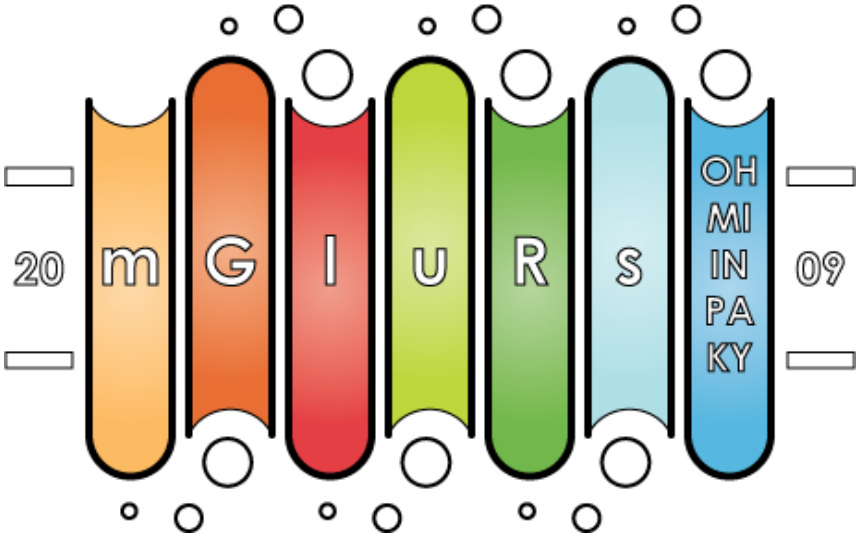
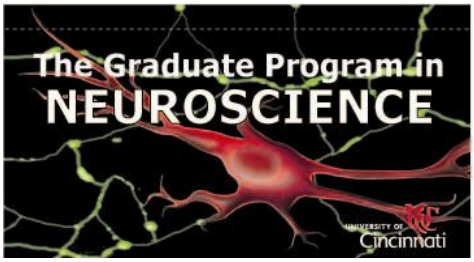


First Annual
Midwest/Great Lakes Undergraduate Research Symposium
in Neuroscience
Hosted by Ohio Wesleyan University

Generously Sponsored by:

cnup Center for Neuroscience
UNIVERSITY OF PITTSBURGH



PROGRAM IN NEUROSCIENCE
INDIANA UNIVERSITY
College of Arts and Sciences
Bloomington

PROGRAM IN VISION SCIENCE
INDIANA UNIVERSITY
University Graduate School
Bloomington

THE OHIO STATE UNIVERSITY
Neuroscience
Graduate Studies Program

OWU

Our Keynote Speaker this afternoon will be Dr. Randy Nelson of The Ohio State University.

Dr. Nelson is a Distinguished Professor of Social and Behavioral Sciences at The Ohio State University. He is Professor of Psychology and Neuroscience and a member of the Institute for Behavioral Medicine Research at The Ohio State University School of Medicine. Dr. Nelson is the Dr. John D. and E. Olive Brumbaugh Chair in Brain Research and Teaching and is Professor and Chair of Neuroscience. Dr. Nelson also directs PhD students in Evolution, Ecology, and Organismal Biology. He also directs the OSU Behavioral Phenotyping Core.

Dr. Nelson earned his AB degree in Psychology in 1978 at the University of California at Berkeley. He began his graduate career at Berkeley with work on canine behavioral sex differentiation with Dr. Frank Beach. After receiving his MA in Psychology in 1980, he began focusing on circadian rhythms and photoperiodism with Dr. Irving Zucker. He earned a PhD in Psychology in 1983, as well as a second PhD in Endocrinology in 1984 from the University of California at Berkeley. Dr. Nelson then went on to complete a postdoctoral fellowship in reproductive physiology with Drs. Frank Bronson and Claude Desjardins at the Institute for Reproductive Biology at the University of Texas, Austin from 1984-1986.

Dr. Nelson served on the faculty at The Johns Hopkins University from 1986 until 2000 where he was Professor of Psychology, Neuroscience, Biochemistry and Molecular Biology. He joined the faculty at OSU in the fall of 2000. Dr. Nelson has published nearly 300 research articles and several books describing studies in seasonality, behavioral endocrinology, biological rhythms, stress, immune function, sex behavior, and aggressive behavior.

Platform Presentations

1. Matthew Figley

Figley MD, Bissel SJ, & Wiley CA
Department of Neuroscience, University of Pittsburgh

YKL-40 Expression in Traumatic Brain Injury

It is estimated that 1.4 million people/year in the United States suffer a traumatic brain injury (TBI). After TBI, there is acute inflammation with local cytokine release, reactive astrogliosis, infiltration of activated macrophages/microglia, and necrotic and apoptotic cells.
The controlled cortical impact (CCI) rat model of TBI was used to study expression of chitinase-like protein YKL-40, believed to be involved in neurodegeneration. Upregulation of YKL-40 has been reported in inflamed tissue, such as rheumatoid arthritis and several carcinomas. The biological function of YKL-40 is mostly unknown.
We hypothesized that YKL-40 is expressed by astrocytes and macrophages in the local injured region as part of the acute inflammatory response. In order to study the time-course of YKL-40 expression, tissues from 1-12 days post-injury were processed for immunohistochemistry or mRNA analysis. To determine which cells express YKL-40, coronal sections were dual-stained with antibodies to YKL-40 and either GFAP (astrocytes), CD68 (macrophages), or NeuN (neurons), respectively. Immunofluorescence and mRNA expression was quantified using laser confocal microscopy or RT-PCR, respectively. In human CSF from TBI patients, YKL-40 concentration was measured using enzyme-linked immunosorbent assay (ELISA).
Real-time RT-PCR results showed similar expression at days 1 and 2 post-TBI. YKL-40 immunofluorescent staining showed peak expression at 2-3 days post-CCI with diminished expression thereafter. Most YKL-40 staining was present in astrocytes. In humans, CSF YKL-40 is increased at least 5 days post-injury. In conclusion, the rat model shows acute YKL-40 expression localized to the injury site that rapidly diminishes, while humans exhibit longer duration of expression.

2. Candice Kruth

Kruth CD & Pollock JA
Department of Biological Sciences, Duquesne University

Identification and Analysis of a Novel TRPM8 Splice Variant Using a Rat Neuropathic Pain Model

Neuropathic pain is a type of chronic pain that afflicts nearly four million in the United States alone. Our studies and others' suggest that transient receptor potential (TRP) splice variants may contribute to pain hypersensitivity associated with neuropathic pain conditions. TRP genes code for calcium channels that act as an interface between the environment and nervous system. Through alternative splicing, functionally distinct protein variants are produced from a single TRP gene. Alternative splicing is a major source of protein variation in humans, and splice variants have been linked to various diseases. This study utilized a rat neuropathic pain model to mimic a human chronic pain condition. By performing quantitative polymerase chain reaction (qPCR) and 5' rapid amplification of cDNA ends (5' RACE); we have demonstrated the presence of a novel TRPM8 splice variant in rat. This discovery may help to elucidate the role of TRP splice variants in neuropathic pain.

3. Patricia Troy

Troy P, Overstreet K & Bucher D
Departments of Chemistry and Zoology, Ohio Wesleyan University

Dopamine Signaling Pathway in the Stomatogastric Ganglion of Homarus americanus

Dopamine can alter the signaling of the pyloric dilator (PD) neuron in the stomatogastric ganglion (STG) of the lobster, Homarus americanus. When applied to the quiescent axon, dopamine elicits peripheral spike initiation. In addition, during normal ongoing centrally generated activity, dopamine modulation of the axon can alter the temporal pattern of spikes during axonal conduction. Previous research has shown that dopamine initiates peripheral spiking by increasing current through HCN (hyperpolarization-activated, cyclic nucleotide-gated) ion channel, increasing an inward rectifying current that depolarizes the cell. Therefore, the dopamine should bind to a D1 type receptor, resulting in an increase in cAMP, increasing the current through HCN channels. Here, we used a pharmacological approach to test this hypothesis. We applied drugs to the axon that are either activators/agonists or blockers of different steps of the pathway to either mimic or inhibit the response to dopamine. There are three different dopamine receptors in H. americanus so in situ hybridization was used to map which cells in the STG are expressing which receptor. The different pathway drugs tested support that the peripheral spiking is initiated via an increase in cAMP which causes the HCN channel to open. The in situ protocol has been optimized such that mapping of the cells can now be done to show that the PD cell is expressing a D1 type receptor.

Poster Presentations

4. Patton MH
Departments of Neuroscience, Psychiatry and Psychology, University of Pittsburgh.

Synaptic Plasticity of the Nucleus Accumbens in Rodent Models of Psychiatric Disorders.
The nucleus accumbens (NAc) receives glutamatergic inputs from limbic structures such as the ventral subiculum (vSub) of the hippocampus and the basolateral amygdala (BLA), as well as from cortical structures such as the medial prefrontal cortex (mPFC). The vSub is proposed to gate information flow within in the NAc and is thought to play a key role in psychiatric disorders such as schizophrenia and anxiety disorders. A hyperactivity is seen in the hippocampus of patients with schizophrenia and a hypoactivity is seen in patients of anxiety disorders. It is thought that hyperactivity of the hippocampus causes an inappropriate interaction between the vSub and the NAc, and thus we investigated the roles of this afferent in a schizophrenia model. We also hypothesized that within a model of anxiety; chronic stress will induce an overactive hippocampus and thus interfere with synaptic plasticity in the vSub-NAc pathway.

Using in vivo extracellular recordings in anaesthetized rats, we examined the effect of high and low frequency stimulation (HFS, LFS) on the vSub pathway to the NAc in two animal models of psychiatric disorders. We found LFS elicits a heterogeneous result in an animal model of schizophrenia in which both LTP and LTP occlusion are seen. However, a HFS to the vSub-NAc pathway in an anxiety animal model elicited a potent LTD in the non-stimulated BLA-NAc pathway. While further investigation is required to fully understand the mechanisms behind these phenomena, these data indicate possible rostral/caudal and/or core/shell differences in the NAc due to this conflicting data. These differences could be due in part by separate messaging systems in these distinct regions of the NAc.

5. Kanaan GR
Department of Neuroscience, Oberlin College

Targeting Cell Surface Transport Proteins in Search of Novel Inhibitors of Tumor Cell Growth
Glioblastoma multiforme is the most prevalent form of primary brain tumors that has no effective clinical treatment. Even with combination of surgery, chemotherapy and radiation therapy, life expectancy of glioblastoma multiforme patients is very short. The present work was designed to find novel pharmacological approaches to stop or limit proliferation of glioblastoma cells using the human astrocytoma U251 cell line. Literature data suggest that in several cell types, proliferation requires activity of plasma membrane chloride channels. Therefore, in our experiments we tested the efficacy of the broad spectrum Cl- channel blocker DIDS (50-500 μM) and the selective inhibitor of volume-regulated Cl- channels DCPIB (1-20 μM). U251 cells were plated at low density in multi-well plates, and allowed to grow for 48 hrs in the presence or absence of Cl- channel blockers. Cell proliferation was quantified using colorimetric MTT assay. DIDS completely inhibited proliferation of U251 cells, while DCPIB was only partially effective. Overall, these data suggest that Cl- channels are required for proliferation of glioblastoma cells. Further work is needed to establish the molecular identity of the Cl- channel involved in glioblastoma cell growth, and if targeting Cl- channels may stop proliferation of glioblastoma multiforme in vivo.

6. Bebensee AF, Tokuyama A, & McFarlane H
Neuroscience Program, Kenyon College

Learning and memory differences in BTBR T+tf/J mice versus C57BL/6J mice

Autism is characterized by three major behavior symptoms: deficits in social interactions, deficits in reciprocal communication, and repetitive and stereotyped behaviors. Present research suggests that the inbred strain, BTBR T+tf/J (BTBR), displays behavioral symptoms analogous to the three major diagnostic symptoms of autism (McFarlane et al., 2007; Moy et al., 2007; Scattoni et al., 2008). However, children with autism spectrum disorder who have impairments learning environmental regularities like when or where an event may occur (Lieberman, 2000) also have difficulties with social communication. In order to further establish BTBR mice as a possible model for autism we must understand their learning in relation C57BL/6J (B6) mice. In the present study spatial awareness and memory were tested using the Barnes maze with 7-9 week old BTBR and B6 mice. The Barnes maze (BM) requires subjects to learn the position of a hole from visual clues; this hole can be used to escape the brightly lit, open surface of the maze. The B6 mice are reported to perform well in different spatial memory tasks including the BM. The mice had one day of 'training' and were then tested twice a day for 38 days. Spatial awareness and memory were analyzed using three categories of search strategies: direct (Spatial), mixed, and serial. The number of errors, (total latency and primary latency), and time required to enter the goal box was also recorded. Only the BTBR mice have variation in the total latency (when the mouse enters the goal box) when compared to the primary latency (when the mouse first finds the goal box). Sex variability was more prominent between the BTBR mice than the B6 mice. In addition, male BTBR mice took significantly longer to enter the goal box, and made significantly more errors than B6 mice. The findings suggest that the BTBR males did not find the environment aversive enough, and/or they had a harder time with spatial learning. These results again show deviances in behavior with the BTBR mice, and suggest they have impairments with spatial awareness.

7. McGraw J, Harmon KM and Cromwell HC
Department of Psychology and J.P. Scott Center for Neuroscience, Mind and Behavior, Bowling Green State University

Corticosterone manipulations and social behavioral development in the rat

Corticosterone (CORT) is a stress hormone that has been known to be responsible for balancing and controlling psychosocial and physical stressors during certain developmental stages. Within the neonatal time period (postnatal days 1-21), there are unique stressors, such as isolation, where the role of CORT could be essential. However, the hormone has not yet been assessed when maternal bonding and attachment takes place between the dam and her pups. Two behavioral paradigms were conducted to examine the role of CORT on mother-infant interaction: 1) Distress calls during isolation 2) Duration of contact with the anesthetized dam. CORT was manipulated with an injection of CORT or a CORT inhibitor called Metyrapone (Met). Metyrapone showed a trend for decreasing distress calls and decreasing amount of time spent with the anesthetized dam. In addition, CORT injections did not affect distress calls, but it nonsignificantly decreased the amount of time spent with the anesthetized dam. These preliminary results suggest that social bonding may be partially mediated by corticosterone.

8. Kelley E, Kennedy RC, & Cushman HN
Neuroscience Program, Washington & Jefferson College

The Effects of Lactate on Acid-Induced Hyperalgesia in Mice

Repeated intramuscular injections of acidic saline cause long-lasting mechanical hyperalgesia in mice via a mechanism thought to involve acid-sensing ion channels (ASICs). Since ASICs are potentiated by extracellular lactate, we explored the possibility that lactate would increase the behavioral effects of muscular acidosis. The right gastrocnemius muscle of C57BL/6 mice was injected with buffered solutions of either lactic or hydrochloric acid. Two additional control groups were injected with either phosphate buffered saline (PBS, pH 7. 4) or PBS + lactate (pH 7.4, 15 mM lactate). Paw withdrawal thresholds were tested over nine days using Von Frey filaments, and the animals' activity level was monitored using in-cage running wheels fitted with distance-counters. Acid-injected mice demonstrated significant mechanical hyperalgesia compared to mice injected with either control solution. In addition, mice injected with lactic acid showed a significantly greater decrease in mechanical threshold compared to mice injected with hydrochloric acid. No significant difference was seen between mice injected with PBS and mice injected with PBS + lactate. Mice injected with lactic acid also exercised less than mice injected with hydrochloric acid of the same pH. Contrary to expectation, mice injected with lactic acid experienced a recovery in mechanical threshold to baseline on day six while the mice injected with hydrochloric acid did not. These data suggest that lactate, when introduced in the presence of acid, plays a significant role in the enhancement of the behavioral effects seen as a result of repeated acid injections.

9. Cochran ML, Karelina K, Norman GJ, Wells J, Zhang N & DeVries AC
Department of Neuroscience, The Ohio State University

Influences of Social Housing and Oxytocin on Neuroinflammation after Focal Cerebral Ischemia

Social integration is essential in order to maintain good mental and physical health. Socially isolated individuals can experience an increased risk of negative physiological and psychological consequences following stroke, while social support has been shown to have a buffering effect on these consequences. Our primary hypothesis was that oxytocin (OT), a neuropeptide released during social interactions, plays a pivotal role in the mediation of these effects. The goals of this research were to determine whether: 1) social isolation exacerbates neuroinflammation following stroke, and 2) the effects of social housing on neuroinflammation are mediated by OT. Socially isolated or paired mice underwent middle cerebral artery occlusion (MCAO) and were treated with aCSF (artificial cerebral spinal fluid), OT or an oxytocin antagonist (OTA). Our data indicate that following a stroke, paired animals have significantly smaller infarcts compared to isolated animals. The treatment of isolated mice with OT, however, resulted in a reduction in infarct volume. Additionally, treatment of paired mice with OTA resulted in increased infarct volume. Social isolation also exacerbated neuroinflammation following an ischemic event; socially isolated mice had reduced mRNA expression of interleukin-6 (IL-6: a neuroprotective cytokine), increased expression of MAC-1 (a complement receptor protein expressed on macrophage-lineage cells), and increased glial fibrillary acidic protein (GFAP; gene markers of reactive gliosis). These effects in isolated mice were reversed by OT treatment, and the neuroprotective effect of social housing was blocked by OTA. Together, these data support the hypothesis that social interaction is protective against cerebral ischemic damage and that OT may have anti-inflammatory properties.

10. Kenemuth JK, Hensler AJ, & Coates EL
Neuroscience Program, Allegheny College

Investigating the Transduction Pathways of Odorants and Olfactory CO2 in Mice

Physiological concentrations of CO2 (less than the 4-5% CO2 in expired air) have been shown to stimulate a small subset of olfactory receptor neurons allowing mice and rats to "smell" low concentration of CO2. The second messenger cAMP is known to play a role in the detection of typical odorants while recent studies indicate that cGMP and the enzyme carbonic anhydrase (CA) are important for the detection of CO2. The objective of this study was to further investigate the transduction pathway for CO2 detection by recording olfactory receptor responses to CO2 and odorants before and after topical application of L-cis-diltiazem, which inhibits cGMP activated Ca++ channels or niflumic acid, which inhibits Ca++ activated Cl- channels. Wild-type (C47Bl6J) mice were euthanized and the olfactory epithelium was exposed. Electro-olfactograms (EOG), which measure summated olfactory receptor responses, were recorded from the surface of the olfactory epithelium in areas known to contain high concentrations of CA. EOGs were recorded in response to CO2 (0-50%) and odorants before and after application of the inhibitors. We found that application of L-cis-diltiazem attenuated the EOG response to CO2 to a greater extent than the EOG response to odorants indicating that cGMP activated Ca++ channels are important in the CO2 transduction pathway but do not play a role in typical odorant transduction pathways. The experiments using niflumic acid show that application of this inhibitor attenuated the EOG responses to both CO2 and odorants, indicating that Ca++ activated Cl- channels may play a role in sensing CO2 as well as typical odorants. The results of these experiments provide further support for a unique olfactory transduction pathway for the detection of CO2 in mice.

11. Gurnani A, Jung K, & Saif L.
Department of Psychology and Program in Neuroscience, The College of Wooster

Potential role of nitric oxide in innate immunity in inhibiting viral replication in pigs infected with porcine respiratory coronavirus

Nitric oxide (NO) mediates innate and adaptive immunity by inhibiting viral replication in response to respiratory infections. Co-infection of pigs with respiratory viruses, such as porcine respiratory coronavirus (PRCV) and porcine reproductive and respiratory syndrome virus (PRRSV), increases IF-γ-induced serum and lung responses relative to single-infected pigs. Thus, the aim of this study was to examine NO levels in the lungs of pigs infected with either PRCV or PRRSV, or co-infected with PRRSV and PRCV. Additionally, a second aim was to evaluate the antiviral effects of NO on replication in PRCV infected cells using the NO donor, S-nitroso-N-acetylpenicillamine (SNAP). Pigs born in a germ-free environment were randomly assigned to one of four groups: PRCV single-infection (n = 26), PRRSV single-infection (n = 20), PRRSV/PRCV dual-infection (n = 26), and mock control (n = 20). Bronchoalveolar lavage (BAL) samples were collected at early, middle and late stages of PRCV infection and the amount of NO generated was calculated using NO assays. Results show that PRCV, but not PRRSV, increased NO levels in early and middle stages of infection. Consistent with antiviral activity of NO, SNAP-treatment inhibited PRCV replication in infected cells. These results suggest that unlike PRRSV, respiratory CoVs such as PRCV which infect pulmonary epithelial cells and cause cytolysis induce NO production, and that NO production may serve to inhibit viral replication.

12. Trembath AT, Fenster CP
Department of Neurobiology, College of Wooster

Effects of Bisphenol-A on Primary Neurons In vitro.

Bisphenol-A(BPA) is a chemical used in plastics and epoxies found in a multitude of everyday items. BPA then leaches out of these products, many of which are used in food containers. Further, BPA is not removed by waste water treatment, which leads to the accumulation of measureable levels of the chemical in lakes and streams. In vivo studies have suggested that BPA acts as an endocrine disruptor, mimicking and disrupting estrogen signaling. Our research focused on comparing the effects of physiologically relevant levels of estradiol with those of environmentally relevant levels of BPA and its estrogenic metabolite, 4-methyl-2,4-bis(p-hydroxyphenyl)pent-1-ene(MBP) on developing neurons in vitro. Both primary cerebellar and primary hippocampal neuron cultures were treated with media containing either BPA or MBP. Following 48 hours of treatment, cells were fixed and MAP2 immunocytochemistry was used to visualize and analyze neurite outgrowth. Neurite outgrowth and cell survival was also assessed via the Alamar Blue cell viability assay from Invitrogen. Analysis of growth data from both assay methods showed no significant difference in growth of cerebellar granule cells between the treatment and control groups. These data were consistent with the results of previous studies, which found that neurite outgrowth of cerebellar granule cells was not influenced by estrogen. Data from cell viability assays of hippocampal cultures suggested that treatment with BPA, MBP, and estradiol individually increased cell viability over the control. Treatment with both estradiol and MBP did not result in a significant increase in cell viability, suggesting that together the chemicals become toxic, or begin to block one another.

13. Derry HM, Hovda DA, Prins ML
Department of Psychology, Ohio Wesleyan University

The Effects of Ketogenic Diet on Axonal Injury and Behavioral Deficits After Repeat Mild Traumatic Brain Injury

Sustaining one mild traumatic brain injury (mTBI) increases the risk of experiencing an additional concussion, and the damage from a second injury may be more deleterious and permanent than that from a single impact. The current study evaluated a new repeat mTBI model in rats by examining behavioral and anatomical outcomes. In addition, a ketogenic (KG) diet was examined as a protective measure against subsequent injury. Juvenile male Sprague-Dawley rats were assigned to sham, single injury, repeat injury, and KG groups. Single injury animals received one mTBI, while repeat TBI rats received a second impact 24 hours after the first injury. KG animals were given the KG diet immediately following the primary injury, and resumed normal diet following the second impact. Rats underwent behavioral testing to evaluate the presence of deficits similar to those that mark human complaints after concussion. Repeat mTBI animals exhibited deficits in exploratory behavior, as evaluated by an open field task, yet maintained the ability to discriminate in a novel object recognition task. Immunohistochemical analysis revealed an increase in glial fibrillary acidic protein (GFAP), β-amyloid precursor protein (β-APP), and myelin basic protein (MBP) staining for repeat injury animals. There were no significant differences between repeat injury and KG animals, and further examination of the diet's usefulness with respect to mTBI is necessary. The model successfully produced greater anatomical and behavioral deficits in repeat injury animals as opposed to single injury animals, demonstrating its effectiveness in modeling repeat mTBI.

14. Wells JS, Karelina K, DeVries AC
Department of Neuroscience, Ohio State University

Social Interaction Ameliorates Stress-induced Worsening of Stroke Outcome in Mice

Stress and social environment have been recently identified as important risk factors for stroke. Specifically, both stress and social isolation exacerbate stroke outcome through a mechanism that may involve the hypothalamic-pituitary-adrenal (HPA) axis. Conversely, affiliative social interactions have been shown to improve stroke outcome. The goal of the current study was two-fold: 1) to identify the mechanism by which social interactions modulate stroke outcome and 2) to determine whether social interactions provide a buffer against stress-induced exacerbation of stroke outcome. For this study, we used middle cerebral artery occlusion (MCAO) or SHAM surgery in mice to induce stroke. Male C57/bl6 mice were housed individually or paired with an ovariectomized female for two weeks prior to stroke and throughout the three day recovery period. Mice in both housing conditions were assigned to stress (restraint) or non-stress conditions. Pre- and post-surgical behavioral testing was conducted on all animals. Our data indicate that following stroke, non-stressed, socially isolated mice showed a significant increase in infarct volume compared to pair-housed mice. However, among stressed mice, infarct volume did not differ by housing conditions. Behavioral analysis indicated that following stress, socially isolated mice had significant functional deficits relative to all other groups tested. However, stressed pair-housed mice showed significant improvements in functional recovery and several behavioral measures indicated that recovery among this group returned to pre-surgical levels. The mechanism by which social interactions influence behavioral measures in the absence of differences in infarct volumes is currently under investigation. Taken together, these data show that 1) social interaction influences stroke outcome and 2) social interaction buffers mice against stress-induced exacerbation of poststroke functional deficits.

15. White A & MacDonald A
Department of Psychology and Program in Neuroscience, Ohio Wesleyan University

Establishing Visuospatial Tasks Sensitive to Context Processing Deficits in Schizophrenia

Deficits in context processing, the ability to represent and maintain information for the purpose of controlling behavior, is one of many debilitating effects of schizophrenia. Tasks have been developed that elicit a double dissociation between individuals with intact context processing and those without. Not only do schizophrenia patients frequently fail to use appropriate information to guide behavior, but extraneous information often impairs their performance. The current study investigated the validity of two potentially translational tasks to study cognitive deficits caused by schizophrenia, the Spatial AX and DYSC Shift Tasks. Consistent with previous work in the field, error rates were increased on trials in which participants had to overcome a prepotent response in the Spatial AX Task and for incongruent trials in the DYSC Shift Task. These findings warrant testing these tasks in schizophrenia patients as well as nonhuman primates in an attempt to further our understanding of this devastating disorder.

16. Stevenson RJ, Esselburn K, & Rhodes HJ
Department of Biology, Denison University

Investigation of chemical communication in Xenopus laevis, the African Clawed Frog

Male Xenopus laevis use advertisement call—a vocal pattern consisting of fast and slow trills—to attract potential mates. They increase this behavior when females are present. Until recently, the attraction and location of mates in anurans has been attributed almost exclusively to acoustic communication. Recently, researchers have found that many anurans also attract and locate mates using chemosignals and pheromones. In this study, we asked whether chemical communication could play a role in the mating behaviors of X. laevis. We found that male X. laevis spent more time calling when exposed to water from another male's tank than when exposed to plain water, and that males spent more time calling when exposed to water from an unreceptive female's tank than when exposed to water from to a receptive female's tank. Based on these findings, the existence of an X. laevis sex-related chemosignal seems likely.

17. Offenberger, MA, Lovejoy, TI, Suhr, JA, Heckman, TG, Sikkema, KJ, Hansen, NB, & Kochman, A
Department of Psychology, Ohio University

Negative Affective States are Associated with Perceived, but not Actual, Cognitive Abilities

Objectives: To examine the association between affective states and perceived and actual cognitive abilities in HIV-positive older adults.

Participants and Procedures: Participants were 287 persons (Mean age = 55.4 years; 67.2% male) enrolled in a three-arm, randomized clinical trial evaluating a coping improvement group intervention for HIV-positive adults 50-plus years of age. At pre-intervention, participants completed a demographic battery, psychological measures including the Geriatric Depression Scale and the Beck Anxiety Inventory, the perceived cognitive functioning scale of the Functional Assessment of HIV Infection (FAHI) quality of life measure, and underwent a brief neuropsychological examination that included measures of executive functioning, psychomotor processing speed, verbal fluency, fine motor control, and global cognitive functioning.

Results: Nearly two-fifths of the participants met criteria for HIV-associated Asymptomatic Neurocognitive Impairment (ANI), defined as performance at least one standard deviation below the demographically-corrected mean within two or more cognitive domains, while 36% perceived themselves to be "somewhat" to "very" cognitively impaired, as measured by the FAHI. Participants who perceived themselves to have worse cognitive functioning scored higher on measures of depression ($t(285) = 8.17$, $p < .001$) and anxiety ($t(285) = 7.72$, $p < .001$) than those who perceived themselves to have better cognitive functioning. However, negative affective states were unassociated with actual cognitive abilities (p's $> .10$).

Conclusions: Heightened depression and anxiety may impact individuals' self-reports of cognitive impairment. Health professionals working with this population should consider assessing patients' psychological states when attempting to determine patients' cognitive profiles using self-report methods.

18. Nordbo M & Leupen S
Department of Zoology, Ohio Wesleyan University

Evidence for Sex Steroid Feedback on GnRH in Urodele Amphibians

In recent years the rate of extinction of amphibians the world over has greatly increased. Our knowledge of amphibian reproductive physiology is incomplete, and therefore this study examines whether or not the reproductive axis of amphibians mirrors that of mammals and birds, in which the hypothalamus secretes gonadotropin-releasing hormone (GnRH) into the hypophyseal portal system, which stimulates the production of luteinizing hormone (LH) and follicle stimulating hormone (FSH) from the anterior pituitary. These hormones enter the bloodstream and reach the gonads where sex steroids are released into the blood and travel to the brain, operating by negative feedback to prevent further production of GnRH. This study examines GnRH protein levels in three groups of axolotls (Ambystoma mexicanum). Control animals were untreated. The second group had their testes removed (orchidectomy, ORX) and the third group had their testes removed followed by a testosterone replacement treatment (ORX + T). The testosterone is replaced by adding a capsule filled with testosterone acetate and sealed at the edges with silica gel to allow for a slow diffusion rate. After three weeks, animals were sacrificed, and the brains were fixed and sliced. GnRH neurons were detected on the slices using a fluorescent immunohistochemistry (IHC) procedure and counted using confocal microscopy. We found a mean of 14 neurons in the control group, 35 neurons in the ORX animals, and 0 in the ORX + T group, which is consistent with the operation of negative feedback in the axolotl. Loss of some brain tissue during the experiment prevented sufficient numbers of animals being included in the final analysis, which will be rectified with the continuation of this project in the fall semester.

19. Benson KE, Campbell KL,& Cushman HN
Departments of Biology and Neuroscience, Washington & Jefferson College

Effects of Lactic Acid Profusion in Rat Model in vitro Skin-Nerve Preparation

Ischemic pain occurs when the local blood supply is unable to meet the metabolic demands of the surrounding tissue. Acid-sensing ion channels (ASICs) are thought to trigger ischemic pain by detecting concurrent increases in extracellular proton and lactate concentrations. In this experiment, an in vitro skin-nerve preparation was used to record activity from sensory neurons. The glabrous skin and attached tibial and plantar nerves were dissected from the hind leg and foot of 20 Sprague Dawley rats. Electrophysiological recordings were then made from small nerve filaments that contained C-fiber activity. A significant increase in C-fiber activity was seen following application of lactic acid (pH 6.5) to the cutaneous receptive field (n=7). This increase in activity was not seen when the receptive field was exposed to hydrochloric acid (pH 6.5, n=4) or when a buffered solution containing 15mM lactate was applied (pH 7.4, n=3). The results suggest that lactate may contribute to ischemic pain by enhancing ASIC sensitivity to H+ ions.

20. Edwards, RD
Department of Music, Ohio Wesleyan University

The Neurosciences and Music Education: An Online Database of Brain Imaging Neuromusical Research

The purpose of this study was to create an online database to organize and summarize the field of neuromusical research (i.e., the study of brain processes involved with musical experiences). The guiding principles of this dissertation were to (1) assess and clarify the current state of neuromusical research, and (2) explore how this research relates to the pedagogical, psychological and philosophical foundations of music education. Given the rise of brain-imaging neuromusical research in the last two decades, in conjunction with a lack of holistic efforts to evaluate these studies, there is a clear need to compile and summarize neuromusical research into a summative database. Until this time, no such resource has existed.

The resulting database of this project has been titled the Musical Brain Imaging Research Database (MusicBIRD) and currently holds 473 studies of neuromusical research available online at http://www.uncg.edu/mus/mri/neuromusical.html. Qualifying neuromusical studies were identified with a keyword search for “music” and “brain” in leading electronic research databases (e.g., PubMed and RILM). After reviewing each study, summative information was entered into an electronic storage format within the following data fields: Title, Author(s), Date, Keywords, Source, Volume, Issue, Online Source, and Abstract.

The implications of neuromusical research for music educators include a strengthening of the belief that the potential for music processing is ubiquitous to all humans, and that until more longitudinal studies can be conducted, a clear understanding of whether musical training does or does not have an effect on non-musical brain processes (e.g., language skills) is not possible at this time. Several recommendations for future research include brain imaging scans associated with effective pedagogical music learning practices, longitudinal studies of brain development during periods of musical training (e.g., preschool to adulthood), and investigating the potential for shared, proximal, or distinct neural networks dedicated to music and non-music systems.