



Integrative Physiology

University of Colorado
Boulder

Department
Newsletter

IPHY

Issue #14

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Special points of interest:

- IPHY undergraduates are encouraged to conduct independent research and present at professional meetings
- IPHY initiates measures to gauge department climate and identify inclusion issues
- IPHY graduate students participate in diversity event
- IPHY summer classes provide flexibility for students with scheduling difficulty

Inside this issue:

Hellos	2
Undergraduate Research	3
International Students	6
Community Night	7
Pathway to Medical School	9
Summer Classes	10
Student Resources	12
Kudos	12
Cartoon	14
Graduates	15
Many Thanks	16

A Few Words from the Chair — Pei-San Tsai

The fall semester of 2015 has been a good one for IPHY. At present, our undergraduate enrollment at ~1900 makes IPHY the largest undergraduate major at CU-Boulder. Accompanying this enrollment is a strong first-year retention rate of 87% and a record number of bachelor's degrees we have awarded in 2015 (333). In addition, we have recruited two excellent faculty, Drs. John Harsh and Josiane Broussard to advance our teaching and research missions. Drs. Harsh and Broussard are introduced in the next section of this newsletter.

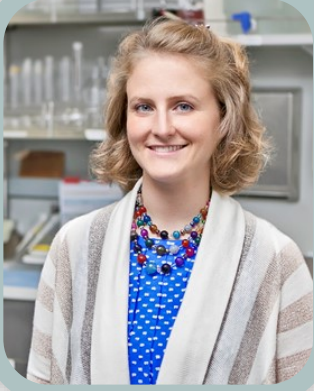
There are a number of notable developments related to undergraduate and graduate education in fall 2015. First, in parallel with the CU-Boulder's effort to improve the campus climate, we have formed a departmental committee that comprises, in part, graduate and undergraduate students. This is a part of the large "Inclusive Excellence" project that aims to identify campus climate issues associated with students, staff, and faculty. IPHY is highly committed to ensuring a healthy, productive, and inclusive environment for all its members and will aggressively identify and address any problems. Second, IPHY is spearheading several efforts to ensure its curricular consistency and teaching innovations through a collaboration with the Center for STEM Learning. An example of this includes having dedicated coordinators to review and innovate our foundational courses such as Human Anatomy, Physiology 1, Physiology 2, and Statistics. Third, we continue to emphasize the importance of hands-on undergraduate research experience by offering an IPHY Everson's undergraduate scholarship and supporting the attendance of several undergraduates to present at national meetings. Some examples of undergraduate research are presented in a later section of this newsletter. An important future goal is to establish additional named scholarships to support undergraduate research and travel to present at professional meetings. These scholarships will foster experiences that go beyond simple classroom learning and benefit the recipients for life.

We will continue to work hard to maintain our teaching and research standards. We sincerely appreciate the feedback, suggestions, and monetary contributions from IPHY alums, students, friends, and members. I would like to take this opportunity to express my gratitude, and I hope I can continue to count on everyone's support in the foreseeable future.





Hello from Josiane Broussard Research Assistant Professor of IPHY (August 2015-present)



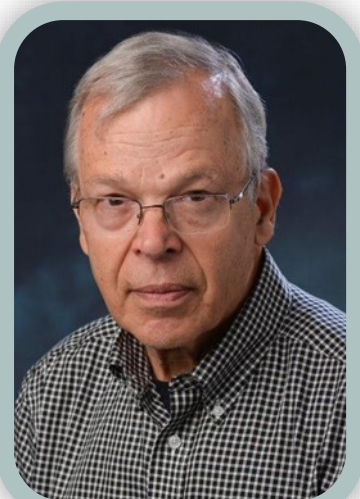
I have been interested in sleep as it relates to metabolic health for the past 10 years. My graduate work focused on the effects of sleep loss on the function of the fat cell and my postdoctoral work focused on insulin sensitivity, compensation and access to skeletal muscle in an animal model of obesity. I now wish to bring my molecular and translational background to a clinical research setting to continue to explore the links between sleep and health. My ultimate research goals are to develop and test countermeasures to the cardiovascular and metabolic impairments associated with insufficient sleep and circadian misalignment. During graduate school I also coached a high school girls' lacrosse team for five seasons where I developed my teaching/coaching style and philosophy. I look forward to putting those skills to good use by participating in graduate and undergraduate teaching in IPHY.

Hello from John Harsh Adjunct Professor and Statistics Instructor (August 2015-present)

Having the opportunity to teach an introductory statistics class as an adjunct member of the IPHY faculty has been a treat for me. The "Baby Stats" course has been my favorite since I began teaching in the early 70s. My experiences in the classroom have been very positive so far. I have high appreciation for the considerable time that has been devoted to the development and refinement of a unique teaching approach. The support from department faculty has been much beyond what I expected, and the students have a level of ability and enthusiasm that is totally new to me.

By way of background, my research career began with investigation of the significance of predictability and controllability in aversive and appetitive environments using animal models. My interests eventually turned to the viability of behavioral techniques in the control of abnormal respiration (obstructive sleep apnea) during human sleep. NIH and NIMH provided good support for these areas of investigation. That support dried up however, with the emergence of CPAP, a convenient and generally effective therapy. I then turned to the study of cognitive and neurobehavioral functioning during the sleep onset period with support from the Department of the Army. Using telemetry, we were monitoring the HR, EEG, and eye movements of sleepy helicopter pilots during Nap of the Earth maneuvers when the USSR collapsed and the division funding this research was eliminated. I then turned to sleep medicine, became board certified (one of a few fields where a PhD can be boarded), and split my research time between target (treatments of narcolepsy, sleep apnea, insomnia, shift work sleep disorder, and restless leg syndrome) and fundamental (pathophysiology of narcolepsy, pediatric sleep) topics. Funding for these studies came from pharmaceutical companies and NSF. During this interval, I was director of the local sleep clinic with responsibility for the interpretation of sleep studies. Now that I am in Boulder, I look forward to working with Drs. LeBourgeois and Wright as they study circadian and sleep health.

I have been asked whether my many years of teaching would lead me to make suggestions about how statistics could best be integrated into an undergraduate curriculum. Being new, my knowledge of the IPHY curriculum is limited, but I can recount my positions and experiences in my former department. I was always ready to argue that mastery of statistical subject matter is essential for knowing what to think and knowing what to do in a data driven environment.





I lobbied for introducing statistics modules at the earliest possible time and throughout the curriculum and advocated for high standards in the introductory course with subject matter carefully tailored to meet post-graduate needs. Also I developed a second statistics course called “Advanced Data Analysis” to increase our offerings for advanced students. This course was in high demand among students working on research teams and/or wanting to be better prepared for grad school, med school, etc. I also developed and supervised a Statistics Learning Center that was initially intended as a resource for students not well prepared to study statistics.

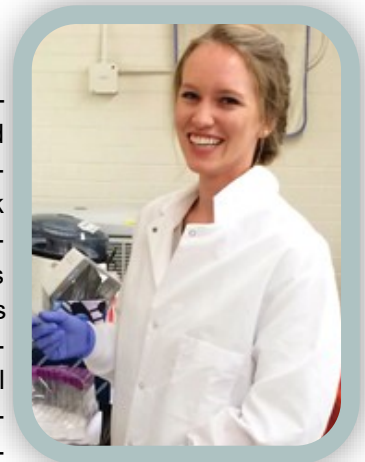
The Center was staffed by undergraduates and a graduate TA, all trained in tutoring techniques. It eventually became the place to go for undergraduate (and graduate) students from around campus wanting help with basic concepts, statistical software, database management, etc. The undergraduate staff were very often inspired by their experiences at the Center and many volunteered every semester until graduation. One of my future goals is to create a service-oriented Statistics Club for IPHY students to boost the interest and advertise the usefulness of statistics.

IPHY Undergraduates Conduct Independent Research and Present at Professional Meetings — IPHY Undergraduates

Performing independent research is an important part of the IPHY undergraduate experience. Depending on the students’ professional goals, the outcome of undergraduate research can range from learning simple techniques to generating novel data for publication and professional presentation. The undergraduate research experience is a unique experience offered only by top-notch research programs such as IPHY. Below is a kaleidoscope of research experiences from some of our top undergraduate researchers.

Kristina Hulen

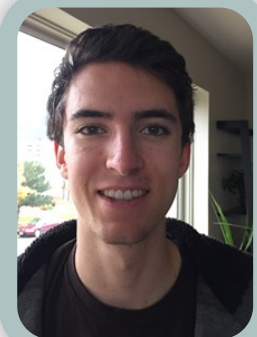
I began working in Dr. Monika Fleshner’s Stress Physiology Lab my junior year, and I initially committed my time through independent study while I tried my best to understand and incorporate myself into all of the different projects within the lab. Coming into my senior year, I received the Howard Hughes Medical Institute Grant (HHMI) to fund my work towards an honors thesis. I worked with a graduate student, Aggie Mika, on several projects and we eventually designed an experiment for my thesis that investigated the effects of exercise within the brain during distinct periods of development. Early-life experiences play a critical role in neural development and can lead to long lasting changes within regions that regulate mood and cognition. We know that early-life exercise has the potential to produce long-term increases in neural growth proteins; however, the period and mechanism by which this happens is unknown. My project aimed to isolate the period of development during which the exercise can produce these robust changes within the brain. With the help of colleagues, I was able to see this experiment through every step and produce substantial data for both my honors defense and HHMI final poster presentation. There is no question that this process was challenging, as I dedicated countless hours and many sleepless nights to complete my work. In the end, however, this experience helped hone my skills and abilities to work independently in a scientific setting and it provided me with a comprehensive, hands-on understanding of the physiology we study as IPHY students. After graduation, I decided to stay with the lab to continue my work on this project and, with funds from the Everson Trust IPHY Undergraduate Scholarship, I was able to travel to Chicago in the fall to present new data from my project at the Society for Neuroscience Conference. The conference gave me the opportunity to talk about my work and explore the posters and presentations from many brilliant minds within my field. It was overwhelming, yet incredibly fulfilling to be a part of this massive hub of scientific discovery. Currently, I am still working in Dr. Fleshner’s lab and I am continuing to produce new and exciting data with hopes of publishing my own paper. This experience thoroughly enhanced my education at this university and gave me insight to the many different aspects of research. Beyond that, this lab has offered me a more involved perspective of the body, bolstered my love for scientific understanding, and gave me the edge and foundation I need to build a career.





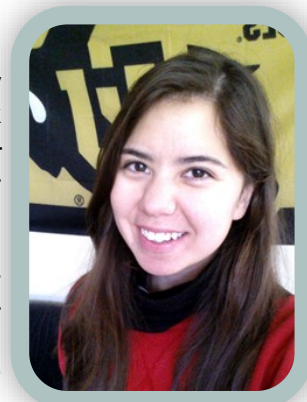
Ian McClain

We know surprisingly little about sleep in toddlers. Why do some children stop napping before others? What are the physiological, behavioral and emotional consequences of a missed nap? What can those odd looking, high frequency bursts of electrical brain activity called sleep spindles tell us about early childhood brain development? At the Sleep and Development Laboratory, we are searching for answers. I presented some of my own answers in poster format at the 29th Annual Meeting of the Associated Professional Sleep Societies ("SLEEP") in Seattle, Washington, following my third year as an undergraduate research assistant (June 2015). At SLEEP, I discussed my project examining developmental changes in sleep spindles and methods of signal analysis, with knowledgeable scientists who provided an abundance of questions, critiques and suggestions. Additionally, I had a chance to network and attend lectures surrounding the most current research in sleep and circadian biology. I was generously supported by a BURST travel grant during this trip and have received numerous UROP grants over the years that have helped support my research. My experience at SLEEP, in addition to the time I have spent pursuing research through the Department of Integrative Physiology, have been invaluable parts of my education.



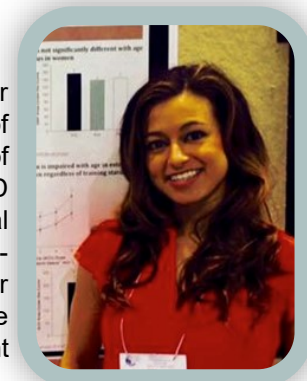
Nicole Rumian

The main focus of the Fleshner lab is to investigate how stress physiology and physical activity can produce stress protective effects behaviorally, neurologically, and immunologically. The work I have been assisting with investigates the underlying neural mechanisms of early life exercise-induced stress protection. Specifically, I have been characterizing the changes exercise produces on the serotonergic system, while simultaneously examining the differences between starting exercise as an adult versus starting as a juvenile. Last year, my research was funded by UROP, allowing me to attend and present at the annual meeting of Society for Neuroscience in Washington D.C. Being my first scientific conference, it was quite overwhelming initially. However, after finally settling into my surroundings, the conference was an incredibly informative event. I was able to learn an enormous amount about the field of neuroscience from not only other undergraduate researchers like myself, but from experts in the field who have been investigating for decades. I also learned just how interdisciplinary and far reaching the field is. The conference was also a great opportunity for me to improve my presentation skills as I took part in a 4-hour poster session explaining the work I do to colleagues of all levels in the neuroscience field. The entirety of my experience in research would have been impossible if IPHY didn't have such a great program, so full of opportunities. Even though I'm not technically an IPHY major (a double major in Neuroscience and MCDB instead), the Fleshner lab offered me a position and has cultivated both my skills and interests as a researcher from day one and I couldn't be more grateful.



Talia Strahler

My independent research project focused on the difference in vascular aging among trained or sedentary post-menopausal women. Cardiovascular diseases (CVD) remain the leading cause of mortality in developed societies. Advancing age is the primary risk factor for the development of CVD in part due to adverse changes of arteries. One primary contributor to increased risk of CVD is the development of endothelial dysfunction. Men show a steady decline in vascular endothelial function from age 30, while women have preserved vascular endothelial function until menopause. With the onset of menopause the rate of decline in vascular endothelial function is greater than the age-matched rate of vascular endothelial function decline in men. We sought to provide insight into the macro- and microvasculature function in habitually AE trained estrogen-deficient postmenopausal women. We hypothesized that chronic AE trained estrogen-deficient postmenopausal women will not be protected against age-related macro- and microvascular endothelial dysfunction.



My study was supported by my mentor, Jessica Santos' PI grant and with her help as well as the work of past lab member's our research was presented at the April 2015 Environmental Biology Conference. I really enjoyed my time at the meeting since the topic of the differences in men and women in later life was a very hot topic at the conference.

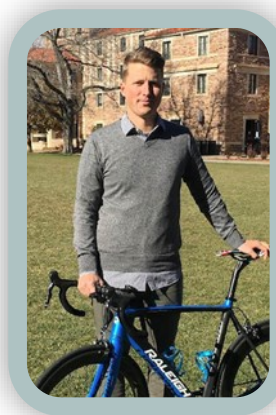


There was a large amount of presentations dedicated to this topic and many researchers in that area of research were very interested in my work as well.

Overall, my experience in the IPHY department has shaped me as an adult venturing out into the real world. I have experience that surpasses my peers and knowledge that surprises many. I am now in the process of applying to physical therapy school. I have accepted the offer to interview at CU Denver as well as anticipate an offer from a few other schools. If entering the world of healthcare/science is of interest, I highly recommend the IPHY program at CU-Boulder.

Asher Straw

Bicycles fascinate me. They are beautiful machines that can both amplify the physical abilities of the human body but also allow racers to push themselves beyond their physiological limits. My enthusiasm for and curiosity about bicycles led me to conduct biomechanical and physiological research in Prof. Rodger Kram's Locomotion Lab. For my first project, I studied how shoes and different pedals affect the efficiency of bicycling. Surprisingly, I found that in terms of physiological efficiency, expensive carbon fiber cycling shoes and pedals offer no advantage over sneakers and pedals like I had on my bike when I was a kid. I presented my research at the Rocky Mountain American Society of Biomechanics meeting in Estes Park and won an award for the best undergraduate poster. I was terrified before I went to the conference and expected it would be like "Shark Tank". But, the conference had a very cultivating and supportive environment allowing me to relax, really learn and grow. I have submitted my findings for publication in the journal *Footwear Science*.



Building on my first study, I applied for and received a summer 2015 UROP grant and began my second study. Prof. Kram encouraged me to think outside the box and I decided to challenge the conventional way of cycling with the cranks/pedals opposite of each other (180 degrees). In my experiment, I set the cranks to be "in-phase" so that both legs push down at the same time, like a kangaroo hopping on a bicycle. My preliminary data suggest that this crazy way of pedaling is nearly as efficient as conventional pedaling. Recently, after I explained my research to a visiting scientist, she made me realize that my unconventional bicycle may be a useful rehabilitation tool for stroke patients! This research will comprise my Honors thesis, which I will present and defend in April 2016. Arriving at CU in 2013, I didn't think I was actually capable of becoming a research scientist, but my lab experience is taking me to places I never thought possible. I am applying to the IPHY master's degree program to continue my research and I will just have to see where my bicycle takes me from there.

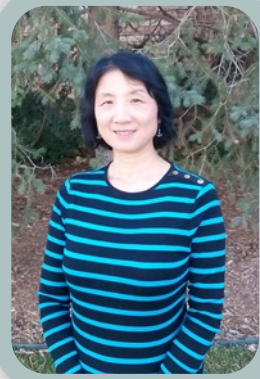
Piper Williams

The objective of my project was to determine the role of organic cation transporter 3 (OCT3) in control of autoinhibition of serotonergic cells within the rat dorsal raphe nucleus (DRN). OCT3 may aid in clearance of serotonin (5-HT) from serotonergic synapses within the DRN, and OCT3 control of serotonergic signaling would have important implications for diverse physiological and behavioral endpoints. Using *in vitro* electrophysiology, the inhibitory effects of the administration of 5-HT and corticosterone, an OCT3 antagonist, on the 5-HT_{1A} autoreceptor function were investigated. My exploration in science included an undergraduate research assistantship, two individual grants from UROP and HHMI, and a fellowship from the Irene and Eric Simon (IES) Brain Research Foundation. I had the opportunity to present my research at the IES anniversary dinner in November 2014, as well as the BSI UROP-HHMI Bioscience poster session in April 2015. I had an extremely positive experience at both meetings and was very fortunate to have had these opportunities. As an undergraduate research assistant in Dr. Christopher Lowry's laboratory, I was challenged both academically and professionally. The experience I gained not only added to my knowledge base in physiology and taught me important tools such as data analysis, but also my experience made me learn to stand on my own, make the judgment call based on what I observe, and push my mental capacity to the limit. I was able to use the skills I acquired to develop and complete an honors thesis. Today, I work as a research assistant at Children's Hospital Los Angeles, and I will be applying to PhD programs in neuroscience next year.





International Student: Insight into Cultural Challenges — Jia Shi



Did you know the number of international students on the CU-Boulder campus reached 2,646 this fall, comprising 10% of the student body? This is a significant increase compared to just 3% ten years ago. These students represent 100 countries with 1597 undergraduates, 531 master's students, and 518 doctoral candidates. This fall, a total of 48 international undergraduate students majored in biology (MCDB, IPHY or EBIO). Most of the MCDB international students are interested in pursuing medical school after their undergraduate education. Fifty-one international freshmen are taking our popular "Nutrition for Health and Performance" class, IPHY 2420.

The first challenge many international students face is adjusting to cultural differences. Cultural differences may include the meaning of eye contact and how to interact socially. Some international students avoid eye contact when they talk with their academic advisors or professors. Is this lack of eye contact disrespectful? In mainstream Western culture, eye contact is interpreted as attentiveness and honesty; we are taught that we should "look people in the eye" when talking. In many cultures, however, including Hispanic, Asian, Middle Eastern, and Native American, eye contact is thought to be disrespectful or rude, and lack of eye contact does not mean that a person is not paying attention. Women especially avoid eye contact with men because it can be taken as a sign of social interest. Asian students may come to an advising appointment or professor's office hours in pairs. This may seem quite foreign in our Western culture, but it is quite common in Asian culture. As an international student from China put it, "People are fundamentally similar in nature. Expressions from various cultures might be different, but it all roots down to the same feelings."

It is common for international students to feel homesick. Two current international students offered their advice to new international students:

"I was a little homesick over the Christmas break. The easy way to deal with that is to keep yourself busy because if you are busy doing other things, you don't have time to think about home and what's going on back there." - **Tom, England**

I came a long way from Africa to here. In the first few months, it was so scary; I didn't know how I was going to cope up with everything. I find that inviting my friends to come to my apartment, cooking traditional food and eating together helped elevate feelings of being scared." - **Micklina, South Sudan**

Some tips about making new friends are exemplified below:

"I'll go to class very early before the starting time. I will always see those students who are also coming very early. I started greeting and talking with them. It was easy for me to connect with them. After the lecture I will say see you next week or next time. That's how I started developing a relationship with students on campus." - **Micklina, South Sudan**

"Be open-minded is one way to make friends. We are all different. We have different background and principles about life issues. The most important thing I think is ensuring that you are willing to have a dialogue. It's not a dialogue if you are close-minded and trying to enforce your principles onto others." - **Funmi, Nigeria**

Writing is challenging for all students and in particular for international students. The College of Arts and Sciences recommends all freshmen, including international students take a writing course during their first year. Good writing skills are fundamental and help students succeed academically. To this end, two first year writing courses are available: WRTG 1150 and WRTG 1100. Both are first-year writing and rhetoric courses.



They are also approved for the arts and sciences core curriculum: written communication. The difference in the two courses is that WRTG 1150 is a 3-credit course and WRTG 1100 is a 4-credit extended writing course. The additional credit hour adds a small group work session and is intended for students desiring more preparation and practice in college writing. International students could also benefit from taking this extended writing course - WRTG 1100.

As ShiChao from China stated: "When you first arrive on campus, I would recommend you to find an American or English speaking roommate. When I came here, I lived with some other Chinese students so it was not good for my English. Also trying to improve your oral and writing skills as soon as possible. It will definitely help you get involved with local people and also help your academic performance."

A common difficulty facing our international biology students is the biological terminology. As one of the international business students explained: "I love the (nutrition) class, but the terminology is too difficult to understand. This is why I had to drop the class." This story came to my attention during a staff meeting of the International Student Success Network (ISSN). We meet monthly to discuss ways to support international students. Academic advisors are another resource for international students. I'm working with the advisor for international students to develop ways to help international students with the issue of biological terminology. We're looking at running a workshop specifically on this topic – which will address terminology by dissecting the words into their affix and Greek and Latin roots. This workshop will be open to any student taking a biology course.

There are resources on campus to help international students adjust to campus life quickly. International students can seek guidance from experienced international student advisors at the Woodbury Advising Center. These advisors can help international students maneuver through their freshman year. Another resource is the Friday International Coffee Hour at the University Memorial Center Grill from 4:00-5:30pm. Staff representatives from campus offices are there to answer questions. This is a great opportunity for international students to get to know the staff better and also to meet other students.

There are also numerous clubs and activities for international students. Some clubs are based on nationality or culture; others are a mix of students from all over the world. For a complete list of CU student Clubs and Organizations, please see the CU Student Group Directory (<http://sofo.colorado.edu/SOFOsdg.php>).

We hope this article has raised your awareness of resources available for international students at IPHY and other biology departments.

Community Night — Annie Miller, Ellen Stothard, Bryant Pham, James Hassell

On October 14, 2015, four graduate students from IPHY participated in a community night activity hosted by the Biological Science Initiative (BSI). BSI is a program at CU that aims to educate and expose underrepresented undergraduate students to science and research. BSI is also involved in training K-12 educators on new hands-on techniques to better teach science to young students. This past fall semester, BSI offered a course to Science, Technology, Engineering, and Math (STEM) students from the Minority Arts and Sciences Program (MASP), called Intro to STEM Research Methods (ARSC 1450). This course provides freshman students with the skills and resources they will need in the future to understand research and gain their own experience in research later on in their academic careers.



The graduate students from all over the CU Boulder campus, ranging from mathematics to astrophysics, came to share their experiences in research. IPHY was fortunate to have four graduate students represent us: Annie Miller, Ellen Stothard, Bryant Pham, and James Hassell. These are IPHY graduate students who serve our educational mission as teaching assistants and as mentors to our undergraduate researchers. After their presentations at the community night, they received multiple inquiries from underrepresented students to tour or conduct research in IPHY labs. On the following pages are personal introductions and research topics presented by the four graduate students at the community night.

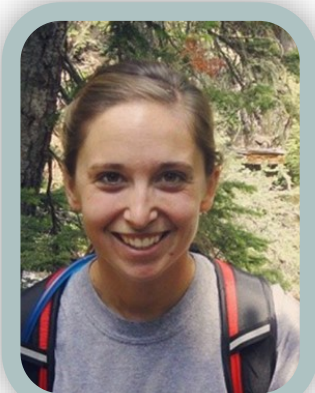
Annie Miller (Reproductive Endocrinology Lab)

I began as an undergraduate, recently graduated with my bachelor's and master's degrees in May, and am currently pursuing my PhD. Our lab focuses on how hormones from the brain and the pituitary gland control reproduction. We are interested in the function of neuronal populations in the brain that produce a hormone called gonadotropin-releasing hormone (GnRH), and we study GnRH populations in mice with deficiencies in important developmental growth factors. Not only are we interested in the function of these neurons, but we are also interested in their development. GnRH neurons are the only neuroendocrine neurons that are born outside the brain—they develop in the nose, or olfactory region, and then migrate into the brain.



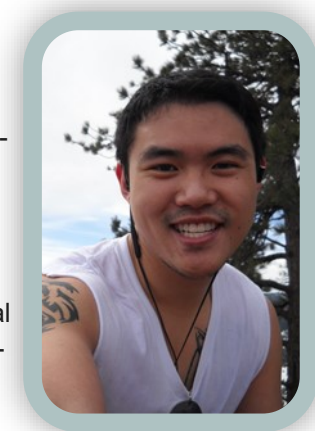
Ellen Stothard (Sleep and Chronobiology Lab)

My path to getting into research has been filled with diverse experiences. As an undergraduate student studying psychology and french, I worked in a cognitive modeling lab, a social psychology lab and a social neuroscience lab. I learned different things from each of these experiences but mostly I learned that I was more interested in neuroscience than psychology and that I preferred studying biology as opposed to psychology. After taking a behavioral neuroscience class and learning about sleep, I knew this was the area of research I wanted to pursue for my doctorate. Through a project I was designing as an undergrad, I came across much of Dr. Wright's work and knew that it would be a good fit for me. I am now in my third year in the lab and my first year of the PhD program working on a project to examine the relationship between the sleep and circadian systems and the brain and behavioral responses involved in metabolism and hunger.



Bryant Pham (Locomotion Lab)

There are currently three IPHY labs that examine movement. They are the Applied Biomechanics Lab, which is investigating topics regarding leg prosthetics and exoskeletons, the Neuromechanics Lab that seeks to mathematically quantify effort during movement, and the Locomotion Lab that examines the mechanics involved in a wide variety of sports. Biomechanics is a relatively new field of research that looks at the mechanical and energetic patterns associated with movement in humans and animals. I personally have looked at the forces involved in the vertical wall run in Parkour, skateboarding, and am currently developing a model for uphill walking. Other sports that are currently being investigated are: steeple chasing, cycling, split belt walking adaptation, uphill mountain running and cross country skiing.





James Hassell (Behavioral Neuroendocrinology Lab)

I presented on the work that we do on the bacteria *Mycobacterium vaccae* and its effects on mood. Several students were interested by the idea that bacteria found in soil around us can manipulate how they feel. Students at the meet and greet were mainly interested in how to get into a lab and what the day to day work was like. If the students' interest were in a different topic I recommended another lab to look into because the students interest in the topic is the most important aspect of getting into research.



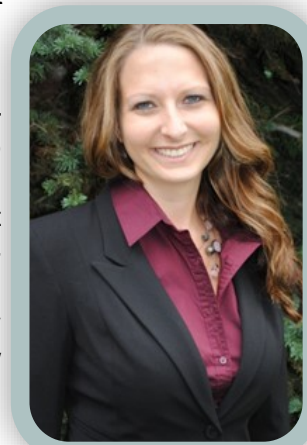
My Pathway to Medical School — Samantha Humann

I am not one of those students who dreamed of becoming a physician from a young age. Instead I considered culinary arts, international relations, teaching, research, law and even religious studies before fully committing to pursuing medicine. My decision became even less clear during my first years at University of Colorado. I recall meeting an older student in the pre-health field who advised me not to ask fellow pre-med students for directions to the exam that evening as they would likely send me to the wrong building. My freshman year of college I was surprised by the 400+ students in my general level classes who identified themselves as pre-med. I recall a professor asking all of the pre-med students to stand on the first day. He then asked all of the students in the right section, the left section and the back of the room to sit down. He then asked us to look at those still standing, the now remaining statistical average of students who would actually end up going to medical school. Pre-med students can be difficult, often known as “grade grabbers.” The phrase “is this going to be on the test?” seems to be a group mantra. Education is goal directed, and there is very little learning beyond the requirements, supplemented by courses perceived to provide “easy A’s.” We study to get an A in the class and perform well on the MCAT so we can apply to a top-10 school from which we can compete for a stand-out residency.

It was a competitive and often dishonest environment where students would sabotage rather than help other students. In many ways, I did not fit in because I would share my notes and help a struggling fellow student. I led study groups. I worked to learn the material, not just get an A.

During my junior year, I was exhausted by the linear coursework and the competitive reality of applying for medical school. I realized I was not enjoying the process. I began to question my goals and the meaning of my degrees. Could I be successful when I refused to compete as others were? Did I want to be in a profession that seemed to not encourage students supporting one another? So I just stopped. I realized the pre-med stereotype did not need to define me. I could pursue any degree I wanted and explore my diverse interests.

When I was able to let go of expectations as well as stereotypes and seek advice from counselors, friends and physicians, I realized I wanted to be a physician. I realized I did not have to enjoy everything I am learning nor will I ever be as competitive as many of my fellow students. I allowed myself to take other courses and explore activities which did not necessarily support my pre-med designation. I taught dance, joined a choir, ordered menu items I cannot pronounce, watched TED talks and medical podcasts and read science journals. Lessons and passion for education are not always confined to the classroom. Interestingly, I started to enjoy my anatomy and other classes. Further, I realized that I could be competitive yet also show compassion and kindness to my fellow students.





Freedom forced me to examine what it means to pursue a medical degree. Medical school is a long and costly commitment. The real cost of medical school is dedicating my 20s to study. When the rest of my friends are climbing in their careers, making money, traveling, getting married and having children, I will still be a student. I wonder if when I complete my studies I will be able to say I am happy, the sacrifice was worth it — I am doing something I love. I now believe the answer will be yes. For me, medicine is more than a job. It is a passion.

My love for medicine has always been there; it has simply took me some time to discover it within the undergraduate “dog-eat-dog” system. Medicine is my passion and I believe I can pursue it by utilizing my diverse talents and strengths rather than stepping on others to succeed. I can do it with integrity.

While the process to get into medical school is competitive and at times grueling, the practice of medicine is about connecting with people, listening, diagnosing and healing. This is why I want to be a doctor and I am proud to be a part of University of Colorado School of Medicine Class of 2019.

Footnote: Samantha Humann graduated from CU in 2014 with BA degrees in integrative physiology and neuroscience with a pre-med focus. During her time at CU Boulder, Samantha worked as a research assistant in both Banich and Johnson Laboratories, served as an EMT for CU EMS, and participated in leadership training as both a Presidents Leadership Institute and El Pomar scholar. Before starting medical school, Samantha served as an AmeriCorps volunteer for a local education-based nonprofit “I Have a Dream” Foundation. This fall, Samantha is excited to start medical school at the University of Colorado School of Medicine where she will be participating in the Rural Health Scholars track and Colorado Springs Longitudinal Clerkship track. Samantha has a passion for working with the elderly and is looking forward to exploring a career in geriatrics. When not working, Samantha can be found testing a new recipe or Latin dancing.

Summer Classes Provide Flexibility for IPHY Students

Heidi Bustamante and Steve Hobbs



Over the last several years, summer classes have become more popular amongst IPHY students. These classes provide great flexibility for IPHY students to juggle their busy schedules and finish within the normative time of 4 to 5 years. As IPHY classes become larger and more competitive to enroll due to increasing number of majors, summer classes are excellent alternatives for those with scheduling difficulties. To clarify concerns on the quality and pace of summer courses, two of our seasoned instructors who have taught regular and summer versions of the same courses offer the following advice.



Having taught the same classes, Human Physiology 2 (IPHY 3480) and Introduction to Human Physiology (IPHY 3430), in both a regular academic semester and summer session for eight years, Instructor Heidi Bustamante would like to share some insights into the differences between the two by discussing her experiences with Human Physiology II. First, class size is very different between summer session and a regular academic semester. In a regular semester, Human Physiology 2 will range anywhere from the minimum of 150 students to a maximum of around 180. In the summer session, however, the maximum number of students enrolled is 65. The smaller class size in the summer can offer a slight advantage in enhancing instructor-student contact and one on one work when needed.

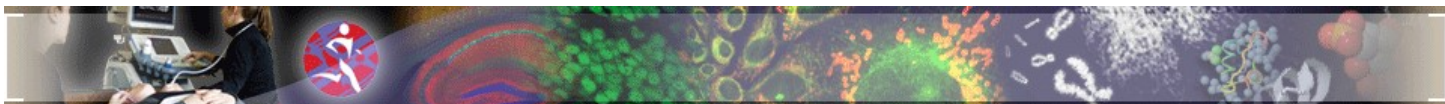


Second, the rate at which material must be learned in a 5-week vs. 15-week semester. Although both semesters have the same number of days dedicated to the class, the summer session consolidates all of those days into five weeks as opposed to the spread-out, 15-week schedule of the regular semester. This requires that for the same amount of material taught, a student must learn it faster in order to be successful.

As a result, there is less time allotted to retain and process information between tests. In a regular semester, exams are paced roughly a month apart while in the summer they are days apart. Finally, student focus and dedication to course material between the two formats is different. In a regular semester students on average are taking 15-18 credits, which translates to roughly 5-6 classes. This requires that they divide their time for studying amongst all these classes so that they are able to achieve and maintain their success. In the summer semester, however, students are taking 1-2 classes per session. This allows for summer session students to dedicate their time and attention to solely one class (at most two). This difference oftentimes leads to a greater attention to detail in the summer classes than the regular semester for some students, despite the fast-paced nature of the class. So, should you take summer classes or not? The answer to that question is a personal one, but can be answered if you know yourself and your study habits. If you are comfortable with a fast paced class, then summer is for you, as you will only be focusing on the one class. If you feel more comfortable having many weeks to integrate and retain information, summer might not be the best choice for you and you can dedicate your time and attention to the class during the 15-week regular semester.

Instructor Steve Hobbs offers the following advice on Human Anatomy Lab (IPHY 3435) and Statistics (IPHY 2800). Human Anatomy Lab is a very rigorous course no matter when students take it. The content and high standards are identical for summer and regular semesters students, but the pace is obviously very different. In a regular semester, anatomy lab students have four hours of class each week and take an exam approximately every month. In the summer, anatomy lab students have four hours of class every day and take an exam approximately every week. The summer course is akin to a language immersion program, where students eat, drink, sleep and think in a new language. Summer anatomy lab students have described the volume of material they have to learn as "obscene" and "sadistic", but they perform similarly, often better even, than regular semester students. They also appear to have the most fun and class camaraderie. My belief is that most learning occurs in the anatomy labs themselves, where students can study the cadavers directly. The summer is really a great time to take anatomy then, because students have the same amount of class time to learn the cadavers, but fewer weekends to forget the details! What's most important though, is that students take anatomy at some point while at CU. For most, it's a once-in-a-lifetime opportunity to peak under the hood of the human body, and learn its amazing architecture and intricacies.

IPHY's Introduction to Statistics is also offered in the regular semester and the summer. As with the anatomy lab, the curriculum and standards are identical. After pace, the biggest difference is that the summer class size is typically around 15 students, while the regular semester courses are 70 to 80. Because of this, summer students can get more individual attention during lectures, and in general appear more comfortable asking questions in class. However, being a highly conceptual topic that requires hours of practice to master, some students feel they need more time outside of class than the summer allows. Any tradeoffs are likely to be well balanced, as student performance is very similar between the summer and regular semester courses. Regardless of when students take statistics, 100% report that it was more fun than a trip to Disneyland, a concert at Red Rocks and a cruise in the Bahamas all rolled into one!





IPHY Student Resources — Heidi Bustamante

As students at a large university, you often aren't sure where you can go for certain services. Perhaps you need help with a resume, application for a particular graduate program, or are looking for other opportunities to advance your career. There are many resources available at your fingertips, it's just a matter of knowing where to go. Some of your resources are even right in the IPHY department!

Student resources:

IPHY faculty – can mentor internships, or independent study, offer undergraduate teaching assistant positions, or all you to do volunteer work in their labs.

<http://www.colorado.edu/intphys/people/faculty.html>

IPHY student club – offers speakers throughout the semester, leadership opportunities within the department, as well as a community of like minded peers.

Heidi.bustamante@colorado.edu

IPHY tutoring – has FREE tutors on staff to help with IPHY classes at all levels as well as other courses throughout various different disciplines. iphytutors@gmail.com

Student Academic Success Center (SASC) – serves low income and first generation college students with academic skills development, math and writing courses, supplementary instruction in gateway courses, tutoring, pre-collegiate opportunities and graduate research opportunities. <http://www.colorado.edu/sasc/>

Pre-health advising – a very special and directed component of the advising services. Here you will be guided on what to do and how to do it in order to successfully apply for any health related program.

<http://www.colorado.edu/advising/pre-health>

Career services – not sure what you want to do? Have no fear the options are endless and can be explored with career services. Meet with counselors, look at what is needed for a certain career path, learn to write a resume, practice an interview, etc. <http://www.colorado.edu/career/>



Kudos

Lameese Akacem (IPHY PhD candidate) led a successful CU Boulder Crowdfunding campaign that raised over \$5,000 to support her dissertation project about how evening light exposure suppresses the sleep-inducing hormone melatonin in preschool children.

Dr. **Josiane Broussard** recently received a 1-year Career Development Award from the Sleep Research Society Foundation to examine physical activity as a potential countermeasure to the impairments associated with insufficient sleep.

Dr. **Josiane Broussard** recently published a paper in *Diabetologia* describing the effects of sleep restriction on circulating fatty acids in humans, which was featured on BBC World Service Radio.

Based upon a collaborative project with Prof. Yuko Munakata (Psychology/Neuroscience), IPHY graduate student **Margaret Doucette** and Dr. **Monique LeBourgeois** recently published a paper in *Brain Sciences* showing that brain activity during sleep is related to cognitive processing in preschoolers.

Drs. **Marissa Ehringer** and **Jerry Stitzel** recently published a review article in *Genes, Brain, and Behavior* describing the genetic and developmental effects of nicotinic receptors on drug use behaviors.

Dr. **Alena Grabowski** presented her research to the NCAA Track and Field Rules Committee, which resulted in their approval of a request to allow an incoming sprinter from Harvard University to compete with a prosthetic running device in the 2015-16 academic year.



Dr. **Charles Hoeffler** has recently published a paper in *Acta Neuropathologica* describing how a gene related to Down syndrome promotes the development of Alzheimer's disease in the general population.

Dr. **Tom Johnson** has been the subject of several recent speakers and a television program that aired on the national Geographic in the "Breakthrough" series for his pioneering research on the genetic basis for aging.

Drs. **Rodger Kram**, **Alaa Ahmed**, **Alena Grabowski**, and **Roger Enoka** submitted a successful bid to host the 2017 annual meeting of the American Society of Biomechanics, which will be held in the UMC on August 9-11 and is expected to attract 1,000 biomechanists mainly from North America.

Dr. **Rodger Kram** was named the 2015 Borelli Award winner at the 39th annual meeting of the American Society of Biomechanics (ASB), the most prestigious honor given by the ASB in recognition of the outstanding career accomplishment based on the originality, quality and depth of one's research.

Dr. **Rodger Kram** was interviewed on the Public Radio International show, "Science Friday", about the biomechanics of how running shoes affect how we run.

Drs. **Monieque LeBourgeois** and **Marie Banich** (Psychology/ Neuroscience) were awarded a CU outreach grant for the second year in a row. This program supports the training of undergraduate CU students in disseminating hands-on learning activities about the brain, sleep, nutrition, and exercise to school-age students in the Boulder area.

CU crowdfunding campaign conducted by Drs. **Tom LaRocca** and **Douglas Seals** last spring led to the launching of a website aimed at sharing reliable information on healthy aging with the general public (www.healthyagingproject.org).

Dr. **Chris Link** received a 5-year grant from the National Institutes of Health to investigate the molecular basis of Amyotrophic Lateral Sclerosis.

Dr. **Chris Link** received a 2-year grant from the National Institutes of Health to investigate the mechanisms of neuronal death in Alzheimer's disease.

Dr. **Christopher Lowry** has recently interviewed with NeuroScientistNews to discuss microbes, mood, and mental health: (<http://www.neuroscientistnews.com/neuroinsights/microbes-mood-and-mental-health>)

Dr. **Matt McQueen** recently published a study in *Behavioral Genetics* that examines the genomic factors underlying behavioral issues such as drug abuse among an at-risk adolescent population.

Dr. **Matt McQueen** was interviewed for a KUSA (Denver) special report entitled, "The People Planet" to discuss the threat of emerging diseases to public health.

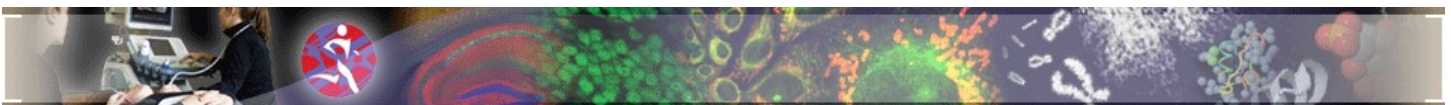
The laboratory of Dr. **Douglas Seals** published a study demonstrating that supplementation with sodium nitrite improved strength and completely restored endurance exercise capacity in old mice to levels seen in young animals, while reversing age-related inflammation.

Dr. **Jerry Stitzel** received two grants from the National Institute on Drug Abuse. The goal of one of the grants is to identify specific genes that contribute to individual variability in nicotine consumption. The goal of the other grant is to determine whether the known higher risk for smoking among individuals whose mothers smoked during pregnancy is due to exposure to nicotine as a fetus, genetic risk factors inherited from the mother, or both.

Dr. **Pei-San Tsai** recently delivered a symposium talk in the 2015 Ottawa meeting of North American Society for Comparative Endocrinology on how a vertebrate reproductive hormone has diverged into a multi-functional neuromodulator during invertebrate evolution.

Dr. **Kenneth Wright** recently published a paper in *Science Translational Medicine* showing that evening caffeine use affects the circadian clock in humans.

Dr. **Kenneth Wright** has received a 5-year grant award from the Office of Naval Research to lead a team of investigators to determine how sleep loss and being awake at night affects the gut microbiome, brain function and performance.





Cartoon representation of Dr. Chris Lowry's research by Leif Saul (IPHY Instructor)

THE IMPORTANCE OF "OLD FRIENDS" FOR MENTAL HEALTH

MODERN HYGIENE HAS REDUCED OUR EXPOSURE TO MICROBES.



BUT SCIENTISTS THINK THIS HAS CAUSED AN INCREASE IN EXAGGERATED IMMUNE RESPONSES LIKE ASTHMA AND ALLERGY

↑
ASTHMA CASES



-- AND EVEN PSYCHIATRIC DISORDERS LIKE ANXIETY AND DEPRESSION.



THAT'S BECAUSE WE'RE MISSING OUR "OLD FRIENDS" -- MICROBES THAT WERE PRESENT THROUGHOUT HUMAN EVOLUTION...



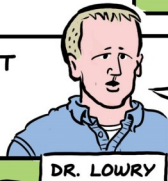
...AND HAVE BECOME NECESSARY FOR NORMAL FUNCTIONING OF THE IMMUNE AND NERVOUS SYSTEMS.



WITHOUT THEM, IMMUNE CELLS GET STUCK IN "DEFENSE" MODE, WITH DESTRUCTIVE LONG-TERM EFFECTS.



A POSSIBLE TREATMENT IS UNDER STUDY BY CHRISTOPHER LOWRY AND COLLEAGUES.*



DR. LOWRY

WE STUDIED MICE THAT, LIKE HUMANS, RESPOND TO CHRONIC SOCIAL STRESS WITH ANXIETY-LIKE SYMPTOMS.

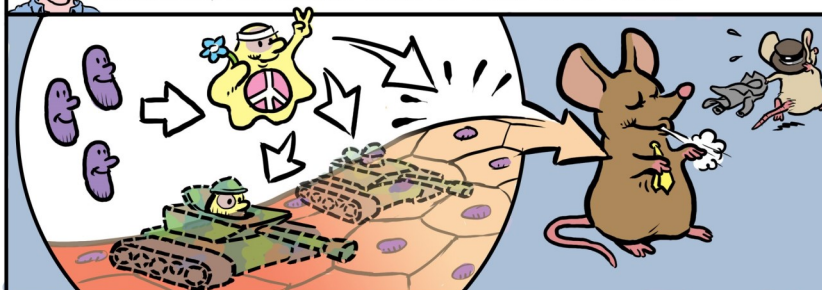


MICE TREATED WITH A COMMON SOIL BACTERIUM* SHOWED MORE PROACTIVE RESPONSES.

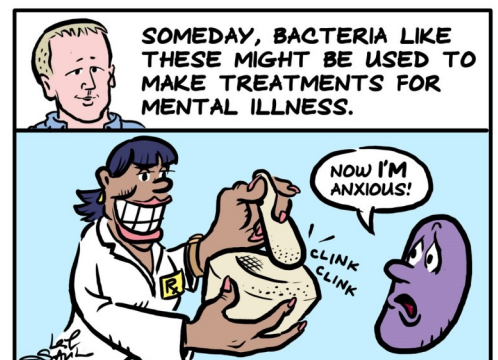


*MYCOBACTERIUM VACCÆE

THESE BACTERIA BRING THE IMMUNE SYSTEM BACK INTO BALANCE, REDUCING ANXIETY-LIKE SYMPTOMS.



SOMEDAY, BACTERIA LIKE THESE MIGHT BE USED TO MAKE TREATMENTS FOR MENTAL ILLNESS.





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Tobias Cody Albrigtsen
Daniel Levi Allen
Danielle Alexis Alvine
Hailee Joy Bankhead
Scott Jacob Beardslee
Samantha Michelle Beech
Nicholas Alexander Bovine
Justin Grant Brown
Stephen C. Bruce
Shelby Brunk
Michael Donald Canale
Emma Lena Carroll
Joseph Ames Chambers
Kara Lee Churma
John Taylor Combs
Danielle Jocelyn Coonrod
Chasen William Daugherty
Marcel Davide
Paige Kristine DeBolt
Olivia Amelia Eggert
Natalie Mae Eidson
Brittany Amber Eveland
Carsyn Gallegos
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Brooke Marie Granstrom
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Natalie Michele Varnet
Victoria Marie Vorwald
Morgan Leigh Weber
Darin Joseph Weltsch
Luke Nelson Woodruff
Olivia Marianna Yerardi



December 2015 MS and PhD

Leah Anne Davis
Jeffrey Raymond Gould

MS
PhD



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To learn about the many ways in which to make a donation, contact:

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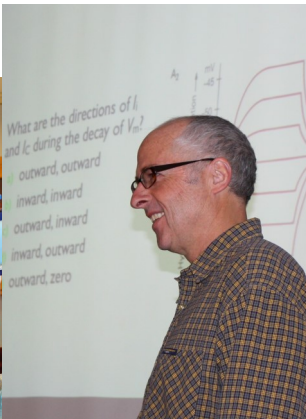
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