Synapse

Fall 2015—Spring 2016 Edition

Featuring:

- Letter from the President
- Event Reflections
- Communicating the Feeling of What Happened by Natalie Pilgeram
- The Complexities of Schizophrenia by Joe DiTrapani
- The Effects of Experience in Visual Cortices of Blind Children by Parker Tirrell
- Chicago Society for Neuroscience Reflection by Sierra Lear
- Addiction by Hanan Rimawi
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Tulane University Neuroscience Association

Editor: Parker Tirrell
Cover photo:
Colored magnetic resonance imaging (MRI) scan; sagittal view of a normal human brain. Credit: Sovereign, ISM
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**TULANE UNIVERSITY**
**NEUROSCIENCE ASSOCIATION**
TULANE UNIVERSITY NEUROSCIENCE
ASSOCIATION EXECUTIVE BOARD, 2015-2016

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From left to right-
Front: John Wolf, Natasha Topolski, Tessa Lavorgna
Back: Caitlin Prince, Parker Tirrell, Megan Haney,
Gali Du

From left to right-
Joe DiTrapani, AJ Ostrowe
Dear TUNA,

Whether you know me as the president who sends obnoxious (or what I would call "vibrant" or "vivacious") emails with tons of large bold print, bright colors and an occasional cheesy neuroscience joke or you know me personally, you probably know that I love neuroscience and I love TUNA. This organization has been a defining aspect of my time at Tulane and I cannot and do not want to imagine my experience here without it.

I have dedicated hundreds of hours to working toward expanding TUNA programming to create meaningful events for members and the New Orleans Community. I was determined to create an environment where people are comfortable sharing and creating ideas. I established more regular meetings and events designed to engage students through activities, games and student presentations as well as discussions with members of the neuroscience community and career development programs. Moreover, I worked against the odds to establish impactful programs to enhance the community including the first Louisiana Brain Bee Competition, Lambeth House Memory Care Volunteering Program and the Celebrate Mental Health Festival.

My experience at Tulane has been a journey second to none. I have been faced with challenges from the simplest to most complicated of practically all of my endeavors leading me to at times question why I do what I do. Nevertheless, witnessing the growth, excitement and passion from students and the community is what ignites the passion within myself. My experiences with TUNA have pushed me to grow as a leader and a person and are something that I will carry with me for the rest of my life. I am so grateful to everyone who has played a part in this organization.

So, to conclude, I would like to say thank you. Thank you to the members who attended our events, volunteered, and contributed ideas. Thank you to all the members who took on leadership roles of increasing responsibility. Thank you to the community partners, the faculty and visiting professionals. And finally, a very special thanks to our advisor, Dr. Wee, and all the executive boards I have had the privilege to work with. You all have played a role in making TUNA what it is today.

I am humbled to have been a part of the growth and success of this organization. TUNA is undoubtedly a leader on Tulane’s campus, yet, it still has so much potential to develop and expand, especially as the neuroscience program develops. It is with a heavy heart to say goodbye to an organization that means so much to me but I am confident that TUNA is in good hands and am excited to see how TUNA will evolve in the years to come.

And finally, here is my final neuroscience joke. I’ve been saving this one for a long time now.

*What did the hippocampus say during its retirement speech?*

*“Thanks for the memories.”*

Synaptically yours,

Natasha Topolski
President, Tulane University Neuroscience Association
B.S. Candidate in Neuroscience
Tulane University, 2016
YEAR IN REVIEW

This year has been, in a word, eventful. TUNA has had the pleasure and good fortune to host many on and off campus events that would not have been possible without the unwavering support of the neuroscience faculty and staff, as well as the general body and executive board of TUNA. Listed below are various activities, professional talks, and campus-wide events that TUNA has hosted this year. Many thanks to those who participated and showed their support!

**Presentations:**
- Brain Computer Interface *by John Wolf*
- Time Perception *by Parker Tirrell*
- Consciousness *by Natalie Pilgeram*
- Hallucinations *by Parker Tirrell and John Wolf*

**Socials:**
- Pizza on the Patio
- Breakfast with Beth Wee
- Dat Dog Trivia Night
- Student-Faculty Winter Dinner
- Final Finals Dinner and Jeopardy

**Guest Speakers:**
- Michele Sinoway Ph.D, *Alternative Careers in Neuroscience*
- Zachary Rowe, *Medicine and Science Careers*
- Edward Golob Ph.D, *Sound Localization and EEG*
- Evan Kyzar, *Why M.D—Ph.D?*
- Heather True-Krob Ph.D, *Turn Your Passion for Science into your Profession*
- Francis X. Shen J.D Ph.D, *New Orleans, Neuroscience, and the Law*

**Brain Week Panelists:**
- Laura Harrison Ph.D, *Neuroscience Professor*
- Aimee Aysenne M.D, *Neurologist*
- Peter Amenta M.D, *Neurosurgeon*
- Rebecca Voglewede, *Graduate Student*
- Theodore Jones, *Medical Student*

**Grants and Awards:**
- Dean’s Grant, *Brain Bee*
- Felson Fund, *Youth Outreach*
- Resiliency Grant, *Mental Health*
- Crest Emerging Leader, *Megan Haney*
- Jim Runsdorf Award, *Natasha Topolski*

**Mental Health Outreach:**
- Lambeth House Memory Care Center
- Alzheimer’s Walk
- National Alliance on Mental Illness Walk
- Celebrate Mental Health Festival
- InspireTulane: A Handwritten Notes Campaign

**Youth Outreach:**
- CACTUS Halloween Day
- CACTUS Field Day
- Girls in STEM Fall and Spring
- Louisiana Brain Bee
- Brain Day at the Children’s Museum
2015-16 PHOTO GALLERY
Girls in STEM is an event which brings 5th-8th grade girls to Tulane to engage in fun workshops in the fields of science, technology, engineering, and mathematics. The girls start their morning exploring different welcoming tables presented by on-campus science-related organizations. They then are addressed by Tulane professors and proceed to work their way to various workshops. In previous years, the neuroscience workshop “Using Your Brain” has been executed and lead by Tulane staff and faculty; this year, however, TUNA had the privilege of running the workshop and introducing some new activities. The girls rotated between three stations, getting the chance to explore their five senses and these mechanisms in the brain, learning about sensory adaptation and motor learning, and of course, looking at and touching real brains! Thanks to the tremendous effort and help of TUNA volunteers, neuroscience staff, and Tulane grad students, the workshop ran smoothly and the girls seemed to highly enjoy their experience. In the following weeks, some of the girls sent gracious letters commenting on their positive experience at GiST, some interesting things they learned in the workshops, and how they can’t wait to return again. Stay tuned for info on GiST next semester and thank you again to everyone who helped contribute to this experience.

-Megan Haney
The Brain Bee is a neuroscience Q&A competition aimed at secondary school students. With competitions present in over 30 countries, it is the world’s largest neuroscience competition aimed at high school students. Nonetheless, until this year, there had never been a Brain Bee held in Louisiana. On March 12th, as part of an initiative to increase neuroscience and STEM outreach among older students, TUNA hosted the first-ever Brain Bee in the state.

High school students within New Orleans came to Tulane starting around 9:30 AM to attend a faculty/student discussion, hosted by Dr. Jeffrey Tasker, where students had the opportunity to learn more about neuroscience research and Tulane University. Afterwards, TUNA volunteers led students through a workshop where participants got to touch real brains and play with optical illusions. Finally, the day was ended with the actual Brain Bee Q&A. High school students were quizzed on a variety of topics, ranging from disease to neuroanatomy. Although the competition was fierce, Riley Marsh was eventually announced the winner of Louisiana’s first Brain Bee, and attended the National Brain Bee at the University of Maryland!

-Sierra Lear
During the 2014—2015 academic year, seven Tulane students died.

Four of these students took their own lives.

This marked a public turning point in Tulane’s mental health epidemic. Suicide and mental illness are rampant across universities worldwide. In any one year, 6% of undergraduates and 4% of graduate students seriously considered attempting suicide and around 1,100 of them succeed. That is approximately 7.5 students per 100,000. Tulane has less than 14,000 students.

However, suicide is an extreme attempt to escape a far too common battle with mental health. If there is one thing I learned at Tulane, it is that mental health is a spectrum. Everyone has their own challenges to face, whether it is diagnosable condition requiring medication or mild anxiety, depression, or general insecurities, no one is completely free. Yet, the vast majority of people feel alone, ashamed and helpless.

Although there are resources and support available at Tulane, many students do not seek these out due to lack of knowledge of the programs, fear of stigmatization, or simply a sense of self-pride. Nevertheless, even those who seek out support often face difficult challenges and roadblocks.

As the Tulane University Neuroscience Association, we decided that it was important to take a stand against mental illness and implemented a Mental Health Executive Board Position. This position was designed to oversee TUNA Mental Health Outreach on campus and in the community.

The position was extremely well received and we ended up interviewing 13 students for the position during one long Saturday morning in early September. However, a sophomore named Gali Du blew us away. She walked in with a notebook full of facts, research and ideas. She shared her vision of “something big”, “an event to unite people”, “an event with art, music and hope”, an event “to destigmatize mental illness” and “to celebrate mental health”.

And thus, the first seed was planted and the First Annual Celebrate Mental Health Arts and Music Festival was created.

- Natasha Topolski

Reference:
As President of NAMI on Campus, it was my mission to create programming that would destigmatize mental illness and promote mental health. One of the biggest problems in creating these programs is that they are often depressing in nature, rooted in sympathy and pragmatism. It is difficult to convince students to attend a program that everyone knows will overall be a “downer”. It was essential then to create programming that would be fun, empowering, and inclusive. First off, it would have to be programing that students genuinely would want to attend and enjoy, and then we could create an environment that fostered honest and valuable discussion of mental health.

When Gali Du and I first spoke, we expanded an idea that I had for a Mental Health Art Gallery and Open Mic to an entire festival with workshops, student organization and Greek Life activities, student musical and dance performances, an art gallery and of course food. We were shooting for the stars, hoping to create an event as large and universally adored as Crawfest. We decided to host the festival in Pocket Park and the adjacent space of the business school courtyard and McAllister drive to utilize the architecture, while running workshops in the conference rooms of the LBC. It turned out to be a great decision. Pocket Park held the sound from the music beautifully, and the trees of the business school courtyard and pocket park provided shade during the warm April day.

There were many highlights from the festival but I would like to name a few. Dean MacLaren was brave enough to get on the dunk tank run by the Swim for Success club that was raising money to teach children how to swim. Alfred Banks, an extremely talented local musician, performed his music and spoke about his personal experience with mental illness, from which his eldest brother suffered tragically. Banks said on stage that even though he has been touring internationally, and that he is opening for Snoop Dogg soon, this performance has meant the most to him because it is dedicated to improving the way we talk about and manage mental illness. Over a dozen organizations were running activities designed to promote mental health, by making stress balls, potting plants, or writing statements of pride regarding the mind and body. A big goal of the festival was to create an environment where students could connect over similar interests and get involved more in their community, while also appreciating the diversity of our campus and this was certainly accomplished.

The day of the festival was beautiful and sweet jasmine filled the air while students played wonderful music and danced and hundreds of students came to enjoy the event. I have never worked so hard on anything in my life, and I could not be more proud of what we were able to create. I truly believe that the Celebrate Mental Health Festival deserves to be an honored Tulane tradition, and I know that as I graduate, I leave the festival and NAMI on campus in the sure hand of the next generation of students. I can’t wait to see how the festival will grow in the years to come.

-Jesse Benzell
As an initiative to engage the student body, members of TUNA have given presentations that cover a number of various neuroscience topics. Natalie Pilgeram discussed consciousness, Parker Tirrell had us consider our perception of time, and John Wolf gave a topical presentation on the future of brain-computer technology.

**Feature Presentation—BCI**

First researched in the 1970s, brain-computer interface (BCI) has quickly become one of the most intriguing fields to emerge from neuroscience. BCI advancements have the potential to offer substantial benefits for a wide range of impairments. As the name implies, BCI is defined by communication between a subject’s brain and an external device. BCI systems may be either invasive (directly connected to the brain), or non-invasive (devices that measure brain waves via electrodes).

Using this futuristic technology, researchers have managed to accomplish a wide range of seemingly impossible feats, ranging from monitoring the visual perceptions of an animal, to enabling paraplegics to control neuroprosthetic devices and exoskeletons, to even providing a means of direct human brain-to-brain communication. With the rapid pace of advancement we have seen in the past few decades, it is safe to say that the future will see many more incredible achievements in this invaluable field.

- John Wolf

**Presentation Photo Gallery:**

John Wolf—Brain-Computer Interface  
Parker Tirrell and John Wolf—Hallucinations  
Natalie Pilgeram—Consciousness
DAT DOG TRIVIA NIGHT

Thank you to everyone who came and participated in the Dat Dog Neuroscience Trivia Night! With trivia questions ranging from colleges, 2k pop culture, American History, and sports, the five teams had three rounds to demonstrate their overall trivia knowledge. A few neuroscience questions added an extra level of difficulty to the competition; those familiar with neurotransmitters and neurological diseases were able to secure these extra points. The night was filled with good people, good food, and good conversation; a big thank you to Dat Dog Management and the people who came and enjoyed!

-Tessa Lavorgna

A COLLECTION OF NEUROSCIENCE HAIKUS

BY BRENNAN FLOOD

Oh brain, you are cool,
I love having you in me,
My big pink balloon.

Hello my old friend,
You’ve always been there for me,
I love my big brain.

Brain brain, oh brain brain,
Brain oh brain brain, brain oh brain,
Oh brain, oh oh oh.
I've found myself reflecting on what humans use language for, how its use affects consciousness, and the adaptive advantages and disadvantages of being not just conscious organisms, but deeply linguistic conscious organisms. I am reminded of an interesting display from the Aarhus Art Museum – Maurizio Nannucci’s “My Sense of Your Sense of Language.” The exhibit consisted merely of bright white neon letters spelling out the name of the piece. I wondered whether Nannucci was making a point about the starkness and phenomenal emptiness, the flashy artificiality, of words. Linguistic communication is in some ways like a spiritual text that is twice translated, and very imprecisely at that. We consciously examine our own inner brain states, translate them into verbal snapshots, and then wait while our peer links the words they hear to their own conscious précis of that brain state.

These thoughts are drawn from the first reflection assignment I wrote for the class “Cognitive Neuroscience of Consciousness,” which I took while abroad as a student in the Psychology Program at DIS – Study Abroad in Scandinavia, based in Copenhagen, Denmark. There are a lot of linguistic structures I could use to tell you about my own conscious experience of the semester - and of course about the larger experience of four months spent travelling in and beyond the fascinating place that is Copenhagen. What I’ll attempt to do here is sketch a verbal snapshot of the relevant points, and rely on “your sense of my sense of language” to fill in the phenomenality.

We talked a great deal throughout the course about a unified, complete theory of human consciousness being a sort of Holy Grail of neuroscience. The class was taught by a cognitive neuroscientist doing research through the University of Copenhagen. She has her own theory of consciousness, but we started out the semester reading up on some of the background: Descartes and dualism, David Chalmers and the “philosophical zombie,” Bernard Baars’ global workspace theory, and the theories of Antonio Damasio (from whose book on the topic entitled The Feeling of What Happens: Body and Emotion in the Making of Consciousness, I’ve lifted my own title here). We talked, too, about the methodologies of cognitive neuroscience in attempting to measure and describe perceptual consciousness. This kind of testing must always rely on pairing objective measures, such as fMRI, with the subjective verbal report of a participant’s perceptual experiences.
Expanding on this concept of subjective experience and verbal report, the course involved a number of investigations outside the classroom. We visited art museums, like the Arhus Art Museum mentioned above, but also one based at a psychiatric hospital consisting solely of works made by patients. We met with a dance teacher, a professional music therapist, and a meditation instructor, and talked about manipulations of states of consciousness for therapeutic purposes or to increase mental and emotional well-being. An emergency room neurologist spoke to the class on the very practical question of determining clinical signs of consciousness in patients. The class spent a week in Amsterdam, an active center of consciousness research. We spoke with Dutch cognitive neuroscientists and toured research facilities, but also engaged in such ventures as a wine and cheese tasting class (ostensibly for the purpose of investigating subjective reports of gustatory phenomenal experience).

The concepts from the classroom and from the travels were put into practice in an associated lab project course. I was a member of a group that designed and carried out a small scale experiment using fellow study abroad students as test subjects. In brief, we were interested in the ability of the unconscious brain to learn simple sequences. Our results were pretty much largely inconclusive, but I did come to some meaningful conclusions through the semester long process of designing a research project collaboratively. One of my favorite things about the class in general was that it attracted the interest not just of neuroscience students. I brainstormed research ideas alongside people with backgrounds as diverse as linguistics, computer science, mechanical engineering, and creative writing. I learned a great deal in discussions with peers on the research they were involved in at their home institutions, on auditory cognition in a bird model, for example, or on language acquisition, or on the phenomenon of déjà vu. I had classmates who wanted to go to medical school, classmates who wanted to build a career on consciousness studies, and classmates who wanted to become poets. As I wrote in my final reflection paper at the conclusion of the course:

*I saw the boundaries of our current conceptions being pushed, whether through experiments in the laboratory or through playful exploration of the types of conscious states to be found in the dance studio, the meditation room, or the cheese cellar. I was left with a reinforced sense of some of the inherent frustrations encountered as a neuroscientist of consciousness – most of them technical and methodological – but also with a sense of optimism about the future of the field.*

The experience of that semester reinforced my sense that, if this is what a career in neuroscience research can look like – experts from a variety of disciplines converging on a single topic such that (as some theorists have suggested of the conscious brain) the sum is greater than its parts – it’s a future I want a part in.
Schizophrenia, a mental illness affecting about one percent of the population, has always been difficult to treat. People with the disorder often experience delusions and have trouble organizing their thoughts, and may find it difficult to find pleasure in everyday activities. Treatment options like different types of therapy and medication are often successful, but it is estimated that only a third of patients can successfully live in the community long-term and stay in remission. So the question remains: why is it that the same exact treatment can be successful for one person but have no effect whatsoever for someone else with the same mental illness? This inconsistency has led some people to be skeptical and believe that this illness is in fact not a real one, which is a harmful viewpoint towards those suffering from schizophrenia. People may feel like what they are experiencing is their own fault. Recent research, however, may start to clarify why this inconsistency exists.

The University of Washington in St. Louis recently discovered last year that schizophrenia is not just one disease, but is in fact eight distinct genetic disorders with their own symptoms. It’s almost as if schizophrenia is an umbrella term containing eight different disease classes. So does this finding prove that schizophrenia is not real? No, not at all. In fact, it offers a very plausible explanation for why treatments in the past haven’t been as successful as desired. Knowing the specific symptoms of the different “classes” of schizophrenia could allow treatments to pinpoint the exact illness that the patient is experiencing.

To strengthen these researchers’ case, they compared the DNA of 4,200 people with schizophrenia to 3,800 healthy people before making this conclusion. There are no single genes that alone cause schizophrenia, but the interactions between many different gene clusters can have huge impacts on the risk of developing schizophrenia, as much as 70-100 percent chance of getting the illness.

This finding is important not only for schizophrenia, but for mental illness in general. It highlights how easy it is to assume that a mental illness does not exist because it is not well understood. Mental illness classifications are far from perfect, but they are grounded in real symptoms that happen in real people. It might be unclear what causes these symptoms or how exactly to treat them, but this does not mean that they are not a real illness. As we as a society learn more about different mental disorders through future research, we will begin to see why different treatments don’t always work as planned, just like we learned with schizophrenia. There may be more umbrella terms than originally thought, but that simply means there are deeper levels of complexity just waiting to be discovered.


Until around the 1970s, a generally accepted idea throughout the neuroscience and psychology communities was that the brain, caged in blackness within the skull, isolated from the rest of the body, was undoubtedly static in the functionality of its structures. Further, it was assumed not to continue developing new neurons postnatally. Scientists did not believe that the nervous system had the capability to adapt to its environment, nor that it could habituate to circumstances that might preclude it from functioning at a normal capacity. No, the brain was thought to be fixed forever. However, after the advent of the MRI in 1971, and after a few notable neuroscientists took on the task of proving the existence of neuroplasticity, the tides began to change. Neuroscientist Paul Bach-y-Rita developed a device that miraculously allowed congenitally blind people to recognize pictures by electrically stimulating their bodies, substantiating the idea of sensory substitution. Considerable changes within the hippocampus were documented in London taxi drivers as they learned to navigate one of the largest and most complex cities in the world. Experiments were conducted on cats who underwent surgery that sewed shut one of their eyes, yet they were still able to repurpose the part of their visual cortex responsible for sight in that particular eye regardless of the fact that they could not see; consequently, they experienced permanent anatomical and physiological deficits after the experiment as their vision was restricted during a critical period of visual development. All these are examples of neuroplasticity - but amazing as they are, they are actually quite simple in comparison. The concept of neuroplasticity is a complex mechanism, vulnerable to a myriad of factors, limited by many more. One of these variables, the effect of age, has a significant consequence on the development of plasticity and will be explored in depth throughout this essay.

Brains are malleable, we know this. But exactly how malleable? As mentioned above, there are confounds that dictate the plasticity of a single brain. One seems to stand out amongst the rest, and that is the factor of age. A young child equipped with a brand new brain can more easily adapt to his internal environment than his adult counterpart; his neurological control center is fine-tuning itself, weeding out the irrelevant information and strengthening the connections that are imperative for its development. As a young child, there is still room for extensive growth. However, it still comes as a surprise that congenitally blind children as young as five years old have the capacity to repurpose their brain's visual centers to process spoken language. This is not just the extension and addition of synapses in one brain region as we saw in the hippocampus of the taxi drivers; rather, this is a complete overhaul of an entire region within the visual processing system, a function that was assumed to take many years. A blind person's brain compensates by using up every piece of cortical real estate that it can. When the visual cortex is obstructed from performing its one and only task (to process visual information), it reacts by helping out its neighbor, the friendly and expressive auditory cortex.
On a simplistic level, brain plasticity can be broken down into two key categories: experience-expectant plasticity and experience-dependent plasticity. The former of these two categories includes the experiences that necessitate the development of a particular brain structure, its function, and the resulting behavior; in the case of congenitally blind children, the critical period that concerns us would be the period that defines the range of proper development of vision in these children. This is important because it illustrates how and why children have the capacity to repurpose pertinent brain structures for other functions. This is precisely what Marina Bedny, Hilary Richardson, and Rebecca Saxe (2015) report on in their study published in the Journal of Neuroscience on the 19th of August, 2015. The study tracked the developmental trajectory of plasticity throughout childhood and into early adulthood.

Considering that most information we have on brain plasticity and blindness has been obtained through studies on adults, the majority of hypotheses on plasticity postulate that the occipital cortex of congenitally blind individuals does not begin to process language until early adulthood. The implication is that the cortical remapping of the brain may take many years to complete. On the other end of the spectrum, it is also speculated that infants might be born with an innate ability to process speech in their visual cortices. Over time, the stimulation of sight nullifies the language function and establishes vision as the exclusive faculty in the visual cortex. The real objective of Bedny et al. in this experiment was to determine the timing and mechanism of brain plasticity in blind individuals and compare that to what is already known.

To accomplish this, Bedny et al. gathered three groups of children of varying ages: 19 blind children, 20 blindfolded sighted children, and 20 sighted children. Each child was placed in an fMRI scan and asked a series of questions known as the “Does this come next?” task. The child listened to a 20 second clip of either an English story, a story in a foreign language (in either Hebrew, Russian, or Korean), or instrumental music. After the first clip, they were asked “Does this come next?”, followed by a short three second clip of one of the three possibilities (English story, foreign language story, or music). The child had to respond with “yes” if the second clip was a continuation of the first, or “no” if it deviated from the initial clip. For the foreign language clip, one of the three languages may have changed from, for example, Korean to Russian; the child had to correctly identify if the language changed. Similarly for the instrumental music clip, the melody, instrument, or pitch was subject to change, and the child was
required to identify if there was any variability in the second clip.

The purpose of the fMRI was to visualize the metabolic activity in the visual and auditory cortices of the subjects. The findings were substantial. First, both hemispheres of the lateral occipital cortex responded to spoken language in blind children, more so than they did to foreign language and music. Interestingly, this region showed no activity in both groups of sighted children. Second, the spoken stories activated the left lingual gyrus in blind children, but again, there was little to no response in the occipital regions of sighted children. It should be noted that the activity in the occipital regions of blind children increased with age; this is justified by the finding that increased occipital activity wasn’t just limited to responses to spoken language, but rather more generally correlated with all sounds regardless if it was familiar language, foreign language, or music. Finally, blind children were shown to have reduced activity in the prefrontal cortex. In addition to the main language processing centers (i.e. the temporal lobes), other brain regions are theorized to be responsible for language production and comprehension including cortical thickness and the prefrontal cortex. Based on the recent findings, the prefrontal cortices in blind children do not respond to spoken language until the age of eight; in contrast, sighted children showed signs of activity by the age of four.

So what does this all mean? From the findings, it is quite obvious that the occipital regions of the brain can and will respond to speech in blind children. It is also observed that these responses steadily increase as a child ages, being most active in cortically blind children at ages 16 and 17. A possible interpretation of this could suggest that occipital responses are only present in individuals who utilize the faculty of the occipital cortex early in development, and is further supported by the fact that adults who become blind later in life do not show any activity in occipital areas in response to speech. On a fundamental level, blindness could theoretically modify the development of the temporal and occipital lobes, contributing to a crossover between these cortices in response to spoken language. This finding emphasizes the importance of experience on sensory development by illustrating the specialized responses that are limited to congenitally blind individuals.

Research has already been conducted that shows blind people can repurpose their brains to improve other senses, and experience touch and sound with greater acuity. What’s important here are the brain regions that respond to sound, the types of sound that elicit the greatest responses, and the validation of theories on the mechanism of visual development. This study has us consider the future implications for treatment of congenital blindness, and how the brain can develop alternative methods to be able to adapt to blindness such as drastically improving hearing and memory. The results of this experiment have been instrumental in helping us understand brain plasticity on a more fundamental level, and have provided key insight into the inner workings of the developing brain.

Reference:
A TRIP TO SOCIETY FOR NEUROSCIENCE IN CHICAGO
BY SIERRA LEAR

I am sometimes described as “loud”; I prefer the word “enthusiastic.” Either way, I cannot contain my delight when the topic of neuroscience arises. People who knew me therefore expressed little surprise when I announced my intent to visit Chicago, Illinois to attend the 2015 Society for Neuroscience (SfN) annual meeting. The Society for Neuroscience is the largest association for professional neuroscientists in the United States, holding an annual conference with over 30,000 attendees from around the world, including many scientists who present their newest findings related to the brain.

Saturday marked the beginning of the conference. On behalf of the Tulane University Neuroscience Association (TUNA), I joined the Brain Bee USA Coordinators Meeting to represent the Louisiana chapter at the Brain Bee USA Coordinators Meeting. The Brain Bee is a worldwide neuroscience competition aimed at high school students; TUNA had decided to jumpstart the creation of the first Brain Bee competition in the state of Louisiana and wanted to collect invaluable information for implementing the first Brain Bee competition in New Orleans.

In addition, I attended the different lectures throughout the sprawling McCormick Place where SfN was held. Ranging from symposiums about new noninvasive molecular imaging techniques at the forefront of the BRAIN initiative to guest lectures about the neuroethics and treatment of patients believed to be comatose but actually capable of consciousness and awareness, I was simultaneously delighted and overwhelmed by the magnitude of knowledge rushing at me. Although I wish I could summarize each and every lecture I attended, instead I will focus on my favorite part of the SfN conference: a fabulous guest lecture by Dr. Sheena A. Josselyn, titled “Making, Breaking, and Linking Engrams.”

Dr. Josselyn described how she was able to use optogenetics, or technology allowing the use of light to either turn on or off neurons, to figure out why and how certain neurons encode memories. Neurons are recruited to encode memories in a competitive process, almost like a boxing match. However, excitability rather than muscle determines the winner. These winning neurons then inhibit their neuronal neighbors, almost as if they were slipping their competitors a drug, so the winners can continue to win more boxing matches in the short-term future. However, by inhibiting both the excitability and the mean-spirited poisoning qualities of these winner neurons, again through optogenetics, loser neurons can be given the chance to encode a memory.
“She started using drugs and dropped out of school,” a friend told me of an acquaintance we had. I responded with concern, as if we had been great friends for years rather than mere acquaintances for far less, but my friend made it pristinely clear that she thought my reaction was genuine but misguided at best. “She chose and still chooses,” my friend said with a face that expressed judgment. It was at this point in our conversation that I realized something significant: it was not that my friend and I had disparate values; rather, our notions of free will were fundamentally different. To her, free will was tangible and had the ability to criminalize. The drug user – or abuser – was fully responsible for her plight because she, in essence, chose it. I appeal to a different view. To me, free will, in the context of this conversation and many others likewise, is severely limited. The acquaintance was not to blame for her own plight. She was the victim.

Research in this field has transcended the view that addiction is a moral failure of the individual, yet many hold the misconception that addiction is simply a willpower issue. This stigmatization among some people has infiltrated the healthcare system and even private pharmaceutical companies, which as a result are loath to invest in innovative immunotherapies and medications that hold large therapeutic – even preventative – value for addicts. Though it seems that we have reached a hopeless stalemate, if we utilize an Epidemiologic Triangle, things start looking a little more favorable. It would be wholly optimistic and simultaneously unrealistic to eradicate addiction, which I must admit is inevitable. But it is possible to reduce stigma as a social phenomenon, and the vessel by which that can become a blooming reality is education. If my logic serves me well, education would lessen stigma, which would contribute to greater investment and mobilization. To bolster my reasoning, the fight against HIV/AIDS is a case in point.

It is important to be sensitive to the fact that drugs have immense biochemical and neuropsychological ramifications. The very brain regions that are hallmarks of impulse control are impaired by drug use. So, body mechanisms that mediate defense are rendered defenseless, absolving, to a substantial degree, the host of agency. Similarly, the body reward systems, after repeated drug use, become compromised. Once habituation settles in, it takes more to feel normal again. It is this very nature of most drugs that is the driving force of addiction. Though one may start drugs with purely recreational intentions, continued drug use is a manifestation of desperation. Reverting to sobriety can be incredibly difficult and can seem nearly impossible when compounded with little social support. So, it looks like I have come to the conclusion that empathy and understanding, rather than judgment and blame, are necessary if we hope to make any headway.

Also a natural derivation is that prevention is key. We know that the most predictable demographic risk factor is adolescence. At first glance, there’s a seemingly irreconcilable discrepancy arising: adolescents are more vulnerable but also more resilient. Upon deeper inspection, it becomes obvious that these two statements, in fact, can sit side-by-side in harmony. Plasticity can be a boon, sure, but it can also be a burden. In other words, plasticity can be adaptive or maladaptive. The bottom line is that it is paramount that we strategically exert a large sum of our energies (both financial and moral) on this segment of the population.

In summation, it is time that we treat addiction like the chronic disease that it is. If addicts really had a choice, many would readily choose to remove the pain and discomfort they face daily. Invoking the just-world phenomenon and advocating laissez-faire will do nothing except exacerbate an already pressing issue. Education, coupled with proactive effort, is the way to go.
I.

Strangers came into the house this morning. I could hear their voices from upstairs. Searched for my parents, but they've disappeared. Everything's disappeared. Nothing looks like it's supposed to, and nothing makes any sense at all. I've never seen these walls, these furnishings, or these doors before. Strangers are waiting in my room when I come back: three women. First one steps up to me, forehead all scrunched and eyes so sad, so tired, claims she is my daughter, squeezes my hand, shows me pictures of a little girl and a young woman at a beach, making sandcastles with grins on their faces. Slowly, familiarity crawls back into my mind as the faces click and my eyes seem to open like from a waking dream. I take her hand and squeeze it back.

It's all right. I do remember her name now.

It is January of the second semester of my sophomore year when I sign up to volunteer at the Lambeth House retirement home to spend a few hours a week helping the residents with various activities such as gardening, exercise, BINGO and trivia games. The facility I arrive at is huge, but that is because it is the home of many residents, and after the obligatory introductions to staff and nurses in the obscurely located Memory Care Unit, the part of the facility where the elderly with memory impairments reside, the activities coordinator and I set off to greet the first resident, Ms. Sarah.

I don't know what exactly I was expecting; perhaps I had been looking for that Hollywood version of grannies that permeates society – the hygienic old women who stroll in their immaculate vests and their crocheted mittens down streets paved with daffodils, the benignly forgetful old women who dole advice to grandchildren while sipping tea and eating biscuits. All clean, all blissful images. As the activities coordinator cracks open the first door and we peek into the room, I meet with a different sort of grandmother. Her hair is a tangled mess from sleep, and a concerned look covers her eyes as she focuses on each visitor – first to her daughter, then to the activities coordinator and, finally, to myself.

She asks me who I am. I tell her. She asks me how we knew where to find her. I tell her. She asks me when she can go home. I tell her. She asks me why the room is so cold all the time. I smile. She weeps. A few minutes later, she repeats herself. And repeats herself. Who are you? How did you know where to find me? When can I go home? And, oh boy, why is this room so cold all the time? She weeps.

II.

I am forgetting things, and that scares me. Not just simple words and concepts, but memories too. There are growing black spots in the pictures I see. They won’t stop spreading and spreading out. I'm afraid that soon they will eat up the whole thing until there's just a hole in my head where it used to be and all I’m looking at are shadows.

People try to tell me that my husband will come to see me for dinner again. That woman frightens me sometimes when she says it, like I don’t know what she’s…I lost it again.

Oh dear.
It is February when I visit Ms. Sarah again, and everyone already has the plans set in place for her 83rd birthday party. For the birthday bash, we invite all of her family and the elderly women from her church. Out of all the residents, she loved to sing the most, so music is, of course, a very important part of the celebration. When the first tune comes on, I recognize it immediately. Moon River. Frank Sinatra. It is a classic song and Ms. Sarah’s favorite with lyrics that she knows back and forth even if she can’t remember the names of her friends at the party. The other aunties and grandmothers begin to croon to the melody softly, and I find myself joining, off-key, in the chorus of surprisingly soothing voices. “Moon River, wider than a mile, I’m crossing you in style someday.” Suddenly, I feel a hand on my shoulder. Looking over, I see Ms. Sarah, smiling at me, and clapping her hands at the end of the song. It’s such a simple gesture, but the moment is a magical one. Sometime after halfway through the party, her daughter arrives, providing me with temporary relief and I leave to help serve the birthday cake, intensely satisfied that I was able to get such a joyful response out of Ms. Sarah, who had been doing nothing but continually asking me the same questions all day. After leaving the facility, I spend a large part of the day thinking of other songs I could sing for her when I visit.

The next day, I arrive at the unit in the morning and find her walking in and out of the kitchen, frustrated and insisting that she needs to get back to her house in New Orleans to take care of her husband. But her husband passed away years ago. I tell her that she lives here now, has been living here for a while actually. She is clearly surprised by the news but also seems to quietly acquiesce, at least for the moment, to the fact that this house in San Jose is actually her real home. She asks me how I knew where to find her, and I quickly change the subject.

“So, did you have a good time at the party yesterday, Ms. Sarah?”

She frowns, clearly confused.

“What party?”

III.

When I was a young woman, I worked at a grocery store and lived in a big, shared room with my siblings. The shelves were clearly marked and neatly arranged boxes for our shirts, shoes, and coats. My brothers were...there. I lost the word. Something meaning “not likely to clean.” It is all right. Sometimes, if I wait long enough the words just come back, like the keys and the glasses I thought I put over there. Most of the time, they never do and I just search and search for words that I’ll probably never find.

Of course, things do not just disappear. They either leave or are taken. When the words left me, they must have taken the sandals and the eggs as well, but they will come back, like my shoe, my keys and the fridge. I check the doghouse. That’s funny. The keys aren’t where they’re supposed to be. I go to the fridge but there is no knife. The saints aren’t where I put them last time either.

I am sorry. I have lost something here, but I do not know where here is anymore.
Ms. Sarah scrutinizes my own role as a volunteer continuously, sometimes with acceptance, many times with hostility. I try to engage her in gardening activities and exercise routines. I try to encourage her to draw, or help with the BINGO, bring her endless cups of coffee, plates of cookies, bowls of cheese puffs, help her to the restroom, get her blankets and encourage her to talk about the past. Sometimes, these little deeds are met with gratitude, but other times she turns against me and the staff, begins mumbling sour criticisms into her hand when she sees us, muttering about how the nasty people make her eat all the time.

But when the music comes on, Ms. Sarah is a different person. The music is loud but no one argues with the way it helps calm her distress and brings such joy to her face. In these moments, I see a glimpse of the woman she once was before she was bound, trapped in a prison of memories.

IV.

Now, I am thinking of a town. Yes, that is the one. I am thinking of a girl in a red dress who danced and danced and thought she could dance forever. Under the moon she saw a river. How did it go again?

“Moon River, wider than a mile, I’m crossing you in style someday.”

But I woke up this morning to find that my parents were gone. I look in the mirror and see someone there, an old lady, who definitely isn’t me. None of this makes any sense. What is going on here? How did I get here? What is happening? Three strangers come in the room, four women. One of them kneels by the bed, claims she is my daughter, squeezes my hand, shows me pictures of a little girl and a young woman at the beach, but I don’t have any children.

I know that something is wrong, something is very, very wrong. But what is it?

I need to remember the name. I cannot forget this because I am supposed to be holding onto it for someone else. Dear God, help me remember the name, even if I forget my own.

Please. Please.

Even when Ms. Sarah is gone, moved to a different unit because her condition has rapidly deteriorated, I still remember her smile. The brief instances of happiness she showed in the past linger in the room whenever “Moon River” comes on the radio. For other residents, it isn’t music, but the pictures in a book, or the scenes of a movie, or a particular jigsaw puzzle that help bring out those pieces of themselves that were thought to have been lost to age. Many times, it’s just having someone there to share an experience before it’s gone forever – to live on in other people. If that is the only thing that we can do for them as volunteers, then we should happily help them relive those fleeting moments of joy, over and over again.
FUTURE ENDEAVORS FOR 2016-17

In only the past two years, I have watched this organization grow exponentially in both member participation and in the extent and success of our community outreach. It’s exciting to be part of an organization that can effect a change on so many levels within the Tulane community as well as the greater New Orleans area, but it’s equally exciting to be able to spread our knowledge of and passion for neuroscience to so many people.

TUNA has hosted a myriad of events this year that have connected Tulane students with the neuroscience community. Many Tulane professors and visiting speakers (including prominent neuroscientists, neurologists, and neurosurgeons) have provided insight and instilled direction in students by sharing stories of their careers, research, and experiences in their field. Our first Celebrate Mental Health Festival gathered hundreds of students together in an effort to acknowledge the issues of mental health on campus. TUNA has been instrumental in reaching out to local middle and high schools to educate and inform youth of prospects in neuroscience. But we are always looking to expand our horizons.

Next year is promising for TUNA. Many opportunities for extensive mental health awareness and youth outreach will be pursued with great vigor. Speaking for the body of the organization, it is imperative that these issues are confronted head on, and with a solid general body and encouraging executive board for the 2016-17 academic year, I strongly believe we can effect these very important changes in our community. We are also striving to engage our members more intimately by pioneering a mentoring program that pairs upperclassmen neuroscience majors with underclassmen—this will facilitate conversation that will show new students the perspective of a college student, and will aim to influence their receptivity to Tulane’s neuroscience program but also the field of neuroscience in general.

My experience in TUNA as this year’s Member Functions Executive taught me the value of accountability, transparency, and effectiveness in maintaining relations with the general body and the surrounding community. As the elected Internal President for next year, I will be working in concert with Megan Haney, the elected Community Outreach President, to make our experience with TUNA even better than it has been thus far.

If you are interested in becoming more involved in the organization, you can find out more about us on Orgsync or social media for updates on upcoming events. We look forward to seeing you next year!

Facebook: facebook.com/TulaneUniversityNeuroscienceAssociation/
Instagram: @tuna.official

-Parker Tirrell