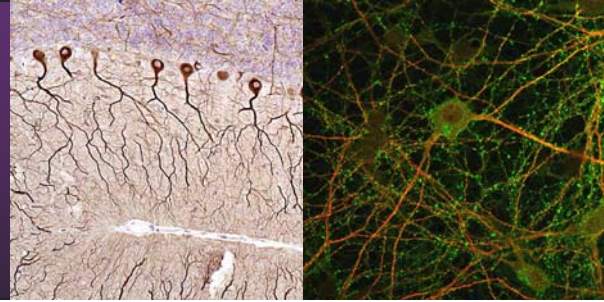


BRAINSTORM

Newsletter of the Program in Neuroscience
Multidisciplinary Studies Department
Harriot College of Arts & Sciences, East Carolina University



Greetings from the Editing Office!



Tuan D. Tran, Ph.D.
Editor
Neuroscience Program
Director

Dear Friends,

It is my pleasure to present you the first newsletter of the undergraduate program in neuroscience at East Carolina University. The program was established in 2004 by Dr. Larry Means (retired) as a way for enabling students to earn either a BA or BS degree in an interdisciplinary area much more unique than traditional fields of study. Neuroscience is the study of how the brain contributes to behavior and cognition, which can be examined at many different levels of analyses—at molecular, cellular, chemical, physiological, and neuroanatomical systems. The curriculum encompasses courses from such diverse fields as biology, chemistry, physics, and psychology. This program prepares them to utilize this interdisciplinary experience for advanced study in graduate school or medical school. Neuroscience is a relatively new field, but despite this, it has experienced tremendous growth in the past several decades and has spurred a vast amount of academic, scientific, clinical, and applied career options. The program at ECU has certainly grown since 2004, not only in the number of majors and minors, but also in its reach with faculty at the Brody School of Medicine, its complement to other ECU programs such as Psychology, and in active student participation. This newsletter is a result of our students' hard work and their intellectual and creative contributions. We hope you enjoy it and look forward to hearing from you. Please examine our website at www.ecu.edu/neuroscience as it contains this newsletter and other information regarding the neuroscience program. If you have any information to share, please email it to trant@ecu.edu.

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Iola Conchar
Associate Editor
Neuroscience, Psychology Major

It is with the utmost pride and gratitude that I serve as the associate editor for the program of Neuroscience newsletter. During my tenure at East Carolina University, I have developed a strong sense of pride in being affiliated with the Neuroscience program. I find myself constantly challenged, motivated and driven by the study of neuroscience, the direction from Dr. Tran, and by my fellow students. Since I joined the neuroscience program I have developed a great deal of respect, not only for the scientific method and challenging curricula, but also for my colleagues who, in striving for excellence, inspire me on a daily basis. It is due to their diligence and creativity that this newsletter is possible. I hope that you find this newsletter both informative and enjoyable, and I look forward to presenting many issues to follow.

Students — Are you interested in contributing to the newsletter? Student involvement is essential to the life of this newsletter. Please contact Dr. Tran about how you can be involved.



We're on the web!

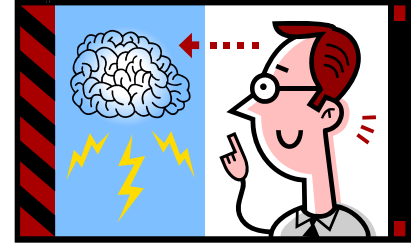
<http://www.ecu.edu/neuroscience>



Synaptic Commune

Brain Cells: Use Them or Lose Them

Dorothy Lloyd (Neuroscience Major)



Many people believe that once adult brain cells are lost (due to any number of reasons), they are never regained. This misconceived notion stems from the assumption that the adult brain does not generate new cells. Due to the work of Dr. Tracey Shors and colleagues and other researchers, it is better understood that the inability of the brain to produce new cells is simply a common misconception. Most areas in the brain do not have the capacity to generate new brain cells, however, one brain structure, the hippocampus, is an exception.

In a paper by Shors and colleagues¹ the researchers focused on the hippocampus, which has received much attention for its involvement in learning and memory. Rats were injected with *bromodeoxyuridine* (BrdU), a chemical marker that indicates cell division (i.e., neurogenesis or the birth of new neurons) for several days within a 14-day period. They were tested for their learning ability using a form of associative learning called eyeblink conditioning shortly after initial BrdU treatment. One group was trained using a simple form of eyeblink conditioning that normally requires an intact cerebellum (delay conditioning), and another group was trained using a more complex eyeblink conditioning task that requires an intact hippocampus (trace conditioning). In both cases, learning was measured by how well and how often the organism related two previously unrelated stimuli. The team discovered that neurogenesis occurred in the dentate gyrus region of the hippocampi of the rats given the complex trace conditioning task. More importantly, these new cells have a critical window of opportunity to be incorporated into an already existing network of mature dentate gyrus neurons, as long as the rats underwent complex training, but not simple training. If they were not incorporated then they would potentially die or serve non-learning purposes. It must be noted that cell death is a normal process, perhaps to prune unnecessary neurons. Shors stated that, "...newly generated neurons may not be used for learning under more lenient conditions, but become involved as task demands increase." More recently, her work involving the relationship between hippocampal neurogenesis and learning was recognized in the March 2009 issue of *Scientific American*.²

Shors and her colleagues have elucidated the concept that new brain cells are being generated constantly in the adult hippocampus. However, it is up to the individual to put these new neurons to use, and in challenging ways, so that their capabilities are realized. So the next time you have the choice between playing video games or reading a master piece of literary work, such as Hemingway's "*For Whom the Bell Tolls*," put down the controller and pick up the book! ☺



Comedian's Corner

(see Page 3 for the punch lines)

What did the neuron say to its dendrites?

Why did some NC State students decide to transfer for to ECU?

Student Research Presentations

The following students are recognized for their hard work and dedication to scientific research. They presented their findings in either poster format or through oral presentation at various research conferences within and outside of North Carolina! Those noted with "*" won a monetary award for best presentation at the particular conference.

ECU Neuroscience Symposium

Greenville, NC

November 3rd, 2009

- Leonardo Duque (Poster)*
- Tiffany Lee (Poster)
- Ellen Sheffer (Poster)

ECU Research Week

Mendenhall Student Center

April 5 - 9, 2010

- Kara Burns (Poster)*
- Ryan Craft (Talk)
- Robert Hazard (Poster)

National Conferences on Undergraduate Research

University of Montana, Missoula, MT

April 15-17, 2010

- Ellen Sheffer (Poster)

Rocky Mountain Psychological Association Conference

Denver Tech Center, Denver, CO

April 15-17, 2010

- Ryan Craft (Talk)

Comedian's Corner Punch Lines (from Page 3)



Get your axons over here!

They found out that we had a hip-ole-campus.

Spotlight: Graduating Senior

Ryan Craft Profile



"Everything I do well is the result of failing at least once. It is only through hard work, dedication and sacrifice that one can be successful, not only extrinsically but intrinsically as well."

• Standing:

- Senior
- Earned BA in Psychology 2008

• Major(s):

Neuroscience

• **Awards:** 2010 Undergraduate Research & Creativity Award recipient (\$2400).

• **Inspirations:** The Dalai Lama, Douglas Adams, The Beatles

• Goals and Aspirations:

To earn PhD/MD in Neurobiology/Psychiatry, specializing in the use of fMRI to diagnose psychiatric disorders.

• Current Research/Clinical/Medical Work:

Conducting senior thesis work in Dr. Tran's lab. The work involves examining the deleterious effects of combined maternal iron deficiency and fetal alcohol exposure on associative learning and the cerebellar circuit that supports this behavior.

• **Post-Baccalaureate Status:** Accepted into M.A. Experimental Psychology Program at Western Washington University (Fall 2010).

• Hobbies/Interests Outside of ECU:

Brains, Guitar, Rock Climbing, Hiking, Gardening, Cooking.

• Other Noteworthy Facts:

- Has an ottoman and old-school PC in lab office.
- Can eat just about anything.



Journal Café

Photo: Courtesy of Dino De Luca

The Journal Café was developed in October, 2005 by Dr. Tran as a means for his laboratory assistants (mainly undergraduate students) to present and discuss topics of interest in neuroscience and many of its related fields. It has grown from being a lab-centered discussion session to a much wider vehicle for neuroscience program majors and minors. The aim of this informal meeting is to have a student select a research article that is of interest and present it in PowerPoint form for 30-40 minutes. The student leads the discussion by identifying the thesis of the paper, the hypotheses, research methods/results, and elaborate on the conclusions. The framework is much like that of a primary research article itself. Students in the audience may ask questions or present points of discussion, and the paper may be critically assessed for its strong and weak points. For others, the Café may simply be a mechanism for learning more about a topic, definitions and concepts, research methodology, and how to critically examine the data. If you are a neuroscience major or minor, it is very likely that you are already on the distribution list to receive Journal Café announcements. If not, please contact Dr. Tran to be added to the distribution list. The Café is open to all students that are interested in neuroscience, so majors/minors outside of the neuroscience program are welcome.

Journal Café Presentations

11.13.09 - Kara Burns: Paus et al. (2003). *Sleep attacks, daytime sleepiness, and dopamine agonists in Parkinson's disease.* Movement Disorders, 18(6), 659-667.

12.04.09 - Iola Conchar: Yamasaki et al. (2008). *Alpha-CaMKII deficiency causes immature dentate gyrus, a novel candidate endophenotype of psychiatric disorders.* Molecular Brain, 1(6).

01.28.10 - Iola Conchar: Monastra et al. (2001). *The development of a quantitative electroencephalographic scanning process for attention deficit-hyperactivity disorder: Reliability and validity studies.* Neuropsychology, 15(1), 136-144.

02.18.10 - Tonya Cox: Cox et al. (2000). *Effect of stimulant medication on driving performance of young adults with attention-deficit hyperactivity disorder: A preliminary double-blind placebo controlled trial.* The Journal of Nervous and Mental Disease, 188(4), 230-234.

03.25.10 - Jerri Waller: Dodds et al. (2009). *The dopamine D2 receptor antagonist sulpiride modulates striatal BOLD signal during the manipulation of information in working memory.* Psychopharmacology 207, 35-45.

04.22.10 - Dorothy Lloyd: Stephens, C. (2006). *Bacterial cell biology: Managing magnetosomes.* Current Biology, 16(10), R363-365.

Spotlight: Graduating Senior

Kara Burns

Profile

• **Standing:**
Senior

• **Major(s):**
Neuroscience,
Biology

• **Awards:**

Best Biomedical Research Poster at ECU Research Week 2010 (\$50).

• **Goals and Aspirations:**

- Enter medical school and become a pediatrician.
- Do mission work by helping underprivileged children around the world.

• **Current Research/Clinical/Medical Work:**

Conducting senior thesis work in Dr. Tran's lab. The work involves examining the deleterious effects of combined maternal iron deficiency and fetal alcohol exposure on associative learning and the cerebellar circuit that supports this behavior.

• **Post-Baccalaureate Status:** TBD

• **Hobbies/Interests Outside of ECU:**

Enjoys hanging out with family and friends and is currently a color guard in ECU's marching band.

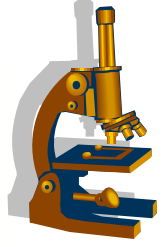


"I like that this program [neuroscience] is multidisciplinary so I feel that I am well rounded in all of the sciences."



Comedian's Corner

Two Purkinje neurons and an astrocyte went to a party and the neurons had too much to drink that night. The next morning the astrocyte found the neurons quite dysphoric. The astrocyte cell asked his neuron buddies why they were in such a sad state of affairs and they responded, "we're overly depressed."



Neuro Focus

*Modified Tanaka 1989 Cryofracture Procedure
Reveals an Intact Complex Neural Network
Surrounding Muscle Tissue in Rat under SEM*
Robert Hazard (Neuroscience Major)

The Tanaka 1989 procedure has been widely used to visualize intracellular contents following cryofracture under *scanning electron microscopy* (SEM). The procedure involves the utilization of Osmium Tetroxide, DMSO, and Tannic acid along with a series of buffered media to fix and preserve tissues which have been fractured under liquid nitrogen and concludes with critical point drying and sputter coating with gold palladium to a thickness of roughly 20 nm. Muscle tissues were extracted from Lewis Rats, prepared to a thickness of approximately 1x1x5mm, subjected to the Tanaka 1989 procedure with a few modifications made to timing and the following images were obtained in a Quanta 200 series scanning electron microscope utilizing a tungsten filament.

This has been an exciting development for the scanning electron microscopy lab at ECU, as this

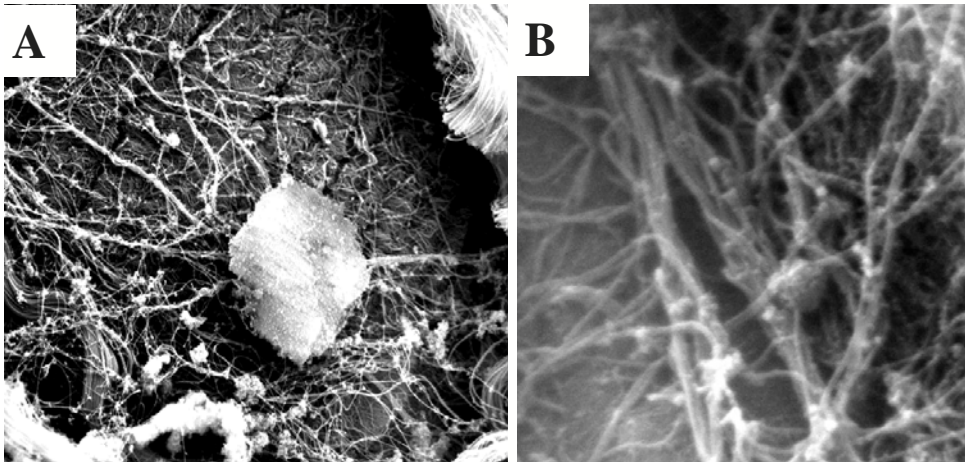


Image A: (roughly 10 micrometers), fine neural processes are visualized running along a single muscle fiber. **Image B:** (roughly 2 micrometers), what is thought to be a terminal Schwann cell clings to processes surrounding the neuromuscular junction.

is the first time such a procedure has been undertaken. This procedure has opened the door for developing and refining methods to visualize soft tissues under SEM in our lab in which ultrastructural details can be clearly observed and visualized without the necessity of purchasing costly equipment. Furthermore, the procedure resulted in a highly conductive and incredibly stable specimen. We were able to truly push the scope to its limits and identify structures as small as

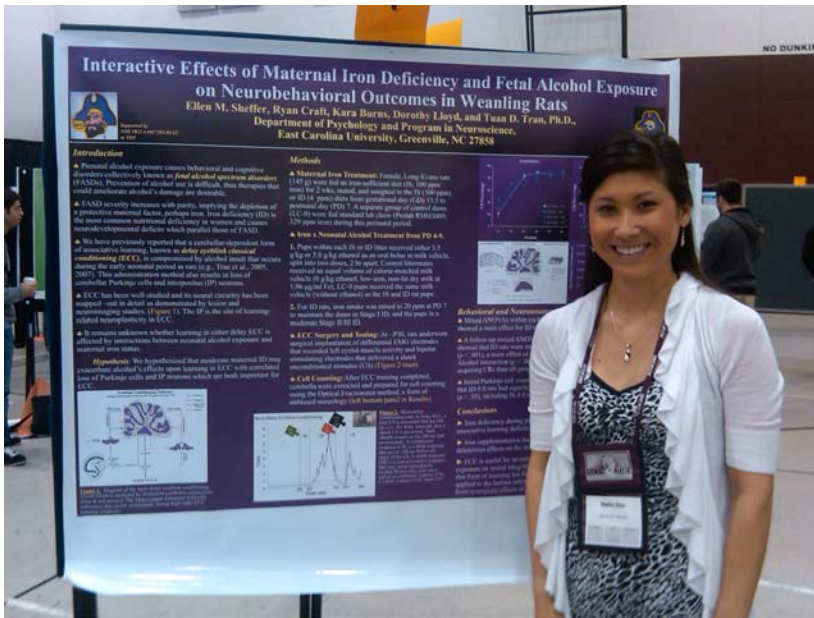
about 500 nanometers under high resolution, with no specimen interactions being noted. The Neuroscience Program at East Carolina University has opened up many new and exciting opportunities for me to explore my interests. This is just one of many wonderful opportunities that I have been granted and I extend my sincerest gratitude to Dr. Mark Mannie and Derek Abbott within the Dept. of Microbiology and Immunology at the Brody School of Medicine for their continued support and use of lab equipment during this procedure and to Dr. Tom Fink within the Biology Dept. for his excellent instruction and guidance in using the scanning electron microscope.

Consolidation: Thanks for the Memories!



Ryan Craft “sweating it out” by speaking about the detrimental effects of maternal iron deficiency and fetal alcohol exposure at the psychopharmacology session of the 2010 Rocky Mountain Psychological Association conference in Denver, CO.

Ryan Craft and Dr. Tran sweating it out in the flatirons of Chautauqua Park, Boulder, CO (as part of the RMPA conference [left]).



Left: Ellen Sheffer poised to take on the challenging questions by convention go-ers at the 2010 National Conferences on Undergraduate Research (NCUR) in Missoula, MT.

Right: Ellen’s feeling like queen of the world at NCUR in Montana!

Awards / Grants / Scholarships / Recognition

In 2009-2010, our majors won various awards for their presentations at scientific conferences, research grants to support their projects, and stipends for research training. Congratulations to all!

- *Kara Burns* (\$50; Best Undergraduate Poster in Biomedical Sciences at ECU Research Week 2010)
- *Ryan Craft* (\$2,400; 2010 Undergraduate Research & Creativity Award)
- *Leonardo Duque* (\$75; Best Undergraduate Poster at the 11th Annual ECU Neuroscience Symposium)
- *Robert Hazard* (\$500; 2010 Undergraduate Research & Creativity Award)
- *Aseem Kaul* (\$1,400; 2009 Undergraduate Research & Creativity Award)
- *Ellen Sheffer*
\$2,350; 2009 Undergraduate Research & Creativity Award
\$500; 2010 University Book Exchange Scholarship in Psychology
\$300; 2010 Psychology Department Earl and Norma Childers Scholarship
- *Suzanne Frisbee* (\$2,600; 2010 Duke University Summer Research Opportunity Program)

East Carolina University.

"The coolest thing to me about my research is having the feeling of helping someone in the years to come. We are pioneering ways to aid unborn children to have and live a normal life."

research in the palm of her hand:

Ellen Sheffer
Sanford, NC

When undergraduate Ellen Sheffer enters the lab where she researches fetal alcohol spectrum in animal models, she radiates enthusiasm for her multifaceted work. Sheffer studies the possible harmful neurobehavioral effects of iron deficiency and alcohol exposure in neonatal rats. Alcohol consumption during pregnancy can result in a variety of fetal alcohol spectrum disorders (FASDs). Children with FASDs exhibit long-term cognitive and behavioral deficits and animal models support these findings in humans. Sheffer's research looks at whether a synergistic relationship exists between maternal iron deficiency and fetal alcohol exposure and whether it results in more harmful neurobehavioral effects than either condition alone. Initially, she chose this area of research to complement a minor in Alcohol and Drug Studies, but as she became more involved with the project, her interest broadened to majoring in neuroscience with a long-term emphasis on specializing in psychotherapy for people that abuse alcohol and drugs. The goal is to one day discover a way to prevent and/or lessen the affects of alcohol on the developing fetus. Listening to her describe her work, one gets the feeling that the goal is entirely attainable.

Recipient, Undergraduate Research and Creative Activity grant for senior thesis project (\$2350, 2008-2009)

Presenter, 2009 3rd Annual Research and Creative achievement Week ECU Undergraduate Research Week. Presenter, 11th Annual Neuroscience Symposium Catalysts for Collaboration

Presenter, 5th Annual State of North Carolina Undergraduate Research and Creative Symposium.

Avid reader and scrap booker

tomorrow starts here.

division of research and graduate studies



Ellen Sheffer (left) was interviewed by Dee Harper from the ECU Public Communications office and a story was written about her research, which involves examining the damaging effects of fetal alcohol exposure in rodents, as a model of fetal alcohol syndrome in humans. The story was promoted by the Division of Research and Graduate Studies. Way to go Ellen!

Post-Undergraduate Recognition

Congratulations to these current and former neuroscience students who were accepted into graduate or medical schools:

- Vladim Bobrovnikov (2008) - accepted into Brody School of Medicine, Fall 2009
- Ryan Craft (2010) - accepted into MA Program in Experimental Psychology at Western Washington U., Fall 2010
- Aseem Kaul (2009) - accepted into Brody School of Medicine, Fall 2010
- Katie Le hockey (2008) - accepted into the PhD Program in Health Psychology at ECU, Fall 2008
- Christopher Richardson (2009) - accepted into Virginia College of Osteopathic Medicine, Fall 2010

Student Research Publications

Congratulations to the following neuroscience students for getting their research published in scientific journals.

Aseem Kaul

Wang, R., Kaul, A., & Sperry, A.O (2010). TLRR (Irrc67) interacts with PP1 and is associated with a cytoskeletal complex in the testis. *Biology of the Cell* 102(3), 173-89.

Christopher Richardson

Nowsheen, S., Wukovich, R.L., Aziz, K., Kalogerinis, P.T., Richardson, C.C., Panayiotidis, M.I., et al. (2009). Accumulation of oxidatively induced clustered DNA lesions in human tumor tissues. *Mutation Research* 674(1-2), 131-6.

Brainstorm

Please consider making a contribution to the Neuroscience Program. Checks can be sent to:

Office of Gift Records
 Greenville Centre, Suite 1100
 2200 S. Charles Blvd., Greenville, NC 27858

On the check memo line, please indicate:
Neuroscience Foundation

Dr. Tran is Secretary of the ECU Chapter of the *Society for Neuroscience* (<http://www.sfn.org>). The aims of this chapter are (1) to promote collaborative work amongst scientists from different disciplines across the ECU main campus and at Brody School of Medicine, (2) to provide advanced training for undergraduates, graduates, and postdoctoral fellows through research experience and seminars, (3) educate communities and schools about the nature of science and its findings, (4) inform lawmakers about scientific knowledge and its implications, and (5) to provide a forum for the exchange of ideas and information and ideas between East Carolina-area neuroscientists.



Newsletter Contributors
 (in alphabetical order)

γ Editing and Publication:

- Iola Conchar (Major: Neuroscience, Psychology)
- Dr. Tran

γ Spotlight: Tonya Cox (Major: Psychology)

γ Neuro Focus: Robert Hazard (Major: Neuroscience, Biology)

γ Synaptic Commune: Dorothy Lloyd (Major: Neuroscience, Biology)

γ Comedian's Corner:

- Ellen Sheffer (Major: Neuroscience, Psychology)
- Dr. Tran

Students — Are you interested in contributing to the newsletter? Student involvement is essential to the life of this newsletter. Please contact Dr. Tran about how you can be involved.

Article References

Synaptic Commune - Brain Cells: Use Them or Lose Them

1. Shors, T.J., Miesegaes, G., Beylin, A., Zhao, M., Rydel, R. & Gould, E. (2001). Neurogenesis in the adult is involved in the formation of trace memories. *Nature* 410, 372-375.
2. Shors, T.J. (2009). Saving new brain cells. *Scientific American* 300(3), 47-54.

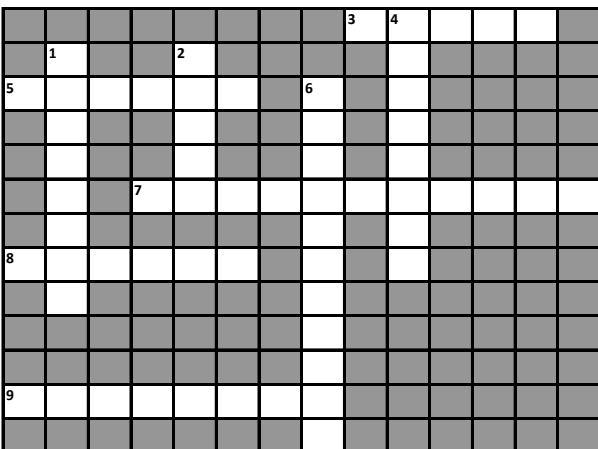
Images and Logos

Banner: Courtesy of Carl Hobbs, Wolfson CARD, King's College, London, England (Left: Adult mouse cerebellum; Right: Drebrin in mouse hippocampal neurons).

ECU logo: Courtesy of East Carolina University.



Are you up to the challenge?



Across

3. Father of modern neuroscience.
5. A brain cell.
7. A brain area that mediates learning and memory.
8. A female gametocyte.
9. A chemical transmitter that is lacking in Parkinson's disease.

Down

1. A type of protein that controls an ion channel.
2. Well known for his cell staining method.
4. A brain area that mediates emotional memory.
6. A brain area that executes motor behavior.