College
Steven Ryan	Biomedical Engineering	Georgia Institute of Technology
Nikki Sawyer	Biology	Clayton State College
Rachel Stewart	Psychology	Georgia Institute of Technology

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Emory Calendar

- August 24-26: Neuro Retreat at Forrest Hills Mountain Resort
- October 30: ACSfN Poster Preview
- November 3-7: SfN hosted by San Diego
- December 12: Last day of Fall Semester classes

PI Personals: Dr. Shella Keilholz Waqas Majeed (GA Tech) & Alex Poplawsky (Emory), Intercollegiate Gatekeepers

Dr. Shella Keilholz obtained her Ph.D. in Medical Physics. She completed her post-doc at the NIH and is currently an assistant professor in the Biomedical Engineering Department at GA Tech / Emory University. Her research interests include imaging of brain function and connectivity, utilizing MRI as her primary tool. She has very recently become a Neuroscience faculty member at Emory University.



Dr. Shella Keilholz

Waqas: From your background, I can see that you arrived at the NIH with no prior experience with neuroscience, but left as an emerging expert.

How did your graduate research prepare you to enter the neurosciences?

Shella: Well, I was trained as a physicist, and in grad school my primary interest was in finding better ways to image perfusion of mobile organs like the lungs or the kidneys. One of my friends was constantly trying to convince me to do some work on the brain, but I thought the brain was just incredibly boring. It didn't move! At the time, I had a pretty naïve view of functional brain imaging. I thought that you just took images while the subject did a task or received a stimulus, and then looked to see what parts of the brain were active. It sounded more like a field for psychologists than for a physicist.

W: What brought you to the NIH?

S: The NIH had an 11.7 T MRI system, one of only two in the world at that time. For comparison, a typical clinical scanner is 1.5-3.0 T. I thought it would be fascinating to work on a state-of-the-art system. My postdoctoral advisor focused on functional brain imaging in small rodents, and I started off by helping to develop an improved sequence for fast, high-resolution imaging. From there, we developed an imaging protocol to map the activation over the whole rat brain during somatosensory stimulation.

W: Is that project what prompted you to begin your neuroscience research?

S: Absolutely. While I worked on that project, I finally began to realize how little we understood about the signals we were mapping and the way the brain works. I was fascinated by the idea that the brain was made up of multi-scale complex networks and astonished that we had no good way to get the data we needed to decipher them. It seemed like MRI might become a good tool for exploring the brain's network structure, and I've been working on that ever since.

W: Once you were sick of the nation's capitol and wanted to get a real job, what brought you to Atlanta?

S: I was invited to the joint Emory/GA Tech BME department for an interview, and the visit convinced me immediately that it was the place I'd like to be. The department had great vibes. Everyone seemed excited about the program and there was so much terrific research happening. The ties between Tech and Emory provide a lot of momentum for combining medicine, biology, and engineering. The other important issue for me in the job hunt was that I wanted to go somewhere that my fiancé (now my husband) would be able to find a job. For our first two years here, he was a post-doc in plasma physics at Auburn University, and he recently started a new job at the Georgia Tech Research Institute. We're both really excited to be working in the same city for a change.

W: Should we expect little Ramblin' Wrecks anytime soon?

S: Maybe someday. Training students is enough responsibility for now!

W: I agree. You are in an interesting position, straddled between Emory and GA Tech. As a faculty member, how has the relationship between these universities contributed to your research?

S: It's interesting that you use the word straddled, because that usually makes me think of an uncomfortable position—and sometimes it's uncomfortable to be caught between the two institutions, to be sure! On the whole, though, it's a great opportunity to act as a bridge between the engineers at Tech and the biologists and clinicians at Emory. One of the things my lab is interested in is how functional networks in the brain change because of learning, and we've found terrific collaborators at Emory. Dr. Mike Davis and Dr. Kerry Ressler are experts in fear conditioning and have been enormously helpful to us, both in interpreting our results and helping us evaluate the usefulness of MRI techniques for observing these changes. We've been testing a technique called manganese-enhanced MRI, which uses manganese to provide activity-dependent contrast in neural tracts in standard MR images.

W: You definitely sold manganese contrast to two very prominent neuroscientists here at Emory! How is this tool attractive to neuroscience research?

S: It's a great tool because it provides a potentially noninvasive method for detecting altered brain activity. Manganese is a calcium analogue and is taken up preferentially by activated neurons through voltage-gated calcium channels. It's transported via microtubules to the synapse, released with the neurotransmitters, and can then be taken up by the next neuron. So it can trace active neural tracts. We are still analyzing the final data from the fear conditioning study, but a preliminary study showed that when mice were given manganese and exposed to a strong odor, there was less uptake and



Waqas Majeed

(Continued on page 6)

Philosopher's Corner: My Brain, A Colony of Ants

Meera Modi, Pursuer of Wisdom

Ants can accomplish a number of incredible events. They can build structures several million times their own size, they can conquer and enslave competing ant colonies and even bridge cavernous spaces, making chains of their own bodies. But can we really compare the HUMAN BRAIN to a colony of animals with an *exoskeleton* (never mind their lack of opposable thumbs)? Can "swarm intelligence" rival our own intelligence?



Meera Modi

The remarkable nature of "swarm intelligence" is the fact that it is accomplished in the absence of any centralized leadership (the queen ant is merely an egg layer, not an authority figure) and each individual can only interact with a few nearby neighbors. Individuals have no way of assessing over all characteristics of the group, like size, goals or health. Instead the complex behaviors of the colony emerge from simple behavior of each individual.

Foraging behavior in harvester ants, for example, is a precisely timed and directed event, the properties of which are determined by simple rules of interactions between ants. Foraging is initiated in response to the rate at which patroller ants return to the colony. Once foraging ants observe the correct rate of return they leave the nest following the scent trail of a returning patroller. The number of ants foraging is determined by how quickly ants return with seeds. Thus in a decentralized fashion the ants are able to ascertain that the external environment is safe for entry (based on the number of patrollers successfully able to leave and come back), the safest parts



A new queen is born! In a complex behavior, the young queen is relocated to her new hive under the guard of her colony. Pictured above, the queen lies below the surface of drones as scouts survey the land for a suitable location. At all times the colony moves as a single entity with the queen nestled in the center.

of the environment (by following the trails of successful returners) and adjust the resources devoted to foraging based on food availability (based on how quickly food is found).

So what does this have to do with us? We are too smart to have to use "swarm intelligence to accomplish complex goals. Instead we have LEADERSHIP (I mean surely G.W. is smarter than a swarm of ants)! Now lets imagine that a colony of humans had to accomplish the task of foraging for food for the colony.

First, the big boss says "We need food!". Then after several years of federally funded research the academics decide that outside the nest is the best place to look for food. So the big boss sets up extensive panels to venture outside the nest to test whether this "theory" is actually real. Only after it has been exhaustively scrutinized by a group of the big boss' friends (who don't really understand foraging, anyway) can plans be drawn to start foraging. And then.... You get the picture, humans love hierarchy and most regulation of human group behavior is achieved through chains of authority.

Ant colonies (as well as many other group oriented organisms) use emergent behaviors (those that arise out of the multiplicity of simpler units) to construct complex behaviors as

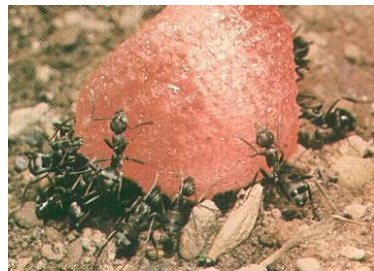
opposed to the hierarchical system favored by human groups.

So how does our brain accomplish complex behaviors from its colony of neurons?

To our knowledge there is no little brain (cerebellum aside)

within our brain telling which nuclei to active when and where each axon should terminate. Instead we have billions of individual neurons that each only communicate with a relatively small subset of other neurons. Yet the brain is able to achieve coordinated thoughts like eating an apple.

To eat an apple or to even conceive of eating an apple, many disparate populations of neurons must somehow function together to produce a coherent thought. Different populations of neurons will follow their own specific sets of simple rules, just as ants will follow job dependent rules. Activation of P type retinal ganglion cells by the excitation of cones encodes the red color of the apple, while the sweet sensation of the apple touching our tongues is mediated by binding of simple sugars to GPCRs in taste cells, and the unique odor mediated by the odor-



A group of ants organize to lift an apple piece back to the colony

ant binding to a distinct pattern of olfactory receptors. Each of these neurons follow simple rules of firing and connectivity that when viewed in multitude, yield the emergent property of 'apple thoughts'.

Some argue that the experience emerges from the milieu of electrical and chemical signals encoding 'apple' that is greater than the combined sum of the multitude of physical reactions; that the emergent pattern is our **conscious** perception of 'apple', which makes us more than a complex chemistry experiment. Others will assert that we are little more than just that, just as ant foraging behavior is little more than an algorithm of ant behavior.

Do our brains use 'swarm intelligence' to make us, uniquely us?

Something to ponder next time you see a line of ants raiding the cupboard. ▲

A Survival Guide to Thesis Writing

Dr. Seth Jones

How do you write a thesis? Easy, get a laptop and vast quantities of coffee. Actually, you're probably closer than you think to finishing your dissertation, even if you haven't started.

Writing your thesis begins in the lab. Taking detailed lab notes (my own note-taking was spotty) will help. Likewise, keeping a log on papers you have read and ideas for future experiment will serve you well in the background and future directions chapters.

If you've already written your thesis proposal or NRSA, you have a start on your background. Papers you have published or are preparing for publication can form the backbone of your chapters. Just remember that much of what you wrote two years ago is probably already outdated,

so use your previous writing as a first draft for your dissertation, not the final copy.

When you sit down to write, it's easy to get distracted. To avoid this, set both a daily and long-term schedule. For my daily schedule, I would first read a few papers or flip through a folder of previously-read papers. Then, I would free-write for one hour without regard to correctness. If I could not remember a reference or detail of paper, I would not stop to look up anything on PubMed; instead I would use parentheses within my paper to write down search terms for later. If I wrote a conclusion that I was unsure of, I would insert question marks rather than stopping to re-analyze my data.

This way, I would then have a list

of keywords to search, data to check, and papers to print. I would spend the rest of the afternoon revising. The remainder of the day would be spent organizing my next day's work by obtaining any new papers and going over data. Finally, I would make sure to back up my work on the university servers.

Your long-term calendar should have as many specific dates as possible for minor goals. You should agree with your friends and labmates on deadlines to turn in each chapter to them for review. Don't worry if your preliminary reviewers are not experts in your field – their purpose is to keep you on task and make sure the first draft is grammatically correct and logical. Save your more technically proficient reviewers for later drafts.

Writing a dissertation is a long and sometimes frustrating process that can take a long time. But with some planning and forethought, you can make it as painless as possible. ▲



Dr. Seth Jones and his advisor, Dr. Kerry Ressler

Science Outreach: A Matter of Job Security

Stefanie Ritter

Often times, when someone asks me the all-encompassing "what do you do?" question, I casually respond that I am pursuing my Ph. D. in neuroscience. Nine times out of ten my answer is followed by a short "Oh" and then a change in conversation, while the remaining 10 percent usually counter by asking if I perform brain surgery like Dr. McDreamy from *Grey's Anatomy*. Honestly, it is slightly disconcerting to think that much of the general public views science, at least neuroscience that is, in this off-hand fashion—I will not address the issue of the difference between an M. D. and Ph. D. As scientists, should we be concerned with this situation?

Raising science awareness in the community is in some ways a matter of job security. Not only do we want to encourage young minds to pursue science, but we also need to cultivate an understanding and respect for science in those folks who will be reviewing our future grants or voting as our future politicians. Increasing science awareness in our schools is a logical starting point.

Brain Awareness Week is an outstanding platform to enhance scientific awareness; however, March does not have to be the only time of year when we reach out to the community. Recently, Erin Hecht, Amy Anderson, and I decided to jumpstart an after school science program at Atherton Elementary, a school we had visited during BAW. Complete with volcano demonstrations, cell pizzas, and of course a rat maze; we plan to do hands on activities with the students throughout the 2007-2008 school year. It is important for young people to interact with scientists, replacing the stereotype of a person in a lab coat with the schema of someone who is relatable and possibly a grown-up version of them.

Organizing a science club is not the only way to be involved, however; many schools have a career day where you can give a short presentation on what you do

as a scientist. Simply contact a school in your area and ask for more information about a career day. Especially if you have kids, this is an awesome way to connect with your children and their peers at school. Not to mention, it is incredible to interact with the students and also personally rewarding. Without fail, I am always amazed at the kids' profound questions and sincere curiosity.



Stefanie (center) on how not to look through a microscope

As important as it is to intervene in a young person's life, some people might prefer to interact with the older community. Emory has a number of forums which are open to the public and act as an informal question/answer session. Depending upon your area of expertise, you may be able to contribute or even organize a forum in your field.

As scientists, we have a vested interest in how the public perceives science. Reaching out both raises awareness and increases respect for science. It is also incredibly rewarding. ▲

Food for Thought: Tofu, No Animal is Safe from Imitation

Alex Poplawsky, Editor

Tofu can take on any form, fit or flavor. From soy burgers, sausage and jerky to scrambled eggs, smoothies and cheese, it is becoming apparent that any culinary desire is just an extrusion away. The consumption of such soy-derived products is increasing for Americans, possibly due to recent reports on the health benefits of this alternative diet. But how does this dietary change impact the brain? With the knowledge of phytoestrogens in soy products, a heated debate has sparked concerns regarding the risk/benefit balance of tofu to health. To fully understand the controversies surrounding tofu, we must go back to the beginning...

Although the time or method of tofu discovery is largely unknown, it is believed to have arrived two millennia ago on the China scene. The most popular story attributes King Liu An (179-122 BC) to the birth of tofu. However, modern historians believe Liu An's involvement to be simply honorary, since achievements were often given to ancient figures during the period when the Chinese word for tofu (dofu) first appeared in 950 AD. Other theories place tofu as an adaptation of the cheese making technology that migrated from either India or Mongolia, which were both dairy consuming cultures, unlike China, at the time. The Mongolian word for cultured milk products (rufu) serves as etymological evidence of this migration. The Chinese characters to signify these Mongolian sounds represent "milk" (ru-) and "spoiled" (-fu), while later substituting "soy" (dou-) to represent "spoiled soy". Finally, there is the "accidental coagulation theory", which considers that early consumers of a soy porridge may have used nigari, a magnesium chloride by-product of refining sea salt, to flavor their meal. Nigari is still a popular denaturant used today to separate soy milk into curds and whey. By 1182, tofu arrived in Ja-

pan by way of Buddhist monks, whose vegetarian diets utilized tofu as their major source of protein. Only by the Japanese did it become known as tofu.

Beyond the origins of tofu, soy products are increasing their grip on the beef eaters of Western culture. The call for diets lower in saturated fats or views on meat independent meals have attracted the attention of heart watchers and hippies alike to focus their feastings around alternative protein sources such as tofu. There is even evidence to support that the phytoestrogens found in soy products could inhibit a class of kinases that are implicated in the proliferation of tumor cells. Under this label, phytoestrogen supplements are claiming to have protective properties against prostate and breast cancers. Although these views are beneficial

toward the periphery, in a neurocentric world, there is still heavy debate concerning its effects on the brain.

Phytoestrogens belong to a class of isoflavones that are found in soy products and are chemically related to estrogen. In fact, soy phytoestrogens bind to the estrogen receptor (ER) and predominantly disrupt this endocrine. Also, phytoestrogens have a greater binding affinity for the ER β compared to the ER α subtype. To make things even more complicated, these individual ER subtypes are dominant in different brain regions, and vary between the sexes and the phase of organism development. This means that phytoestrogens will have a different effect on the brain depending on the sex, how much, how long, and how old the subject is when soy is consumed. No wonder there is such debate among scientists!

Considering these complexities, a number of studies have explored phytoes-

trogen and the adult brain. One study administered a commercial phytoestrogen supplement to female rats and observed a decline in their sexual behavior. Adult male rats fed a routine diet that contained phytoestrogens displayed behaviors of increased anxiety and contained higher levels of stress hormones, like corticosterone, in their blood. Finally, it is traditionally observed that male rats regularly outperform females in visual spatial tasks. However, when fed a phytoestrogen rich diet, this dimorphism is reversed whereby the females regularly outperform the males and never ask for directions.

In addition to examining adult animals, there is an increasing interest in the effects of phytoestrogen exposure during the neonatal and early postnatal periods of human life when a grand orchestration of endocrines is performed to ensure proper brain maturation. Unfortunately, to this day, there is not a single widely accepted study of these time periods. What is known, however, is that phytoestrogens do infiltrate the placental barrier and are found in similar concentrations in the fetal

brain as in the mother's. Also, with 25% of total baby formula sales belonging to soy formula, a typical daily consumption of phytoestrogens for an infant is about 4 to 7-fold higher than the FDA recommendation for adults.

This translates to a phytoestrogen blood concentration that is >10,000-fold above that of endogenous estrogen, which is comparable to doses found in animal studies! Whether this will have adverse effect on young humans is still under investigation.

Originating in ancient China, tofu has an upbringing that is cloaked by many questions. Even thousands of years later, few answers are left credible by the growing mystery of health and soy foods. The enigmas continue to mount with the uncertainty of what I had for dinner last night. Was that edamame flavored tofu? ▲



"Under this label, phytoestrogen supplements are claiming to have protective properties against prostate and breast cancers"



Spoiled Soy

The EC Review (cont'd)

(Continued from page 1)

offered during the fall semester of the 2nd year, during which time students will learn to critically evaluate peer-reviewed scientific research.

After a successful pilot program in the fall of 2006, "Techniques in Experimental Neuroscience" will officially be offered to 1st year students during their fall semester as NS559, beginning with the incoming class of 2007. Students will meet once per week to gain exposure to a variety of methods employed by researchers in neuroscience, such as brain imaging, animal/behavioral models, computational neuroscience, electrophysiology, etc. Each class will be divided into two components: a brief 30-minute lecture to showcase what types of data can be gathered and when it is appropriate/useful to utilize the technique, followed by a 60-90 minute "lab" section in which students

can see the method in action (and in some cases, gain hands-on experience!). The course will be co-directed by Vallabh Das and Yoland Smith.

Some other important changes worthy of mention:

The Executive Committee recently approved a motion that will affect our advanced students. In the past, students in their 5th year or higher were required to meet with their thesis committees at least once per calendar year. However, these students will now be required to meet with their committees once every 6 months.

As some may recall, our Program was excited to report recently that our number of training grant slots had been increased from six, to nine total. However, NIH has contacted our Program Director, Yoland Smith, and informed him that no programs will be receiving the promised increased slot allocations due to unexpected budget-

ing woes. Fortunately, we will be retaining our original six slots, despite many other programs losing slots for their training grant programs.

Finally, we would like to thank our outgoing Executive Committee members for their hard work and dedication – Mike Kuhar, Amy Lee, and student representative Todd Ahern. In addition, we welcome our newly-elected members – Gary Bassell, Beth Buffalo, Steve Potter, and Brittany Copp (student representative), and re-elected members Dieter Jaeger and Kerry Ressler. Here's to another year of furthering our Neuroscience Program and community!

If you have any questions, comments, or concerns, please contact your Executive Committee student representatives, Dan Manvich (dmanvic@emory.edu) and Brittany Copp (brittany.copp@gmail.com). ▲

PI Personals: Dr. Shella Keilholz (cont'd)

(Continued from page 2)

transport of the manganese throughout the bulb and olfactory tract than in mice that were simply returned to their home cage. These results are promising for future studies that will focus on subtle changes in activity caused by learning.

W: Do you think this technique will ever have a potential for human studies?

S: I wouldn't rule it out, but it won't happen any time soon. Manganese is a known neurotoxin and too much exposure can cause symptoms similar to Parkinson's disease. However, the amounts needed for tract-tracing are small and many animal studies have reported no obvious ill effects after manganese administration. Anyway, even if we can never reduce the exposure to levels where we're comfortable administering manganese to humans, there will still be much to learn from animal models.

W: Besides manganese contrast, what other projects are you working on that you would like to mention?

S: Another technique that we're using to study networks within the brain is called

functional connectivity MRI. Basically, MRI can be sensitive to hemodynamic parameters such as blood oxygenation that change whenever the brain is active. The idea behind MRI functional connectivity studies is that if you look at the 'noise' in the MRI data acquired while the subject is just relaxed, doing nothing, you can find correlations in areas that are known to be strongly connected, like bilateral motor cortex. It's widely assumed that this correlation is caused by some kind of coordinated neural activity, but the actual relationship between the neural activity and the correlated MRI signals hasn't been explored, probably because most of the work on functional connectivity was done in humans. We are developing a rat model of functional connectivity so that we can combine electrophysiology and MRI to explore the relationship between the two.

W: Do you foresee functional connectivity being a useful tool for the neurosciences?

S: There are already some indications that functional connectivity changes in patients with neurological disorders like Alzheimer's disease or multiple sclerosis. I

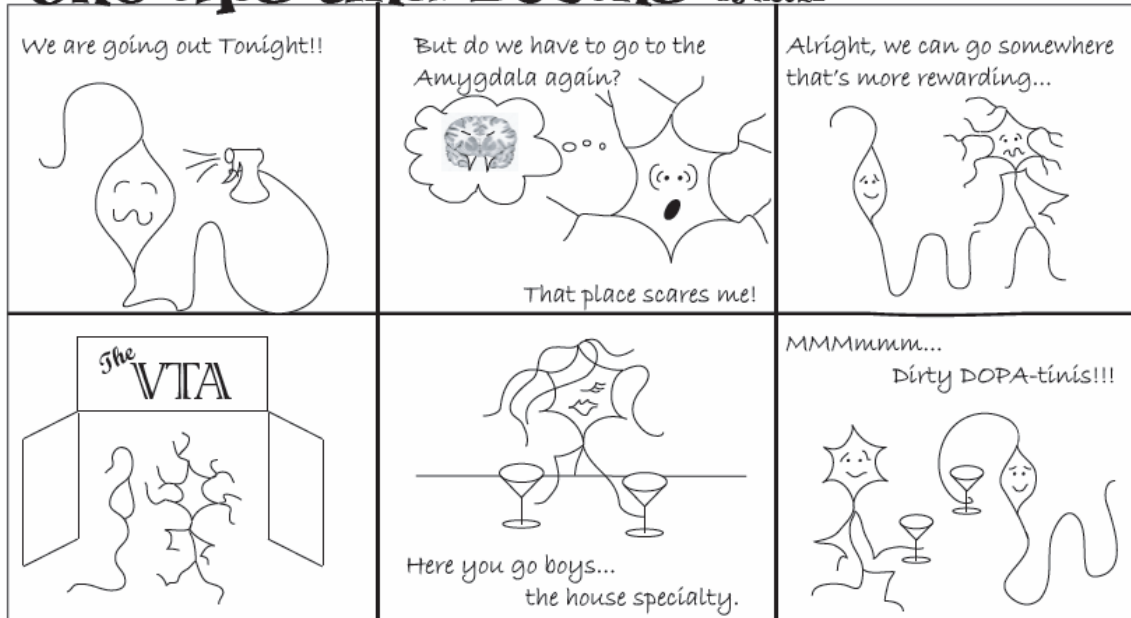
think the question is really whether these changes tell us anything about the actual neural activity. One of the problems with MRI measures of functional connectivity is that they can easily be contaminated by other physiological processes like respiration or the cardiac cycle. Again, these are some of the questions we hope to answer with an animal model.

W: For your final words, if you could name one thing that you would change in your graduate experience and one thing you wouldn't change, what would they be?

S: Probably the best thing I did in graduate school was to arrive early and start research the summer before classes began. Coming early let me get started in a lab before the stress of classes set in, and since I got to work in the lab full time for the summer, I had a good grasp of the basics and was able to make much more progress during the first year than I would have otherwise. As for things I would change, I'd take an electronics class to improve my circuit-building. And maybe I'd learn something about the brain! ▲

The Printables...

The Ups and Downs by K802L

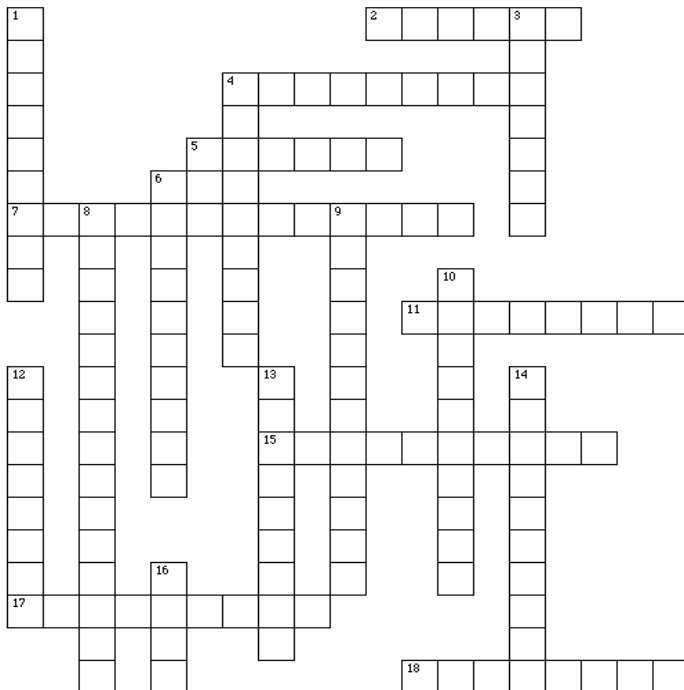


ACROSS

- 2 Watch carefully when crossing here in Greece.
- 4 Only sense that does not relay to the thalamus.
- 5 A woven com-plex.
- 7 The big cauldron where the brain's magma can be found.
- 11 A king of the jungle's posse.
- 15 The supernovas of the brain.
- 17 Floor of the tectum.
- 18 Pale region of the basal ganglia.

DOWN

- 1 A turd one of these.
- 3 Venous drainage sewer stores.
- 4 Stretched center of hindbrain that controls vitals.
- 6 Communist stronghold in the midbrain.
- 8 Black humor (can be found here).
- 9 Rural brain region without BBB.
- 10 A bundle of Ethernet cables that carries info fast.
- 12 Architectural structure prototyped by the ancient Romans.
- 13 Deep within the insular cortex.
- 14 The memory of a bug's nose is stored in this cortex.
- 16 Knee of corpus callosum.



Sudoku

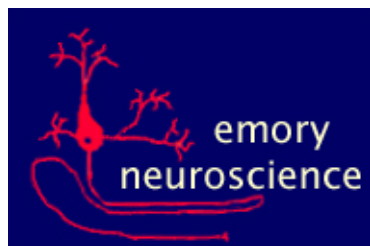
Rules:

- 1. Insert a number (1-9) into every square
- 2. Each ROW must contain every number 1-9
- 3. Each COLUMN must contain every number 1-9
- 4. Each 3 X 3 group of squares (highlighted with bold lines) must contain every number 1-9

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8				5			7
	1		3				6
9	6		7				
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				4		1	5
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5				6		9	3

Graduate Division of
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Co-Editors: Alex Poplawsky &
Amy Mahan
Crossword: Vasiliki Michopoulos
Sudoku: Meriem Gaval
Extracurriculars: Amy Mahan



...never lacks brains.

Results of the GIN Election

GIN Co-Presidents:	Jacob Shreckengost & Kate O'Toole
GIN Secretary:	Michael Jutras
GIN Treasurer:	Amy Anderson
Webmasters:	Vasiliki Michopoulos & Santiago Archila
Web Proofer:	Erin Hecht
Frontiers Coordinators:	Stefanie Ritter & Amanda Caster
Admissions Committee:	Michael Kelly & Rebecca Seaman
Executive Committee:	Daniel Manvich & Brittany Copp
Curriculum Committee:	Meera Modi, Sharon Swanger, & Stefanie Ritter
GSC Representatives:	Daniel Manvich, Kalynda Gonzales, Alex Poplawsky
DSAC Representative:	Zoe Donaldson
ACSFN Representatives:	Kim Maguschak & Rebecca Rosen
Newsletter:	Alex Poplawsky & Amy Mahan

A Call for Presenters!

Graduates in Neuroscience (GIN) in cooperation with the Neuroscience Program will be sponsoring a new seminar series for our advanced students. This is an opportunity to maintain ties within our Neuroscience family as students become immersed in their individual labs and projects as well as a forum for practicing presentation skills and thesis defense. Students, be prepared to participate and support your fellow graduate students. All fourth years and above, contact us now to schedule your preferred time slot.

See you this Fall!!
Jacob and Kate
GIN Co-Presidents

Extracurriculars

August

8/22	7:10 pm	Atlanta Braves v Cincinnati
8/25	2pm-8pm	German Bierfest (Atlantic Station)
8/31-9/2		Montreax Jazz Festival (Underground Atlanta)

September

9/1-9/2	12:00 pm	Drive-Invasion (Starlight Six Drive In)
9/13-11/4		Octoberfest (Helen, GA)

October

10/6	2pm-8pm	Creative Loafing 3 rd Annual Field Day (Piedmont Park)
10/12-14		The Echo Project Music Festival (www.the-echoproject.com)
10/20	1pm-6pm	Decatur Beer Tasting Festival (Decatur Square)

November

11/3	1pm-4pm	Decatur Wine Tasting Festival (Decatur)
11/17		Three Days Grace in Concert (Tabernacle)

The Emory Neuroscience Graduate Program leads to the Ph.D. degree and is designed to provide a broad background in modern neuroscience, as well as specialized training in a wide range of specific research areas and techniques. The particular areas of strength in our program are further described on our website. The broad range of research interests coupled with a collaborative atmosphere make the Emory Neuroscience Program well suited to provide a strong, dynamic and exciting environment in which to pursue graduate studies.

For more information please check out:

www.emory.edu/NEUROSCIENCE

or

Contact Sonia Hayden at shayden@emory.edu or (404) 727-3707.

For comments on this newsletter please contact Alex Poplawsky at apoplaw@emory.edu.