



## Special points of interest:

- The Public Health Certificate Program, directed by Dr. Matt McQueen, will launch spring 2015 with its introductory course, IPHY 3490, Introduction to Epidemiology
- Advising is consolidated among IPHY, MCDB and EBIO to facilitate cross-advising of undergraduate students in life sciences
- IPHY awards its first Everson Trust Scholarship to female undergraduate students to conduct faculty-sponsored independent research

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## A Few Words from the Chair — Pei-San Tsai

It is with great pleasure that I introduce myself to all of you -- IPHY students, alumni, affiliates, and loyal supporters. On July 1, 2014, I officially took over as IPHY Chair. It was not easy accepting the baton from our former Chair, Professor **Roger Enoka**, who has led the department to its current success during the last 13 years of his leadership (2001-2014). These are big shoes to fill. I appreciate the fact that I have taken over a vibrant, harmonious, and highly productive department with excellent students, faculty, and staff. Below are some notable accomplishments of IPHY under Professor Enoka's tenure as Chair:

- Reorganization of two academic units to form the Department of Integrative Physiology in 2003
- Development of the major and an increase in the number of majors from 675 to ~2,000 students
- Participation in the Science Education Initiative and the reorganization of the curriculum to provide a flexible and coherent program of study for IPHY majors
- The 2010 ranking by the National Research Council that placed our doctoral program at 6th out of 63 physiology programs, most of which are located in medical schools
- IPHY is one of five academic units on campus to offer all three degrees (bachelor, masters, and doctorate) not available at other institutions in the state of Colorado
- IPHY was one of six academic units on campus ranked in the excellent category in 2014 by the office of Academic Affairs
- Development of a contemporary website and the publication of a newsletter twice a year
- Generation of videos on teaching and research that are used in our graduation ceremony and linked on the department website

In sum, please join me in a round of applause for Roger Enoka's 13 years of excellence. *A job well done!*

Concurrent with our success, we face some interesting challenges due to our popularity. The department is currently committing all its resources to achieving and maintaining excellence in undergraduate education, graduate training, and world-class research. It is my long-term goal to ensure that IPHY continues to make our students and supporters proud!

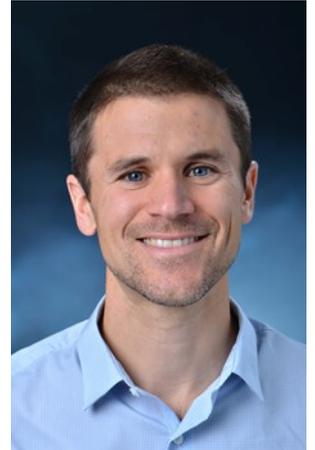


## Hellos and Goodbyes

### Hello from Tom LaRocca—Instructor of Scientific Writing

I read once that writing is a form of problem solving, and in my experience this is true. Before coming to CU-Boulder for graduate school, I taught high school chemistry. My students kept lab notebooks and learned to balance chemical equations (standard chemistry skills), but I also asked them to write research papers and formal explanations for their hypotheses about chemical reactions. These projects forced students to put their ideas into words, and that seemed to make their ideas *better*. It felt like I was on to something, and it crystallized for me when I got involved in scientific research.

When I started graduate school here in IPHY, I joined the Integrative Physiology of Aging Laboratory. In the lab, we study how the aging process affects physiological functions. For example, artery and motor (muscle/nerve) functions decline as we age, and this increases our risk for serious medical problems later in life. Clearly, it's important to understand why these changes occur, and to identify strategies for preventing them. It's also important to share information about research like this, so that people can benefit from it. So, like all good scientists, I spent lots of time writing papers, making charts and graphs, and getting manuscripts through the difficult publication process. I also wrote grants, presented my research at scientific meetings, and even did a couple of media interviews. After completing my PhD, I took some of this work in a different direction. In order to reach some people more directly, I started working with others in our lab to develop educational talks, flyers, and even a website aimed at a broad audience. All of these projects have required me to solve problems and communicate ideas in different ways. Every time I have devised a new experiment, revised a paper or grant, or designed a new presentation slide, I've seen the project from a different angle and used the opportunity to make the ideas better—to come up with a better solution for the problem. For me, sharing ideas and sharpening thoughts like this is one of the best parts of science.



This fall, I was excited to share my experience in my new position as the instructor of scientific writing, but I also knew it would be challenging. Some people enjoy writing, but for many it is nebulous and difficult. Scientific writing can be especially tricky, because it often involves complicated ideas that are hard to communicate. How would I make it more tractable for my students? How would I organize all of the complex steps in scientific writing? For me, a great resource has been Desire2Learn (D2L), CU's online system for learning management. D2L is a platform for organizing course content (readings, media, etc.) and assignments, all of which are accessible to students anywhere and anytime. I've organized my entire curriculum on D2L, kept a straightforward calendar on our main course webpage, and even maintained a regularly updated news section highlighting recent research articles and examples of good scientific writing. The semester has been fast and furious, but I think this system has supported the curriculum effectively and (hopefully) made the writing process more accessible to my students.

My advice to students taking scientific writing? Remember that writing is different from other subjects. You can't study for it or memorize things. It's a process, and it takes practice—much like sports, or playing a musical instrument. So, approach writing with that mindset, keep in mind that you'll be improving your ideas and solving problems as you go, and chances are you'll learn a lot and become a better writer in the process.

## Hello from Jia Shi—Physiology Lab Instructor

This fall semester, I joined the IPHY faculty as the human physiology lab coordinator. The course is designed to be simple but make students think very hard. In each lab, students work in groups of four to conduct experiments and use statistical tools to analyze and interpret data. During the last few weeks of the course, students have the opportunity to design, conduct, interpret, and present their own experiments. I am grateful to my colleagues who have transformed this course from a traditional cookbook-based lab into an inquiry-based lab course. This course now integrates statistics and medical applications into human physiology. I believe this lab experience will teach students to critically interpret vast amounts of medical information and to think as scientists.



One of the greatest challenges of being the physiology lab coordinator is keeping the lab equipment functioning. Some of the common lab equipment frequently fails because of wear and tear – about 500 students use the equipment each academic year. Keeping the equipment running requires closely monitoring the use of the equipment and quickly replacing or repairing any malfunctioning items.

The second challenge is to ensure that all the lab computers have the required updated statistical software. Sometimes certain computers stop working after the new updates are applied. I work closely with the Arts and Sciences IT staff to ensure all the computers are functional before labs start.

Being a lab coordinator is like being the conductor of an orchestra. Each teaching member is a player. To make the “music” appealing, each player has to follow the conductor - with consistent teaching and grading. However, some variations need to be allowed in teaching just like the crescendos and decrescendos in the music. This semester, I have been working with a team of 20 individuals (3 instructors, 5 graduate teaching assistants and 12 undergraduate teaching assistants (UGTAs). Training, managing, and effectively communicating with the teaching members is another area of importance. I enjoy the weekly meetings because this is the time when I can directly communicate with them, discuss issues that may have arisen from the previous week, and prepare the team for the upcoming lab. The physiology labs have been running smoothly thanks to the great teamwork. New graduate teaching assistants have been coming up to speed quickly through the meeting preparations and in-class experiences. It is worth mentioning that the UGTA team leader model works very well. Three UGTAs act in dual roles. In addition to helping out in the classroom, they train and communicate with their team of three other UGTAs. Two UGTAs also help me behind the scenes by preparing reagents, testing equipment, and formatting the weekly case studies for displaying to students while they are waiting for the labs to begin.

Lastly, I would like to outline some tips on how to do well in the physiology lab:

1) Come with a strong background in physiology and statistics – students must have the pre-requisites including Statistics, Human Physiology I and II (or are concurrently taking Human Physiology II). Some students struggle with the lab when they don't have the mandatory IPHY statistical background.

2) Preview the lab manual, PowerPoint slides, and complete the pre-lab questions before each lab.

3) Perform experiments and actively participate in each lab. Since students work in groups of 4, not every student will have the opportunity to collect, enter, and analyze data in each lab. Students should practice these lab skills outside of the classroom as well as during the open lab times.

I look forward to continuing to work with my IPHY colleagues to make this lab course a unique and rewarding learning experience for IPHY students.



## Goodbye from Marie Boyko—Scientific Writing Instructor

Back in 1994, when I accepted a newly created position to teach scientific writing in kinesiology, I had no idea what lay ahead. I thought of the job as an experiment to see whether my previous career in scientific publishing and outreach would translate to teaching, and whether I would like teaching full-time. I soon found that I do enjoy teaching, as well as the science we now know as integrative physiology. But most of all, I fell in love with IPHY students.

If you've been in my class, you know that every semester I add to my list of reasons why I love IPHY majors. You work hard, you take challenges in stride, you want to make a positive difference in the world by caring for people, and you have been unexpectedly considerate of me as a teacher. Your honest feedback has helped the scientific writing courses evolve into formats that do a better job of helping students learn. Working with you has been a joy and a privilege. Despite some challenging moments, I have felt spoiled, and I thank you for that.

After 20 years, I retired from full-time classroom teaching, but I am still involved in the department. I am teaching one online section of scientific writing each semester. With the time freed from grading many papers, I am participating in a research project to investigate student learning in our writing courses, serving on a department committee working to enhance the IPHY major experience, and preparing articles about our writing curriculum. On the personal side, I'm taking time to visit my grandchildren in South Carolina more often, as well as work through my list of other travel destinations. Over the years I have enjoyed the tantalizing postcards you have sent from semesters abroad; now I look forward to being the one sending the postcards.



## Goodbye from Molly Welsh—Physiology Lab Instructor

After 2 years as the physiology and cell physiology lab coordinator, I left the position because my husband's job was relocated to Seattle, Washington. Two years as the coordinator seems insignificant compared to the 10 other terms that I served as a graduate teaching assistant or assistant to the lab coordinator for the classes, but the lessons learned in those 2 years in a leadership position for the class were countless. About 250 students attended this lab course that I was responsible for managing, although my leadership was mostly silent because graduate teaching assistants were the voice in the classroom. This disconnect may have been the greatest challenge to the position, but it allowed me to have more casual interactions with almost all of the students as I floated from lab to lab on a daily basis to check in on experiments.

Taking a step back from the classroom allowed me to focus on improving the inquiry-based lab materials and gave me time to absorb the advice from a few key colleagues involved with the lab. One of my teaching accomplishments included working with Drs. Teresa Foley and Chris Link to renovate the lab exercises through a Chancellor's Award for Excellence in STEM Education to transform the cell physiology labs (2013). Around same time, we also received an ASSETT award to purchase 5 microscope-mounted digital cameras for the cell physiology labs. In this position, I greatly enjoyed working closely with instructors and graduate students to teach this lab, but I think my most gratifying achievements were the relationships that I formed with the select undergraduates that returned to help out with the class as teaching assistants. When students ask me how to succeed, I remind them that these classes are not about memorization. They are about critical thinking and problem solving, skills that become essential for a research scientist. I encourage students to get together in small groups outside of class to talk through concepts, and test themselves by explaining to non-science friends.



Though my PhD in the IPHY department was temporarily put on hold to pursue this teaching position, it is exciting to have successfully defended my dissertation in December. The move to Seattle is now complete, and I am currently looking for jobs in biotechnology. The picture to your right is now home for me and my husband, two large dogs, and a cat. The 42-foot cutter rig sloop sailboat is docked at one of the most beautiful marinas on the Puget Sound with an Olympic mountains view. We spend most of our time sailing and downhill mountain biking in the Pacific Northwest, and prepping our boat to sail around the world in the next 10 years.



## ALS Bucket Challenge by Pei-San Tsai



On Sept. 8, 2014, IPHY took part in a nationwide fundraising effort called the “ALS Ice Bucket Challenge” to support research on amyotrophic lateral sclerosis (ALS; also called the Lou Gehrig’s disease). ALS attacks neurons that control voluntary muscles and often leads to death within years after its onset. The ALS Challenges across the US have already raised more than \$115 million in donations. The fundraising event involves individuals or groups volunteering to be doused with ice water to encourage donations to the ALS Association. IPHY enthusiastically participated in the event to promote ALS research and awareness.

The IPHY-sponsored ALS Ice Bucket Challenge was the brainchild of Drs. **Rodger Kram** and **Chris Link**. In addition to volunteering to be doused with ice water by the highest bidders, they also recruited Drs. **Roger Enoka** and **Ken Wright** to join the team. On Sept. 8, IPHY faculty, staff, and students gathered in front of the Ralphie statue for the dousing ceremony. The highest bid (\$50.00) was for the dousing of Dr. Kram by his former graduate student, **Jamie Bartlett**. All four faculty members courageously accepted the icy challenge, raising a total of \$600 towards the cause of ALS from 20 donors.

The photos on the following page provide a rare glimpse into what faculty look like when being assaulted by icy water. From left to right: (1) Rodger Kram doused by Jamie Bartlett; (2) Chris Link doused by Gretchen Stein and Christine Roberts; (3) Roger Enoka doused by Jamie Justice; (4) Ken Wright doused by Monique LeBourgeois and Gayle Wright; (5) four wet and happy professors after dousing.



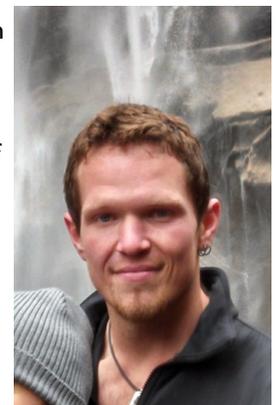
## The Evolution of My Career by Larry Taylor—MS in IPHY (2011)

Whether by their own choice or by that of others, it certainly seems that a fair share of individuals in academia have a straight and narrow path for their careers, and they have checked off each milepost in satisfactory time. I am not one of those people. My career has thus far been winding, circuitous, largely unforeseen, and immensely fulfilling. I left my undergraduate education knowing simply that I wanted to work in academia, likely focusing on teaching, and that biology was my field of passion. Beyond that, I also recognized that I faced a long climb and no guarantee of success.

The majority of my undergraduate career was acceptable, in my mind, and not much more. My GPA was never as high as the standards I'd set for myself, as the struggle of balancing a full-time job with my academic requirements left me often stressed, strained, and perpetually sleep deprived. Attending school on academic scholarship upped the ante for me, and a semester that saw me balance fifty hour work weeks with eighteen semester credits left me facing scholarship probation. Had I lost my scholarship – at a pricey private school – the financial burden would have been absolutely overwhelming; as one of four kids from a lower middle class family in rural Texas, it had long been clear to me that I was on my own once I graduated from high school. So naturally, I freaked out. But I worked harder, streamlined my life, and increased my GPA enough to pacify the powers that be.

Oddly, I wouldn't change my experience. I graduated from Baylor University with a deeply-rooted sense of who I was, what I was capable of, and confidence in my ability to overcome life's struggles. I wasn't afraid of risks or failures, and I had learned to deeply appreciate those who lent a helping hand.

The story picks up with me moving to Colorado, craving a change of scenery to go along with my graduate education. Without any research experience during my undergraduate career, I felt less prepared for graduate work than I would have liked. Thankfully, Dr. Tom Johnson took me into his lab, and the next two years altered my life's direction in ways I'm only now fully appreciating. During the course of earning my





My experience as a TA revealed a passion for teaching, and upon graduation I immediately took a position as an adjunct instructor at Arapahoe Community College (ACC). A year later, I was hired as a full-time faculty member by ACC, and the following two years were perhaps the most rewarding of my life thus far. My student base – far from what I might have expected – was made of hard-working, mature, and capable individuals who all too often had been dealt a bad hand. Many of them were single parents, most of them were paying for their education with their own money, and all of them appreciated the time and energy I put into my teaching. I found teaching to be a humbling and deeply fulfilling endeavor, and it was a privilege to serve the student base that I did.

As much as I loved my career as faculty, when my fiancé entered medical school across the country, I had little choice but to align my life accordingly. To that end, I sought and was awarded a research fellowship at Stanford to study evolutionary biology, drawing on the interests I was encouraged to explore in Dr. Johnson's genetics course. There I had studied the use of phylogenetic modeling to reconstruct extinct genomes, and I became fascinated with the application of current understandings in physiology and genetics of the prehistoric past. My work in the lab of Dr. Jonathan Payne at Stanford used physiological principles to study the connections between extinct organisms and their environment, as well as their response to multiple biotic and abiotic factors. After completing my fellowship, the lab asked me to continue working with them, and we'll publish our ongoing research in the coming year.

Upon completion of my fellowship I then found my current job as a research associate at Stanford School of Medicine. There, Dr. Ross Metzger and I use a mouse model to study the development and evolution of the respiratory and cardiovascular systems while elucidating mechanisms underlying various disease processes of these systems. Needless to say, I never could have been hired for this position without my degree from IPHY, my mentoring from Dr. Johnson, and my extensive day-to-day laboratory training from Dr. Cypser.

My career has been anything but simplistic or straightforward. My path is certainly not the most efficient at gaining any particular accolades. Fortunately, I care more about being open to new experiences and doing the best I can with the options laid before me while keeping the long-term aims in sight. In the long-term, my career aspirations on the research front will likely nudge me to study the evolutionary and ecological aspects of biology, particularly in a prehistoric context. Teaching will always be a top priority for me, and in that regard, my range of experiences has helped me relate to students from diverse backgrounds and teach subjects from a multidisciplinary perspective.

Recognizing what I've learned over the past few years, my advice to the IPHY students of today is simple: work hard, knock on a lot of doors, be willing to fail, know how to pick yourself up when you do, be exceptionally grateful for each person who helps you along the way, and no matter what, keep moving forward. Don't expect life to work out perfectly, and find the means to be grateful for each opportunity and good moment you're given. If you can do those things, odds are you're going to end up okay.

## Notes from IPHY Undergraduates

### IPHY Student Club Offers Undergraduate Tutoring by Grace Boll

The Integrative Physiology (IPHY) Club's Tutor Program has expanded tremendously during the course of this semester! Created spring 2014 by IPHY student Grace Boll, the IPHY Club's Tutoring program has doubled in size in just one year. Starting with 20 tutors helping 50 students, the program now matches over 40 volunteer tutors with over 150 students. The program offers free tutoring to any IPHY student or any student taking an IPHY class.

Students have been taking advantage of this amazing opportunity provided by the IPHY club free of charge. Students can meet with tutors one on one or in groups. Feedback on our tutors has been overwhelmingly positive saying they are excellent tutors who are supportive, encouraging and extremely helpful.

The IPHY Club's Tutor Program is organized and run by tutor coordinator, Grace Boll and student coordinator, Laurel Kornblau. These two IPHY club members and fellow IPHY students have put in so much time and work to provide all IPHY students seeking help with access to tutoring to make sure they excel in their demanding IPHY classes.

Next semester the IPHY Club's Tutor Program is partnering with Academic Support Assistance Program (ASAP) to expand and reach out to as many students as possible. We will combine our tutors with ASAP's resources to provide free tutoring for all students looking for help with IPHY classes. Through this collaboration, some of our volunteer tutors will even get the chance to be promoted to a paid position. The alliance between the IPHY Club's Tutor Program and ASAP will ensure the IPHY tutoring program's longevity and further expansion to help even more students in the future.





## Surviving Human Anatomy Lab (IPHY 3415) by Taylor Pence

Many students here at the University of Colorado (CU) have the dream to become a doctor, physical therapist, sports trainer or some other health professionals. The Department of Integrative Physiology (IPHY) gives students the opportunity to learn a vast amount about the human body through the various courses offered, such as endocrinology or exercise physiology. Regardless of the profession you desire, there is one common foundation we all must build, human anatomy. As one of the first IPHY major courses we encounter, it is essential to get off on the right foot in order to succeed in one of the most prolific degrees at CU. This is a guide on how to survive the anatomy labs.



Anatomy lab practicals can be one of the more terrifying experiences in a student's academic career. At first, being faced with tackling thirty practical stations, and having to answer two questions in only one minute seems nearly impossible. The pressure of achieving a good grade can become overwhelming at times, but in order to overcome the difficulty of this class, you need to be confident and prepared. Here are my top three tips on how to succeed.

### Tip #1: Make the most of your time in lab

It is no easy task to simply memorize all the structures of the body; it takes time to learn each bone, muscle or vessel. With many of the resources only available during class time, it is essential to utilize the models and cadavers as well as the TA's knowledge as much as possible. There may be times where class finishes up early; however, this provides an opportunity for students to focus on learning material that they find difficult. With a limited amount of time in lab to learn on the models and cadavers you will ultimately be tested on, a student's best course of action is to utilize their time in lab.

### Tip #2: Create study groups

In a class of only sixteen students, you will be spending a bunch of time with your fellow classmates. This is an excellent opportunity to form study groups. Through the process of studying for the lab practical, one of the more effective ways of learning is to teach the material to your study partners. The ability to teach one another the information builds confidence in what you know and cements the knowledge you have gained

### Tip #3: Utilize your resources outside of lab

With limited time available in lab, it would be nearly impossible to perform highly without studying outside of class. There are multiple opportunities for students to study the material at home or elsewhere on campus. The course atlas gives a student the ability to study pictures of the same models used in class. These provide accurate and consistent visuals of the structures being taught. In addition to the atlas, the course's mastering A&P program gives students access to online visuals. This allows students to continue to work on the differences between structures both on models and on cadavers. Lastly, the Integrative Physiology Club holds practical reviews, where models and worksheets will be provided to assist with studying. At these reviews there are current and former teaching assistants that can help answer questions and clarify any confusion for upcoming practicals.

As one of the first classes in the IPHY degree, Anatomy Lab can be one of the best experiences an undergraduate student can have. To succeed, it is essential to get off on the right foot and take advantage of all the resources provided. While there may be pressures to perform highly in the class, it is equally important to embrace and enjoy the opportunity to learn in such a highly regarded lab. By following and applying to my tips above and developing more tricks along the way, you can survive the anatomy labs.





## Kudos to Faculty

Dr. **Cindy Carey** published a review of the literature on how climate change is already disrupting reproduction in vertebrates, with predicted extinction of 30-50% of existing species by 2030-2050.

Dr. **Janet Casagrand** received a CU-Boulder Online Pilot Grant award to develop an online course on movement disorders for the summer 2015 session.

Dr. **Marissa Ehringer's** laboratory published a paper in *Physiology and Behavior* demonstrating that adolescent mice show decreased preference for alcohol when given access to a running wheel.

Dr. **Monika Fleshner** delivered a symposium entitled, "Exercise Promotes Stress Robustness" to an audience of over 1,200 at the annual meeting of the Society for Neuroscience in Washington DC.

Drs. **Teresa Foley** and **Janet Casagrand** presented their work on improving student performance in a physiology lab at the Annual Symposium on STEM Education at CU-Boulder.

Under the leadership of Dr. **Todd Gleeson** and Office Manager **Marsha Cook**, IPHY contributed to the scholarship fundraising success of the 12th annual Buffalo Bicycle Classic. The annual ride included over 1,700 riders, netted over \$200,000 this year, and raised over \$2,300,000 over the lifetime of the Ride.

Dr. **Alena Grabowski** published a paper in the *Journal of Applied Biomechanics* that compared how biological and prosthetic legs effect the optimal starting block configuration for sprinting.

Dr. **Charles Hoeffler** published a paper in *Nature* describing the role of Caspr4 mutations in neuronal function and how these inherited human mutations may cause the manifestation of behavior related to neuropsychiatric disorders.

Dr. **Tom Johnson** received a \$200,000 award from the State of Colorado, Office of Economic Development and International Trade to study pharmacological abrogation of injury associated with cryopreservation.

Dr. **Rodger Kram** delivered the Kevin Granata Memorial Lecture at Virginia Tech. Dr. Granata was a biomechanics professor who lost his life while trying to rescue students during the 2007 shooting tragedy.

Dr. **Christopher Lowry** published a paper in *Neuron* describing the role of microRNA 135 in control of serotonergic systems and stress resilience.

Dr. **Matt McQueen** was interviewed by 9News to provide a perspective on the future of public health for a news series on humanity's origins, development, challenges and to look for solutions to a sustainable future.

Dr. **Douglas Seals** received a 5-year grant award from NIH (National Institute on Aging) to study the effects of sodium nitrite supplementation for improving vascular, cognitive and motor function in older adults.

Dr. **Jerry Stitzel** and former graduate student **Tristan McClure-Begley** recently published a paper in *Biochemical Pharmacology* that identified a biochemical pathway that might be responsible for the known ability of a drug called baclofen to reduce nicotine dependence.

Dr. **David Sherwood** recently published a paper in the *Journal of Experimental Psychology* on how the focus of mental attention affects accuracy and consistency in dart-throwing.

Dr. **Pei-San Tsai** received a 4-year grant award from the National Science Foundation to investigate if a hormone critical for vertebrate fertility had evolved from an ancestral hormone with very different functions.

Dr. **Kenneth Wright** published a paper in the *Proceedings of the National Academy of Sciences* describing why shift work contributes to risk of obesity.

## Other News

Dr. **Roger Enoka** and colleagues at the Anschutz Medical Campus have begun a two-year study on how to improve walking performance in persons with multiple sclerosis. They will use a 6-week treatment of neuromuscular electrical stimulation to reinvigorate the nervous system. They are actively seeking study participants. To learn more about the study, you may contact Dr. Enoka ([enoka@colorado.edu](mailto:enoka@colorado.edu)).

The College of Arts and Sciences now offers an Undergraduate Certificate in Public Health. The program is directed by Dr. **Matt McQueen**. Read more about the program at: <http://artsandsciences.colorado.edu/magazine/2014/05/public-health-study-now-an-undergrad-option/>.

The IPHY Student Club offers diverse opportunities to promote undergraduate student development, including monthly seminars by health-related professionals or directors of admissions, tutoring, and introduction to internship programs. Contact **Heidi Bustamante** or visit the website at: <http://www.colorado.edu/intphys/ugrad/club.html>.



A cartoon representation of Dr. Ken Wright's research By Leif Saul (IPHY Instructor)

# CIRCADIAN BENEFITS OF NATURAL LIGHT

**T**HE ELECTRIC LIGHT HAS DONE WONDERS FOR OUR PRODUCTIVITY AND QUALITY OF LIFE...

...BUT MANY OF US ARE OUT OF SYNC WITH OUR WORLD.

EVIDENCE SHOWS THAT IN THESE PEOPLE, THE INTERNAL CIRCADIAN CLOCK IS OUT OF SYNC.

THE "OFF" POINT IN MELATONIN SECRETION...

...WHEN MENTAL PERFORMANCE IS AT ITS WORST...

...OCCURS AFTER WAKING.

MENTAL PERFORMANCE (IF AWAKE)

MELATONIN

TIME (BY INTERNAL CLOCK)

SINCE THE TIMING OF THE INTERNAL CIRCADIAN CLOCK IS DRIVEN BY LIGHT EXPOSURE, THIS LEADS TO AN IMPORTANT BUT SIMPLE QUESTION:

WHAT WOULD HAPPEN IF WE LIVED WITHOUT ARTIFICIAL LIGHT?

PROFESSOR KEN WRIGHT, UNIV. OF COLORADO BOULDER

SO, PROF. WRIGHT'S SLEEP AND CHRONOBIOLOGY LAB\* TESTED THIS:

**1** FOR THE FIRST WEEK, SUBJECTS LIVED THEIR NORMAL LIVES.

\*DEPT. OF INTEGRATIVE PHYSIOLOGY, UNIVERSITY OF COLORADO BOULDER

**2** THEN, THEY WERE BROUGHT INTO THE LAB FOR 24 HOURS TO CHECK MELATONIN LEVELS IN THEIR SALIVA.

**3** NEXT, A WEEK OF CAMPING IN THE COLORADO WILDERNESS...

Hello facebook! Wish U were here

...WITHOUT ANY LIGHT-PRODUCING GADGETS!

**4** FINALLY, ANOTHER DAY IN THE LAB TO CHECK MELATONIN LEVELS.

THE RESULTS SUGGEST A SOLUTION FOR THOSE WHO DON'T FUNCTION WELL IN THE MORNING.

AND NOT A MOMENT TOO SOON...

AFTER A WEEK OF CAMPING, THE MELATONIN "OFF" POINT (LINKED TO POOREST PERFORMANCE) HAPPENS EARLIER, BEFORE WAKING.

I FEEL AS SHARP AS THE SKYLINE!

MELATONIN

MENTAL PERFORMANCE (THEORETICAL)

TIME (BY INTERNAL CLOCK)

BUT YOU DON'T HAVE TO GO CAMPING TO APPLY THE RESULTS OF THIS STUDY.

DARN, I WAS HOPING FOR AN EXCUSE TO DO THIS ALL THE TIME!

SIMPLY DIM YOUR EVENING LIGHTS...

GO TO BED AT A REASONABLE TIME...

AND START YOUR DAY BY GETTING SOME SUNSHINE...

...TO HELP AVOID THAT "DIM" FEELING IN THE MORNING!

HERE'S TO A "BRIGHT" AND EARLY START!



### December 2014 Bachelor of Arts

Michael Anderson  
 Isabella Asamoah  
 Anna Autry  
 Hannah Beck  
 Michael Benallo  
 Anthony Bosco  
 Christopher Brazell  
 Jarryd Butler  
 Connor Caldwell  
 Dianne Callaghan  
 Ellington Chase  
 Olga Chesnokova  
 Roxie Christ  
 Danielle Claeysens  
 Grace Clinton  
 Clarisa Czekajlo  
 Samuel Danford  
 Kathleen Dao  
 Kendra DeHay  
 Alex Dobzanski  
 Kendall Douglass  
 Olivia Du  
 Courtney Flood  
 Nathanael Florea  
 Kendall Fosse  
 Michelle Freeman  
 Anna Freemantle  
 Jason Geller  
 Jesse Goodrich  
 Alexandra Gundersen  
 Andrea Gutierrez  
 Brian Hackman  
 Madison Hayes  
 Garead Head  
 Kirk Hofsfield  
 Daniel Horne  
 Taylor Hotz  
 Adam Kapitz  
 Alyssa Kasten  
 Susie Kim

Bryan Koppa  
 Marissa Kraus  
 Joleen Kwok  
 Kenny Lam  
 Curran Landry  
 Eric Lenser  
 Aliya Luther  
 Carmen Ma  
 Douglas Matthews  
 Tara Mattson  
 Carey McCloskey  
 Paige McLoughlin  
 Alena Merrick  
 John Milliken  
 William Moore  
 Courtney Negley  
 Nicole Nocella  
 Chelsea Peterson  
 Erich Pomrening  
 Hector Porragas  
 Connor Powers  
 Lauren Ray  
 Jessica Ray  
 Katherine Reilly  
 Kirsten Revitte  
 Ashley Schroeder  
 Cameron Schubert  
 Dillon Shije  
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### December 2014 PhD, MS, and BA/MS

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Agnieszka "Aggie" Mika	MS	Ryan Price	MS
Thomas Moehlman	BA/MS	Molly (Madden) Welsh	PhD



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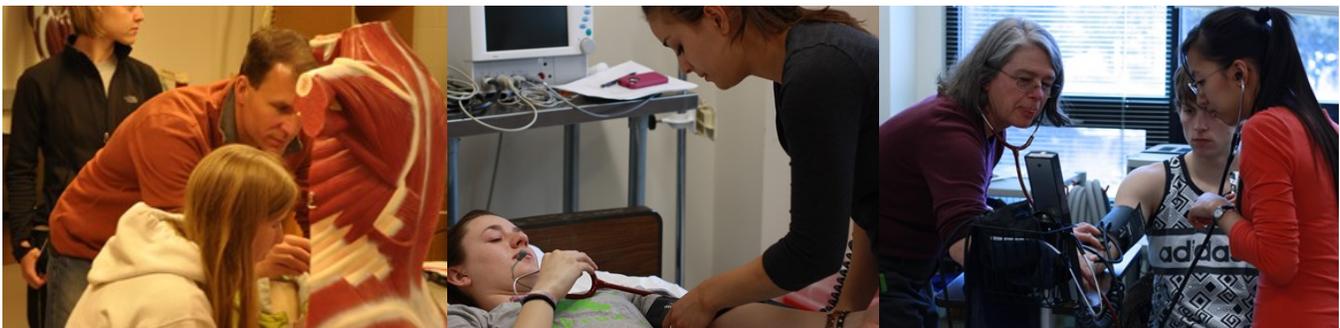
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