Spring 2015
Features

- Biosensors: The Faster Future of Medical Tests
- Watching What You Eat: How Diet Can Affect Gene Expression
- Seeing Yourself in Structure: Organic Inspirations for Design
- Yes, You CAN Take a Mental Health Day
- Coalescing the Realms of Science and Humanity
- Man’s Best Friend: Hope for Fighting Brain Cancer
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In the past decade, advancements in technology have opened a plethora of new opportunities in several fields, but medicine in particular has benefited greatly from this new wave of discovery. Researchers have arrived at innovative solutions by linking areas such as engineering, nanotechnology, and biology. Cornell University is also working toward technological innovation through people like senior Ricki Korff, who currently researches biosensors and bioanalytical systems in the lab of Professor Antje Baeumner.

Korff is majoring in biological engineering in the College of Agriculture and Life Sciences and has extensive experience in the laboratory setting. Prior to the Baeumner Lab, she participated in a high school summer program at the Feinstein Institute, where she studied cognitive dysfunction in lupus patients. In addition, she worked on two computational biology projects at New York University and Cold Spring Harbor Laboratory during her summer breaks. Her latest project combines her research experiences as she focuses on the engineering aspect of biology, specifically isolating a method to better determine whether a heart attack has occurred.

In the United States, heart disease and heart attacks are high-ranked on the list of leading causes of death. And although they are prominent health problems in today’s society, ascertaining the ultimate causes of chest pain, a potential indicator of heart issues, with present methods is still difficult in the medical field. Furthermore, hospital clinical tests consume valuable time that could be directed toward other patients who may require more urgent care. Biosensors, devices that detect chemical markers using biomolecules, would be an instrumental tool in improving diagnostic efficiency if they could be used to isolate and identify symptoms of a heart attack or muscle damage. Korff is attempting to optimize the efficacy of medical systems by optimizing a biosensor that detects elevated levels of myoglobin, a protein that functions as a molecular reserve of oxygen in muscles. Although the protein troponin is a gold standard for determining a heart attack, it takes up to fifteen hours for it to reach its peak concentration in the blood, whereas myoglobin achieves the same in about two hours. With her current data, Korff has been able to assess the quality of her biosensor from the lab to cold blood itself. Her two-step biosensor can produce semi-quantitative visual results of drawn blood in about 15 minutes at a patient’s bedside. In fact, Korff has tested the sensor on herself with her own blood drawn at Gannett!

Korff has obtained tremendous results in her project, and she credits her mentor Katie Edwards, a research associate at Cornell, as an integral part of her success. Since introducing the project to her, Edwards has been providing Korff with guidance at every step. Korff’s new goals now include evaluating her past results carefully as optimization of the biosensor is key to its acuity in clinical situations.

When asked about her experience in the Baeumner lab, Korff said, “I have always enjoyed research, and I love the fact that my research project addresses a real-world engineering problem. I have been able to delve deep into my project and do thorough background research on academic journals. I can now see how research fits in. Through research, I have developed an intuition for evaluating what is known, recognizing what is unknown, and knowing where to ask the next question.”

Despite a heavy workload, Korff finds time outside of academics and research to participate in extracurricular activities around the Cornell campus. She is involved with the EYES club, an organization that emphasizes science and engineering outreach to local elementary school students through hands-on activities, and has been its president since her junior year. She also is a member of the sorority Sigma Delta Tau and enjoys playing volleyball.

After graduation this spring, Korff will be attending medical school. She has always enjoyed science, and her research focus in biomedicine has drawn her toward pursuing medicine as a career. And in training for the physician she hopes to become, Korff would like to continue working on clinical research and apply the findings of her research in real-world interactions with patients.

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Membrane proteins are important for the structure of cells. So what happens when they aren’t present? With a focus on cancer cells, how might a decrease in membrane stability affect how it migrates and possibly metastasizes?

Researching this novel idea is Kathy Zhang, a junior biology major in the College of Arts and Science, of the Lammerding Lab for biomedical engineering. Zhang observes what happens to breast cancer cells lacking these nuclear lamin proteins as they travel through microfluidic devices, small pathways with gaps only microns wide simulating the inner human body.

This project started several years ago and Zhang has been involved for the past one-and-a-half. Due to a lack of many published studies or methodology on the topic, Zhang spends much of her time optimizing the process for quantifiable data collection. First she obtains MDA-MB-231 breast cancer cells that have had their lamina proteins knocked out and compare their migration through the devices to normal cancer cells. One of many reasons the project has taken time to get informative data is because the MDA-MB-231 cell line is extremely sensitive and operate much differently than more predictable human fibroblast cells used in migration analysis.

Zhang has observed a general trend in which cells without lamina proteins move faster through the microfluidic device, but rupture more often. This makes sense since the cell has a more fluid nuclear membrane at the cost of instability due to a lack of structural proteins maintaining its shape. Additionally, by using fluorescent tagging, Zhang has observed that although the nuclei may rupture when squeezing through the gaps, they consistently recollect itself once it frees itself from the squeeze.

In her free time, Zhang enjoys writing and currently holds the position as Editor-in-Chief for TRP. Additionally, she is involved as a designer for the on-campus magazine The Student Body. She serves as a student advisor with the Office of Undergraduate Biology, where she helps incoming freshman biology majors navigate and accommodate to Cornell. Zhang plans on taking a gap-year after graduating to seek exposure in the clinical setting before attending medical school. For prospective researchers, Zhang advises to look into labs that truly are interesting to you. Don’t simply sign up for one that may “look impressive” on paper – if it doesn’t appeal to you, you’ll simply be much less motivated and get less out of the entire experience.

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Each day, the human heart beats roughly 100,000 times and pumps as much as 2,000 gallons of blood. Vital to the human body, the heart serves as a pump to transport oxygen and nourishments throughout the body. Unfortunately, cardiovascular diseases are the leading causes of death in the world, and for decades, medical treatment of these diseases has been met with little success. Now, rather than seeking a reduction of disease symptoms through medication, a new approach focuses on the issue’s core: regeneration and renovation of heart muscle tissue via heart stem cells.

One of the leading studies on this subject is being conducted in Cornell University’s Kotlikoff Laboratory, located in the College of Veterinary Medicine’s Biomedical Sciences Department. The laboratory combines mouse genetics, molecular biology, and molecular imaging to advance the understanding of cardiovascular disease. More specifically, the cellular function in mammals is studied in vivo (experiments directed inside live organisms) to understand the complex biological signaling in mammals at a molecular level and identify pathways to induce regeneration of heart muscle tissue after an injury or disease. To examine the cell signaling and cell integration in vivo, optogenetic molecular sensors are utilized, which facilitate control and monitoring of the cell behavior. Under the supervision of Michael I. Kotlikoff, the Dean of the College of Veterinary Medicine, the research is piloted by a group of hard-working researchers. The laboratory has established the Cornell/National Heart Lung Blood Resource for Optogenetic Mouse Signaling (CHROMus), and their research is working towards monitoring and developing novel genes for heart tissue repair through the creation of transgenic mice.

As a junior biological sciences major in the College of Arts and Sciences, Joseph Neumeyer is the only undergraduate researcher in the Kotlikoff laboratory. In the lab, Neumeyer spends most of his time growing mammalian stem cell cultures and testing DNA samples in search for novel genes. Of the numerous techniques he has learned so far in his lab, generation and utilization of embryonic stem (ES) and induced pluripotent stem (iPS) cells has served as a tool for understanding the mechanisms of stem cell differentiation. Although culturing and maintaining ES and iPS cells requires a considerable time commitment, iPS cells could generate a limitless source for tissue engineering as it has the potential to differentiate into tissues of all three germ lineages (i.e. ectoderm, mesoderm, and endoderm).

Currently, Neumeyer is working toward developing a fate map (which tracks the transformation of different types of potential heart repair cells as the organism matures) and hopes to contribute to the advancing medical research on heart tissue repair using these cardiovascular muscle stem cells. Ideally in the future, this research will lead to a range of effective therapies for cardiovascular diseases.

“Currently, Neumeyer is working toward developing a fate map (which tracks the transformation of different types of potential heart repair cells as the organism matures) and hopes to contribute to the advancing medical research on heart tissue repair using these cardiovascular muscle stem cells.”

Neumeyer joined the Kotlikoff laboratory at the beginning of his junior year, and he enjoys the hands-on nature of his research experience. Among other skills picked up in lab, he has become proficient in the art of multitasking, given that time management is crucial in the lab. Planning for the future, Neumeyer would like to pursue a career in medical research. Aside from his scientific endeavors, Neumeyer is also involved with various organizations, including the Pi Kappa Alpha fraternity and the Class Notes a cappella group. In his free time, he enjoys playing intramural sports, boxing, and lifeguarding at Cornell.

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Watching What You Eat: How Diet Can Affect Gene Expression

By Jacob Kolenda ’28

Our understanding of how traits are passed down from generation to generation has rapidly evolved in the past few years. Initially, scientists thought that the inheritance of characteristics was dictated primarily by the sequence of DNA base pairs. However, we are learning that other elements can influence the traits which an organism’s offspring might express. Epigenetics is a relatively new field that examines how certain factors such as diets, behaviors and toxins can affect gene expression and the subsequent phenotypes which appear.

While most genes are expressed equally, there are cases in which this fails to occur. One example of such a situation is genetic imprinting, a phenomenon in which the allele from only one parent is expressed and the other is silent. The determination of which allele is expressed is typically influenced by methylation of the gene.

Paul Soloway is a Cornell professor whose lab examines the field of epigenetics, specifically in mammals. Soloway’s lab developed a mouse model to investigate the mechanisms by which methylation patterns and their associated phenotypes are passed trans-generationally. However, in 2003, the Soloway lab was moved from Buffalo to Ithaca, and during this move there was a loss in this trans-generational effect. This was believed to be due to dietary changes during the translocation. The Soloway Lab hypothesized that the phenotype which was lost could be recovered by modifying the maternal mouse diet.

Angelica Cullo, class of 2016, works in Soloway’s laboratory and researches the effect that parental diet has on the extent of gene expression in a particular phenotype by using a tractable model system. She examines Rasgrf1, a paternally imprinted gene, which means that only the paternal allele of the gene is translated into proteins. This allele is methylated at the differentially methylated domain while the maternal allele is not, which results in blocked expression via enhancer-blocker CTCF binding.

In this study, the maternal mouse diet was modified in an attempt to determine the effects on this unexpressed allele. Four diets with varying methyl amounts were observed: low, supple, excess, and control. The brain tissue associated with Rasgrf1 imprinting were isolated from the mice at birth. Afterwards, Reverse Transcriptase-PCR and restriction endonuclease digestion were used to survey allele-specific expression and determine the validity of the idea that diet affects the pertinence of trans-generational phenotypes. Preliminary results have shown that a methyl-supplemented diet produces a threefold increase in the number of mice that exhibit bi-allelic expressors. While the remaining groups have yet to be tested, these initial results suggest that aberrant modifications can cause defects in cellular processes.

With Cullo’s research, we delve deeper into epigenetics and gain a better insight into this revolutionary field. As epigenetics play an important role in understanding how diets and other environmental factors can affect gene expression, studying what directs the placement of epigenetic marks can lead to a greater knowledge of how diseases originate and progress. With this information, we can develop more effective drugs and treatments.

One of the more challenging aspects of Cullo’s research is the lengthy nature of the procedures which are employed, making the data-gathering process rather slow-going. However, Cullo enjoys the anticipation of finally getting results and interpreting the significance of the data, claiming that, “It’s incredibly rewarding.” Overall, Cullo has thoroughly enjoyed her experience in research, stating, “It’s taught me in every sphere of my life.” She greatly admires her mentor Soloway for his passion and dedication to his work. Through her time in the lab, Cullo has learned about patience, resilience, and the importance of keeping an organized lab notebook.

Cullo originates from the Hudson River Valley area and is a Biological Sciences major concentrating in Nutrition in CALS. Outside of the lab, Cullo is involved with Cornell’s Minds Matter, a mental health awareness program, Meds and Food for Kids, a global health organization, and the Roosevelt Institute. Additionally, she works with Collegetown Bagels and helps tutor students in chemistry and organic chemistry. In her spare time, Cullo enjoys running, drawing, and watching movies. She is a fan of Kurt Vonnegut and likes to collect quotes. After Cornell, Cullo hopes to enter a MD/PhD program and perform research with clinical applications.

This research is being conducted under the supervision of Prof. Paul Soloway.

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If even for a moment, you’ve probably wondered about love—when you will find it, whether it even exists, or if your date on Friday night will be awkward—but have you ever questioned why the human species “loves” the way it does? Do you ever wonder why we are (relatively) monogamous or think there’s a benefit to understanding the science of love? To most people, monogamy is almost intuitive, but compared to the majority of our mammalian relatives, we are somewhat unique in our proclivity for single pairing. One of the few other single pairing mammals is the prairie vole, and these monogamous mammals are often used by researchers to study the neurological components of social interaction. Working with the Psychology Department and a set of these faithful rodents, Senior Nikki Lee is attempting to address the question many of us are subconsciously asking: what is the neurobiology of love, and how can we apply this understanding?

While the human (and prairie vole’s) brain impacts experiences, experiences likewise physically affect the brain. When prairie voles find their mates, a physical change occurs in their brains, leading them to act (as a species) monogamously. It should be noted that monogamy here refers to a social, rather than sexual, monogamy. Social monogamy involves the formation of a pair-bond (a preference for) a specific partner with whom the organism raises its young, but unlike in sexual monogamy, extra-pair copulations (what we might call cheating) occur. In voles, a large minority of up to thirty percent defy the behavioral pattern of pair-bonding. If a difference was found in the neuropeptide layout in the minority vole brains and the majority-monogamous vole brains, a huge step would be taken toward understanding the neurobiology of monogamy. Moreover, these non-monogamous voles can be characterized as more than just unfaithful; it is possible that voles straying from the monogamy norm actually lack the ability to differentiate social situations. Interestingly, the “lack of ability to distinguish between social situations” is definitionally very similar to that of autism, and Lee uses this observation to fuel her study. Physical differences in the brains of the “abnormal” minority voles may reveal why some individuals deviate from social behaviors of the majority. If Lee determines the driving factors of monogamy in the prairie voles, it could be helpful in understanding all social interactions.

To better understand the physical science of monogamy, Lee observes groups of paired and single male prairie voles for preferential differences in varying social situations. A testing apparatus allows the voles to choose between four social contexts: a female with multiple-male-scented bedding, a female with female-scented bedding, a female with single-male-scented bedding, and a female with unscented bedding. Lee records the time each male spends in each social context. By first observing how the different voles act and then studying their brains, a relationship between whether the voles are single or paired and what social context they prefer may be related to differences in their brain structure.

Research on the biology behind love is only the primary step in decoding social interactions. What shifts in prairie voles’ brains when they find a mate, and why don’t certain voles form a pair-bond? An increased understanding of the programming behind monogamy will hopefully yield insights to more general social interactions, which could be critical in the treatment and understanding of social disorders like autism. Though modeling social interaction is difficult, even a small discovery enables researchers like Nikki Lee to move quickly in the field. In the College of Arts and Sciences, Lee is double-majoring in Biological Sciences and English. As a scientist with a knack for writing, she intends to stay in academia and hopes to become a professor and inspire students to pursue scientific professions. Lee notes that research is grounds for development, and an appreciation for science should be nurtured whenever possible.

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Mothers’ Move Toward Feeding Pumped Milk

By Kelly Jiang ’17

As the number of working new mothers continues to grow, many cannot afford, financially or professionally, the extended maternity leaves required to breast-feed their babies. In recent years, rising evidence that “Breast is Best” has prompted busy millennial mothers to look to using pumps and bottles to feed their babies their human milk (HM). This trend is a shift in U.S. infant feeding practices from directly feeding at the breast (FAB) and bottle-feeding formula, most popular in the early and mid-20th century, respectively. Pumping is nationally endorsed as a method that provides similar results as feeding at the breast (FAB). Since bottle-feeding formula was more popular in the past than feeding pumped HM, current mothers lack direction for pumping and cannot ask their own mothers due to a lack of generational knowledge. The shortage of evidence-based procedures for pumping has led mothers to use social media to obtain and share information. How then, are mothers’ behaviors and perceptions of pumping reflected online, and how can mothers’ concerns be addressed to maximize their infants’ welfare?

Rei Yamada, a senior majoring in Human Biology, Health, and Society in the College of Human Ecology, has been conducting research in the Division of Nutritional Sciences since her sophomore year. In order to better understand the general opinion on pumping, Yamada gathered data from around 25,000 women from an online discussion forum about nurturing infants. Using ATLAS.ti, a program used in qualitative data evaluation, Yamada analyzed 543 posts about pumping and bottle-feeding HM in three intervals: prenatal, 0-1.5 months, and 1.5-4.5 months postpartum. Her five themes of research were purchasing and choosing pumps, storing pumped human milk, the strategies of pumping, balancing work and pumping, and stopping pumping.

After coding the forum posts, Yamada discovered that mothers’ concerns about choosing and purchasing pumps and about arranging for storing, preparing, and feeding pumped milk were mainly asked in the prenatal period. When their infants were 0-1.5 months old, mothers’ enquiries emphasized how to integrate pumping milk and bottle-feeding HM into their FAB procedures. Particularly, mothers questioned the optimal frequency and time of pumping and guaranteeing infants’ bottle acceptance. Among the posts, the collective question related to the quantity and actual supply of the mothers’ pump output.

Yamada concluded from her results that mothers need early guidance from health professionals on selecting pumps and from insurance companies on acquiring high-quality pumps, ideally before delivery. Since the enactment of the Affordable Care Act in 2010, health plans cover breastfeeding supplies, such as pumps for nursing mothers. However, many mothers do not receive their pumps until after giving birth, and they need pumps early in order to prepare themselves. Moreover, because the Affordable Care Act does not mandate which pumps are covered, insurance companies do not provide superior pumps for new mothers. Therefore, many mothers who cannot afford higher-quality pumps opt for less suitable substitutes. Mothers may extract less milk when using a cheaper pump, causing them to falsely believe that they produce less milk than they in fact do. Yamada’s data analysis shows that many mothers’ concerns about output versus their milk supply indicate that policy makers need to ensure that optimal pumps are available to all mothers. In addition, mothers’ focus on the relationship between output and supply calls for further investigation on this association. Yamada remarks, “My findings are not necessarily surprising, but I have a wonderful time doing research. I had no knowledge of maternal challenges before joining my research group, so the opportunity to learn from my mentor has been invaluable.”

Over the years, Yamada’s research experience has inspired her to one day become an OB-GYN. Her study in infant feeding has been a valuable supplement to her interest in women’s health. Outside her lab, Yamada is extremely involved in the Cornell community. Yamada was the President of Japan–United States Association (JUSA) and is active in the Cross Cultural Adoptee Mentorship Program. In her free time, she enjoys traveling, hiking, baking, and playing the piano.

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Seeing Yourself in Structure: Organic Inspirations for Design

By Alexander Cheng ’18

Oftentimes, when one thinks of architecture and arts, the mind is led to think of structural models, great sculptures and soaring buildings, all of which are notably static objects. David Rosenwasser, a sophomore in the College of Architecture, Arts and Planning, is working with Professor Jenny Sabin on a project that defies most peoples’ expectations when they hear the words “architectural installation.” Their research project focuses specifically on adapting origami and kirigami principles to cellular structure, and creating larger, more dynamic designs and installations.

Research for this project began by examining different geometries and ways of manipulating surfaces in certain ways to create an interactive installation, and investigating the topic of adaptive architecture through kirigami principles. Kirigami is the Japanese technique of paperfolding and cutting. The current iteration of the project was created from a single polycarbonate surface, using multiple sheets layered with dichroic film in order to create the surface’s “phenomenal reflections.” This dichroic film is the product of investigations into nano-scale features and effects of structural color. The piece is inspired by the fluidity and adaptability of the extracellular matrix in animal cells, with transparent joints stitching the reflective plates together that allow the installation to flex and bend freely. These joints are articulated by wire springs that contract upon exposure to heat or an electric current. Sensors allow the installation to react to the presence of a viewer, causing the polycarbonate matrix to flex and fold in an organic, natural manner similar to musculature movements in response to the environment and viewer with a “certain variation of movement that can be controlled.” “Fabrication” in an architectural context refers to the actualization of a design to create a “tangible physical object.”

Unlike some other designs that incorporate biological elements, this research project strictly excludes biomimicry as part of its design inspiration. This project aims to take inspiration or details from various biological phenomena or organisms, regarding different geometries and ways of manipulating folded and cut surfaces but not mimic biology directly. Rosenwasser explains that the scope of this research extends beyond that of the directly visual, and that “there is an interest in the design and aesthetics, but it’s more so an interest in the technology, movement, and structural characteristics.” The main scientific basis of this project originates from Dr. Sabin herself, who leads the project.

Professor Sabin and her team of seven are currently working on refining the boards, saying that “the boards will then be manipulated to produce a more precise series of movements” across the next few months. There have been setbacks concerning the fabrication of the installation, such as difficulties with the number of components comprising the installation, which created a degree of complexity and issues with the project itself. However, the team has embraced such design problems with ease, and these issues “[allowed] them to look back on solutions that can produce the same result without needing other factors such as computers or electricity,” to inspire improvement.

Rosenwasser and Professor Sabin hope that this project, as a first prototype, can “act as both inspiration and something to adapt, refine and continue on a different scale.” Rosenwasser says that the project in its current form is a small scale model, and “the idea is to […] create something that can be inhabited and interacted with,” as well as adapting it for “real world applications such as dynamic and adaptive building facades.” The Sabin Lab is also working on other projects in tandem with the interactive installation, such as using 3D printing to create designs for bricks that maximize and optimize their strength, as investigations into robotics, self-assembly and manufacturing to determine potential future avenues of research. The project is funded by the National Science Foundation under the EFRI Origami Design for Integration of Self-assembling Systems for Engineering Innovation.

Rosenwasser is studying Architecture in the College of Architecture, Art and Planning. He is currently involved in other smaller projects in AAP involving fabrication, shop and 3D printing labs, and is interested in pursuing a career that blends business and fabrication. He enjoys woodworking and solely operates D ROSE MOD, Inc., a business specializing in 20th century modern design and restoration of notable design icons.

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This research is being conducted in the College of Architecture, Art and Planning under the supervision of Prof. Jenny Sabin. To contact the researcher, e-mail dsr234@cornell.edu.
Teacher Evaluation: 
Looking at the Numbers
By Radhika Ghosalkar ’18

Although education has become a highly-politicized debate, the need for improvement is undeniable. The last decade has witnessed a collective awakening to the reality that our public schools are often underfunded and ill-equipped to cater to the needs of the diverse students that enter its classrooms every morning. Although teacher evaluations are contested, viewed by some to be cumbersome and ineffective, teachers play a critical role in the move to better educate our nation’s children. Honore Johnson’s “The Bargaining for Better Schools” (BSS) project has tried to address this very issue.

In 2012, school districts in New York State jumped on the teacher evaluation bandwagon, instituting the Annual Professional Performance Review (APPR) in accord with reforms introduced under the White House’s “Race to the Top” education platform. In a testament to New York’s varied localities, the APPR agreement created by each of the state’s seven hundred school districts differ in their content. Members of the ILR School’s Scheinman Institute on Conflict Resolution have been investigating trends in these APPR agreements in hope to better understand the dynamic relationship between the teachers and the management who draft these evaluation systems.

Since early 2014, Honore Johnson, a junior in the ILR School, has been actively involved with the Scheinman Institute’s research of APPR agreements. Overall, the project studied the manner in which teacher unions and local school districts negotiated the APPR agreements. Johnson first learned of the research opportunity through fellow ILR student Simon Boehme ’14, who spearheaded the research. Johnson realized that she shared Boehme’s passion for conflict resolution and was interested in studying the means by which teachers and school districts established appeals processes that educators could use to contest their individual evaluations. It was precisely such opportunities and the field of conflict resolution that had attracted Johnson to transfer to ILR from the College of Charleston and delve into research. She currently works with fellow ILR student Abigail Frey under the supervision of Professor Alex Colvin and Sally Klingel.

In her work with APPR agreements, Johnson has not only cemented her passion for alternative dispute resolution but has also developed invaluable critical thinking skills. Through her role classifying contracts based on several variables, processing statistics, and writing reports summarizing the group’s findings, Johnson believes that she has gained an understanding of the complex teacher-administrator working relationship. To date, the BSS project has concluded that tenured teachers have broader right to appeal their evaluations, that district superintendents have the most authority in permitting appeals, and that the average appeals process requires forty-six days. Furthermore, analysis of these contracts has allowed Johnson to ask deeper questions concerning the underlying factors that may result in more efficient negotiations in certain school districts and has also strengthened her ability to extrapolate relevant data from large public repositories. “It is interesting to see how the data is representative of districts and how for example, rural and urban school districts differ in the content of their APPR agreements,” says Johnson. She has treasured the hands-on research experience, especially valuing the power of raw data to validate or nullify the researcher’s intuitions.

Though the “Bargaining for Better Schools” project completed the publication of its latest APPR study in early March, Johnson plans to continue her work with the Scheinman Institute in the effort to create a publicly accessible understanding of the group’s conclusions. Presently, Johnson is also involved in several other initiatives on campus, serving as the secretary for the Cornell Rotaract Club (a sub-organization of Rotary International), working with the ILR Admissions office as a student ambassador, and teaching for the Cornell Team and Leadership Center. Though she is open to many possibilities regarding her future after Cornell, Johnson is enthusiastic about the field of alternative dispute resolution, in which she has completed significant coursework, and hopes to work as a neutral.

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One of the most iconic scenes in modern cinema is from Star Wars: A New Hope. In this product of human ingenuity, Luke Skywalker gazes out into the plains of Tatooine just as the landscape is illuminated by the glow of the planet’s sunset; a sunset generated by its two suns. For many of us, this moment is fated to remain an artifact of a galaxy far, far away, but not for Michael Hammer. In the Department of Astronomy, Hammer conducts research on celestial situations just like this one. Using computer-based simulations, he works to improve our understanding of the orbital stability of circumbinary planets that orbit binary systems containing two stars.

Past studies conducted in planetary dynamics have examined “how close a planet can be to two stars without the planet ejecting or colliding with one of the stars”. However, relative to single-star systems such as our solar system, many circumbinary planets have not yet been isolated. Hammer points out that in the past, some methods of detecting extrasolar planets have resulted in a bias towards analyzing planar orbits; they use the “transit method”, which detects reductions in the light emitted by a star caused by planets passing in front of the star. However, this method has lower success rates for inclined orbits that are not in the same plane as that from the astronomer’s vantage point.

With this in mind, an analysis of the behavior of planets in inclined orbits (such as those caused by an external star) will yield new insights and data. Hammer, who is majoring in Physics with a concentration in Astronomy, is thus involved in a research project analyzing inclined orbits in order to determine the regions in which planets may potentially be able to maintain a stable orbit in a binary system. To do this, Hammer runs simulations using his computer. In these simulations, he positions planets at different distances from a center of mass that can approximate the gravitational effects of the two stars. Hammer, who is also a Computer Science minor, uses the programming language Python to set the initial conditions of these simulations and analyze the output produced. He appreciates “the programming side” of his work and enjoys “seeing what happens to planets.” In the future, Hammer hopes that he will have opportunities to write code that allows simulations to be run.
From popular hashtags to the “Trending” sidebar, social media is an indisputably powerful tool in spreading news and information. This modern method of exposure influences us on a daily basis, even more than we might expect from just a swipe down the scroll bar. The psychology of social media is a popular topic of study, but taking this one step further are studies that test the effectiveness of this tool in improving the health of its users.

Nicolette Lee is a senior Biological Sciences major working on a techno-social media project in Professor O’Brien’s lab and is examining just that. With a concentration in Nutritional Science, it is not surprising that Lee would choose to invest research hours into a project focused on promoting a healthy lifestyle. Lee channels her Rochester roots, medical school ambitions, and passion for community support into her research. The research project she is working on studies the impact of social media on improving nutritional knowledge and this project is unique in that it has an underlying outreach aspect. Its target population consists of underrepresented pregnant adolescents (ages 14-18) in the Rochester, NY area. The goal is to study the effectiveness of various social media techniques as a method to improve their nutritional knowledge and awareness.

It’s important that these young soon-to-be-mothers increase nutritional awareness not just to ensure a healthy pregnancy, but also to ensure that their children have a nourishing environment that is optimal for healthy development. Low socioeconomic statuses often derail nutritious choices because fresh avocados and apples are typically more expensive than a variety pack of Poptarts.

“While the conclusions of the study as a whole have not found a significant change in the participants’ health knowledge, Lee did notice small improvements on individual levels.”

About 40 12-week-pregnant participants volunteered to be a part of the project. They were quizzed on their knowledge and understanding of nutrition before and after the experimental social media exposure. For 12 weeks, they were exposed to YouTube videos, posts, and texts of healthy recipes, eat-this-not-that suggestions, and other campaigns encouraging the value of good nutrition using a consumer-friendly approach.

While the conclusions of the study as a whole have not found a significant change in the participants’ health knowledge, Lee did notice small improvements on individual levels.

One of the most effective ways to educate the participants on the concept of a “colorful plate” — eating brightly colored vegetables to ensure consumption of a broad variety of vitamins — was by creating an online photo competition. The challenge engaged the participants to take photos of their meal with the enticement of a prize for the most colorful plate. This interactive method seemed to successfully improve the young women’s understanding of this specific nutritional concept. Thus, engagement with social media does have promise to increase healthy lifestyle choices.

Lee has enjoyed research both for the skills she has gained and for giving her the ability to positively impact local communities. She appreciates the thorough research process starting with “digging through the literature, figuring out what the current studies are, what’s been found, and what are the missing questions that can be answered.” She enjoys working on the project in its developing stages, execution, and then being able to see firsthand how the relatable discipline of Nutritional Science can affect communities and personal lives in the long term.

Passionate about community outreach, Lee also works for Alternative Breaks — a service-learning program that launches an outreach trip to a community every spring break. She has been involved with this program since freshman year and has learned more about the economic aspects of community nutrition that also parallels her research. Lee has enjoyed utilizing Cornell’s outreach opportunities for these past four years. After a gap year, Lee hopes to continue her promising path in medical school.

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Think of the last time you struggled to get out of bed because you felt blue. Did you tell your professor or supervisor the truth? Or did you cover it up with an excuse? Workers throughout the country have faced this dilemma because there is yet to be a clear definition of mental illness in the workplace.

Research shows that in the United States, mental illness affects on average 17-20% of employees annually. These effects include workplace phobia, job absenteeism, and extended sick leave periods. Whether it is a result of a chemical imbalance in the brain or something else, mental illness deserves recognition in the workplace. Employees too frequently attend work in mental pain, and their performances in the workplace consequentially suffer. They also skip work unable to provide their employer a real explanation. To support the implementation of workplace policies for mental illness, ILR student Kristen Lovely ’18 conducts research towards creating a working definition of mental illness in the workplace.

Lovely’s research, titled: “Mental Health and the Labor Market,” is a part of the Institute for Compensation Studies at Cornell’s ILR School. The Institute for Compensation Studies (ICS), founded by Professor Kevin F. Hallock, serves to improve research and public discourse for compensation and rewards for work. Lovely got involved with research after attending an ICS reception in the fall. Drawn to Professor Hassan Enayati’s discussion on mental illness, Lovely interviewed with him and started working as a research assistant. As an assistant, she reads and analyzes articles on mental illness policies in various settings, such as in the workplace, government, and prison. Every Friday, she meets with Professor Enayati to discuss findings from literature reviews and government publications. Topics have included depression and workplace absenteeism, schizophrenia, workplace behavior, and different workplace policies that address mental illness.

After weeks of analysis, Lovely and Professor Enayati pieced together a working definition of mental illness in the workplace. Mental health, they concluded, is “a mental impediment that habitually hinders progress from productive work routines and normal behavior.” With a clear definition of mental illness in the context of labor, employers can be more informed about creating policies to address mental illness. Studies similar to Lovely and Enayati’s have led government institutions and national movements to become more active about the cause.

At the end of the fall semester, Lovely presented her findings to board members of the ICS. Such presentations are crucial in acquiring funding for continuing research projects.

“IT was nerve-racking at first. I had done presentations before, but never to such an influential group of people that could truly make a difference,” Lovely said. Although a great amount of research already exists about specific cases in mental illness, it takes a collection of information and presentations to bring the problem to light.

“When you piece these points together and get the public to see them together, the problem becomes more apparent,” Lovely described as the “foundation of taking action.” Through her research, Lovely learned more about the prevalence of mental illness. Beyond being a disease that results from a chemical imbalance in the mind, mental illness also leads to physical symptoms that can be seen and addressed. Unfortunately, people continue to hide their mental disabilities from their managers because of the strong stigma attached to mental illness. On a brighter note, Lovely also learned about how some companies are training responders and police officers to react to emergency situations due to mental disabilities. Such educational programs create opportunities for people to become more aware and respectful of mental illness.

This spring semester, Lovely is conducting research for ICS about green infrastructure. Outside of research, her hobbies include photography and sailing. In addition, she is also a part of the Cornell Concert Commission, the Slope Day Programming Board, and the Prison Reform Education Project (PREP), which has recently completed a campaign against solitary confinement. In the summer, Lovely will be interning at Everfi, an educational software company based in Washington D.C. Eugenia Xiao ’18 is in the College of Arts and Sciences. She can be reached at eyx2@cornell.edu.
A Small Change Can Go a Long Way

By David Wang ’18

Sometimes, a small change can go a long way. This is especially true for the sensitive components of biological systems. Even the slightest change to a protein in your body can change its properties and functionality. The effects on the protein are immediately perceptible, but the repercussions can affect the entire organism in rather subtle ways that are not readily apparent. Membrane vesicle trafficking is an important regulatory process, involving many proteins, that occurs in almost every cell. The chances that a small change to this mechanism will be fatal are just as likely as the chances that it will be beneficial. Inspired by this prospect, one researcher has discovered the effects of phosphorylation on a protein involved in membrane trafficking. This discovery may one day save lives.

Olya Spassibojko is a junior in the College of Agriculture and Life Sciences, majoring in Biology. Working under the guidance of Dr. Ruth Collins, Spassibojko analyzed the effects of phosphorylation on membrane trafficking activity within a cell. This biological process involves the transportation of biochemical signaling molecules from the source of synthesis to secretory vesicles. The focus of her research was primarily on Ypt7, a protein crucial to this process. While adding a phosphate group may seem like a minor adjustment, the results of her experiment revealed incredibly significant changes in protein behavior.

In her study, Spassibojko analyzed the effects of phosphorylation on the Ypt7 protein using yeast as a model organism. The experiment involved comparing the location of proteins in a yeast culture containing phosphomimetic proteins (an amino acid substitution that mimics a phosphorylated protein) to a control culture of unaltered yeast. All Ypt7 proteins were tagged with a green fluorescent protein and were visualized using fluorescent microscopy. The results of her experiment revealed that the modified protein localized in a different part of the cell. Under normal conditions, Ypt7 localizes on the vacuolar membranes of a cell since the vacuole is the location of nutrient digestion and conversion. However, localization of the phosphorylated protein was discovered to be completely cytoplasmic. This unexpected change in protein localization led Spassibojko to believe that a seemingly minor change like phosphorylation would have drastic effects on the functionality of Ypt7.

Spassibojko’s research is still on-going, so many of the applications of her data have yet to be discovered, however, she believes that in the near future her research may have significant applications in neurobiology. Neurons communicate with each other by releasing neurotransmitters, a process that is closely linked to membrane trafficking. It is likely that the results of her experiment will eventually contribute to groundbreaking work in curing neurodegenerative diseases.

For Spassibojko, research has been an important part of her life for several years. Her first exposure to research was in the summer before her senior year of high school when she was accepted to Cornell’s summer college program. During this time, she was involved in a research internship for Biological Sciences in the Collins Lab where she continues to work as an undergraduate. She enjoys collaborating with her graduate mentor Dante who has not only been a great teacher, but has also improved her confidence in lab work. Through her research experience at Cornell, Spassibojko has developed a passion for research. She claims that the hardest part of research is maintaining interest in course work because “it’s very difficult to not get addicted to research.” She would much rather “go into the lab and solve some puzzles.” Overall, her favorite part of the research experience is designing clever experiments that yield concrete answers, regardless of whether it is expected or unexpected.

Beyond research, Spassibojko is involved in the iGEM project team, teaches tree climbing, and is a member of the Wait Avenue cooperative house. She is looking forward to an internship with Indoor Biotechnologies Inc. this summer and plans to attend graduate school to eventually pursue a PhD.

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This research is being conducted in the under the supervision of Dr. Nikatin. To contact the researcher e-mail os76@cornell.edu.
Cognitive task performance was measured using the Purdue Pegboard Task, the Identical Pictures Task, and the Vandenburg and Kuse Mental Rotation Task. Mergler took the study’s results and modeled the reproductive and metabolic parameters in relation to task scores. Some of these reproductive and metabolic parameters included testosterone, LH:FSH ratio, follicle counts, BMI, and insulin resistance markers. By using statistical analysis through the Spearman Rank Correlation Test, multiple linear regression modeling, and backward selection in SPSS, Mergler has concluded that women with PCOS performed worse in all three mental tasks. Moreover, the reproductive and metabolic parameters helped to predict performance on these cognitive tests.

Mergler’s interests in reproductive endocrinology were further developed in research experiences outside of Cornell. In the summer of 2011, Mergler worked with two top endocrinologists at Mt. Sinai Hospital to develop nutritional strategies for PCOS, supplementing Mergler’s understanding of PCOS and teaching her how to write scientific literature effectively. Furthermore, through the Boston University Geneva Study Abroad program in Spring 2014, Mergler was able to work for the World Health Organization and the Director of Reproductive Health and Research, Dr. Sheryl Vanderpoel. Her experience exposed her to “the burden of infertility worldwide and how it is recently coming to the forefront of public health with the strong efforts of Dr. Vanderpoel.” Mergler used this experience to place her PCOS research into a broader context in public health. She was also a volunteer clinical research coordinator at Penn Medicine’s Women’s Health Clinical Research Center for oncofertility studies.

Mergler is also a Human Ecology ambassador and an Organic Chemistry tutor with the Cornell Learning Strategies Center. As a tutor, she is able to give back to the Cornell community and help others, while applying problem-solving skills. After graduation, Mergler will be attending the Albert Einstein College of Medicine while aspiring to become a reproductive endocrinologist.

Amy Wang ’18 is in the College of Human Ecology. She can be reached at aw529@cornell.edu.
In April of 1961, Canada licensed the prescription of Thalidomide, a wonder drug that provided safe and sound sleep to pregnant women and helped combat the symptoms of morning sickness. Unfortunately, Thalidomide was a catastrophic drug with tragic consequences. Researchers did not know that Thalidomide could cross the placenta to cause Phocomelia Syndrome, which causes malformation of the limbs. The numbers vary from source to source, but figures for Canada suggest that there were between ten and twenty thousand babies born disabled as a consequence of mothers consuming Thalidomide during the first trimester of pregnancy.

What can be done to minimize such side effects? There are two possible solutions — you can either create stronger drugs or employ targeted drug delivery. Making stronger drugs is a long and arduous process. Research and development of new drugs take years of grunt work and decades of testing. The latter option of utilizing targeted drug delivery holds promise. Wouldn’t it be wonderful if we had nanoparticles that could increase the specificity of drugs and therefore decrease the incidence of harmful and unintended side effects? We are already using targeted drug delivery systems, but none of the current techniques employ nanotechnology. Such a sci-fi solution seems too far into the future of our present-day analog world.

Brant Lai, an undergraduate researcher in Cornell University, is currently working towards bringing us that future by working with nanoparticles that can be utilized for targeted drug delivery systems. Lai is a senior majoring in Biological Sciences and Chemistry in the College of Arts and Sciences and he is conducting competitive research in nanotechnology that has wide and pragmatic implications. “The field of nanotechnology deals with molecules in the nano-scale,” Lai explains. “When you work with molecules in the nano-scale, you begin to see properties that are novel and absent from bulk material,” he added. A researcher can subsequently modify these molecules to be more specific than organic molecules, thus increasing precision and yield.

Lai’s particular project involves finding ways to attach gold nanoparticles onto solid surfaces. Because the field of nanotechnology is in its infancy, examining properties of isometric nanoparticles like gold is crucial. Gold is particularly hard and makes a great conductor. These particular properties are preserved at the nanoscale level and thus gold makes for a very useful nanoparticle. Additionally, the more researchers know about nanoparticles, the better they can alter their properties for practical usage. Theoretically, a nanoparticle with high structural specificity and solid surface binding properties could be used to transport effective drugs to appropriate sites. Such accurate administration of medicine could potentially decrease the likelihood of inadvertent side effects. Lai uses computer simulations to determine whether the surface-binding properties of gold can be enhanced.

Most of Lai’s work has been done in the Dan Luo lab in the Department of Biological and Environmental Engineering in the College of Agriculture and Life Science. Lai acknowledges that his graduate student mentor, Thomas Derrien, has contributed strongly to Lai’s growth as a researcher and critical thinker. Due to the autonomy he received from his research mentor, Lai has learned to be an accountable and independent researcher. Additionally, four years of active research has fostered his scientific and objective mindset.

In his free time, Lai likes to travel, watch movies, and compose and analyze music. After graduation, Lai will work in a consulting firm in Boston. Depending on his experience in the consulting firm, he may or may not choose to pursue an MD-Ph.D. dual degree. Regardless of what academic avenue he may choose to pursue, Lai will continue to be a treasured member of the applied research community.

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Do you know where the clothes on your back came from? What if the workers who made them had many of their rights violated? Would you still wear them? Generally, when people think about international issues, their minds turn to topics like oil dependency or war crimes. Few would link their warm sweater to labor abuses on the same scale as other international rights violations. Lawrence Goun, a senior in the School of Industrial and Labor Relations, illuminates this exact problem with his research in the Peruvian textile industry.

One glaring issue in Peru’s textile industry is its questionable treatment of workers, often conflicting with labor rights set by the International Labor Organization. This is where Goun’s research comes in, as he tries to draw conclusions about where the Peruvian textile industry is heading and what international action should be taken in response. He asks himself, “How do we approach the situation of trading with countries who violate international trade relations set by the ILO?”

It all started last spring in Lima, Peru, where Goun began his independent study under Dr. Lance Compa. Here, Goun’s initial research at The Solidarity Center revealed that Peru violates several terms of its Free Trade Agreement with the United States. He discovered that many Peruvian textile companies treat their workers extremely poorly, neglecting essentials such as required breaks, quality food, decent wages, and unionization rights. Goun realized that the biggest problem lies in the difference between informal and formal workers, which Peruvian companies take advantage of by using 90-day contracts. If workers are formally hired, they are entitled to national social welfare and are protected by the Peruvian laws and justice system. However, since most Peruvian textile workers are on 90-day contracts, they are only considered temporary workers, which allows employers to bypass laws regarding the firing of workers, maternity leave, and compensation for injuries. Goun further explains that “the workers have no choice—it’s either sign a 90-day contract or try to make it on your own.”

With this knowledge in mind, Goun set out to garner data from primary sources by interviewing workers, business owners, and government officials in Peru. Unsurprisingly, he encountered an enormous obstacle when he contacted the top 10 textile producing companies in Peru. None of them would allow him to conduct an interview. Goun noticed that of the people who would speak to him, each had a different story, as “every person feels like they’re a victim.” He notes that business owners believe that the government is not helping them, while the government believes that business owners are disregarding their rules. Additionally, Peruvian consumers believe that the international market brings them trouble.

With his independent study complete, Goun continued his work at Cornell. He realizes that the story is still incomplete, as Goun asserts that Peru’s textile industry continues to violate the International Labor Organization’s labor standards. Many organizations have sent letters to the Ministry of Labor and the President, who have ignored them entirely. To get a feel of the common person’s knowledge of the issue, Goun interviewed his Peruvian and foreign friends. Goun’s foreigner friends felt that it was not their country’s place to pressure Peru to fix its textile industry. On the other hand, his Peruvian friends stated that they were more concerned with other fields, such as mining and oil. Thus, Goun’s ultimate goal is to share the knowledge that he has gained from his research, as he believes that “when people become more informed, they’ll make better decisions and more productive choices.”

In the future, Goun seeks to address similar issues, as he looks for jobs where he will work one-on-one with people on labor issues. Outside of research, Goun has served as President of the Cornell Union for Disability Awareness, which conducted an accessibility awareness event to encourage prominent campus officials to recognize the accessibility flaws of buildings on campus. He further seeks to be involved with the greater Tompkins County community through the Cornell Elderly Partnership and the Cornell Organization for Labor Action.
Sliced and stained to elegantly illustrate the supporting text, tissue sample images are familiar to anyone who has handled a biology textbook. The trained eye, however, sees beneath the surface. Properly understood, histology, the study of microscopic cell anatomy, allows one to enter a world unseen by most and observe minute cell interactions that can occasionally go horribly wrong. The potential value of using biological tools to detect cancer is the driving force behind Carolyn Creneti’s research. Creneti, a senior double majoring in Biological Sciences and Spanish in the College of Arts and Sciences, has been conducting research on canine cancers with Dr. Andrew Miller in the College of Veterinary Medicine using techniques derived from histology and immunohistochemistry (IHC). Immunohistochemistry, an important subset of pathology, involves the use of primary and secondary antibodies to stain specific cell elements.

Creneti’s current project, The Expression of Tissue Transglutaminase in Canine Meningioma Cases, looks at seventy cases of canine meningioma, a type of brain cancer affecting the meninges (the outermost membranes of the brain), using the tissue transglutaminase (tTG) antibody. This antibody has been recently found to play a role in inflammation and tumor biology, and its expression is greater in certain cancer cell types. Chosen because of their potential expression in canine meningioma, the antibody staining patterns in brain tissue samples are then interpreted with the help of pathologist Dr. Miller. Creneti says, “We’ve hypothesized that there might be a correlation between the tumor type and subtype and the amount of expression of tissue transglutaminase in the tissues.” Although it is too early to know whether the hypothesis has any merit, Creneti is excited to see what the statistical tests will yield. If tTG expression is found in correlation with the type and severity of meningioma, it could be used as a predictor for the cancer. Even if no correlation is found, Creneti will not be heartbroken as she notes that “the negative results are just as important as the positive results” and serve as “a springboard for other studies.” Once her project is completed, Creneti plans to publish her results as a first author, which she finds to be an extremely exciting prospect.

Along with characterizing canine brain cancer, her study also aims to portray dogs as valuable model organisms for human brain cancer. Because the dog is not a typical model organism, it has not been extensively researched, and the Miller lab has had to adapt IHC techniques to their canine samples. Creneti explains, “We're pretty much discovering the protocols for how to use these antibodies and if they work at all in dogs.” Through trial and error, she has successfully implemented a number of protocols using canine tissue samples and contributed to her lab’s goal of establishing the dog as a model organism.

Creneti’s research journey has been eventful and rewarding. First, she gained valuable basic skills from her initial exposure to research working at the Pathology and Laboratory Medicine Department of the Cleveland Clinic for three summers during high school. She then veered off in another direction, studying monarch butterfly and milkweed interactions for two years in a Cornell ecology lab before returning to pathology this past summer at the Miller lab. Because of her prior pathology experience, Creneti found the adjustment to the Miller lab surprisingly easy, and her pending second-author paper and her planned first-author paper evince her productivity.

For the future, Creneti plans to continue research in pathology while also putting her Spanish major to use. She would love to be a “pathology liaison in a Spanish-speaking country” or perhaps “start a histological educational program in a country such as Guatemala.” In the meantime, Creneti is enjoying her last semester at Cornell in gorgeous Ithaca and recommends that everyone stay for a summer and get to know the locals. Creneti is also president of the Squirrel Club and a regular participant in the International Ithaca Dragon Boat Festival, which takes place in the summer.

Jane Wei ’18 is in the College of Arts and Sciences. She can be reached at jmw487@cornell.edu.
As college students, we’re always using social media to connect with our friends, share experiences, and take study breaks. Yet, why is it common for students to log in to Facebook within minutes of logging off? What causes the extreme frequency with which students return to Facebook? In an extensive research project, senior Shelby Rokito addressed this question with the hypothesis that the discrepancy between what students hope to attain from going on Facebook and what they actually attain drives them to return frequently.

Rokito, a Communication major in CALS, conducted her research in the Social Media Lab, where she began working as a sophomore. She began her research career as a research assistant to her current mentor, Dr. Natalya Bazarova, who was studying self-disclosure on Facebook at the time. Since then, Dr. Bazarova has been a helpful asset to Rokito’s research process. Not only has she been helpful and supportive, but she has also guided Rokito through every stage of the project using Rokito’s own experience, leading her to literature, and connecting her with a computer programmer. As a junior, Rokito applied for the Hunter R. Rawlings III Cornell Presidential Research Scholars Program, which selectively chooses undergraduate students and provides them with the opportunity to conduct financially supported, faculty-mentored research. Rokito was accepted into the program and was awarded funding to perform her social media experiment. She is now using this research project for her honors thesis.

After a year of working on the experiment, Rokito is finally ready to begin analyzing the results. For the experiment, Rokito worked with a graduate computer programmer in the Department of Information Science to develop a web browser extension that surveyed the 73 study participants before and after logging in to Facebook. Existing studies of this sort have used retrospective methods to survey participants about their experiences with social media; contrarily, Rokito wanted to try surveying her participants during the experience itself. The questions asked before the students logged in to Facebook were aimed at capturing the gratifications they hoped to receive such as “to what extent are you on Facebook to ease your boredom?” The questions asked after the student logged out of Facebook were aimed at assessing whether or not the gratifications were obtained. Rokito is currently in the process of interpreting her findings. She expects to see that the discrepancy between what students hope to attain from going on Facebook and what they actually attain drives them to constantly log back into Facebook relatively frequently.

“"The questions asked before the students logged in to Facebook were aimed at capturing the gratifications they hoped to receive such as “to what extent are you on Facebook to ease your boredom?” The questions asked after the student logged out of Facebook were aimed at assessing whether or not the gratifications were obtained. Rokito is currently in the process of interpreting her findings."

Throughout her experience with research, Rokito has improved her abilities to conduct in-depth literature review, formulate testable hypotheses, and perform statistical analyses. Rokito claims that her favorite aspect of conducting research is “discovering new information about how and why we interact the way we do on social media platforms.” Though Rokito has been involved in research for the majority of her undergraduate experience at Cornell, she does not plan on pursuing research as a career. Instead, she is going to law school next year. Besides researching with the Social Media Lab, Rokito is President of Cornellians for Israel, in a sorority, and holds a position on the Communication Student Advisory Board. In her free time, she enjoys traveling, visiting food trucks, and watching sitcoms.

Santana Silver ’17 is in the College of Human Ecology. She can be reached at srs384@cornell.edu.
Hutchinson-Gilford progeria syndrome (HGPS), a rare genetic disorder that occurs in 1 out of 8,000,000 live births, causes premature, accelerated aging. HGPS is caused by a mutation in a gene that encodes for proteins in the nuclear lamina, and untreated patients have a life expectancy of about thirteen years. Research on the syndrome focuses mostly on treatment, but because some of the cellular processes occurring in HGPS are similar to those in normal aging, studying it could be one of the best ways to understand human senescence. For this reason, Shen Ning can spend up to five hours at a time performing surgery on a mouse to model the effects of mechanical stress on HGPS cells.

Ning is a senior in the College of Arts and Sciences, completing a degree in Biology and Society with a minor in Cognitive Science. She does her research in the lab of Dr. Jan Lammerding at the Weill Institute for Cell and Molecular Biology. Ning works on a surgical model that induces stress on vascular smooth muscle cells in HGPS mice. During the surgery, she creates a constriction in the lower abdominal aorta that causes increased ischemic and hemodynamic stress on the vascular tissue superior to the constriction. Ning harvests the tissue above and below the constriction three times over a period of eight weeks and examines the samples for cell loss. So far, she has found that even though there is no significant increase in cell depletion in HGPS mice, the mice exhibit blunted formation of the neointima, or scar tissue. She will continue to investigate this during the remainder of her senior year.

Although Ning has been working on her HGPS project since her sophomore year, she joined Dr. Lammerding’s lab as a freshman, after meeting him at the Cornell Undergraduate Research Board’s (CURB) fall dinner series. In her junior year, she studied abroad at Oxford University and decided to pursue her interest in neuroscience by doing research on memory.

“I’m really committed—when I start a project, I’m going to finish it, so when I started my HGPS project as a sophomore I really wanted to finish it,” Ning says. “But I was interested in neuroscience because it’s something I want to do in the future ... so when I went to Oxford, I approached two different professors and said I’m interested in memory.” Ning studied working memory, a type of short-term memory that stores the information needed for tasks like learning and reasoning, and she stayed at Oxford over the summer to complete a project on using working memory deficits for early detection of Parkinson’s disease. She will finish her work in Dr. Lammerding’s lab before matriculating to medical school next fall.

Ning is grateful for the support she has received from the people with whom she works, from postdoctoral researchers at Cornell and Oxford to Dr. Lammerding himself. “[Dr. Lammerding] has been really supportive in every single way, and he’s been there for me for everything academically,” she says. “I talk to him about things I’m excited about, a project I’m working on, or applications I’m thinking of doing.”

One of Ning’s favorite memories of her research is meeting children suffering from HGPS, an experience she calls a reminder of “the human element” of research. She hopes to pursue an M.D.-Ph.D. to become a physician scientist specializing in neurodegenerative diseases.

“I’m hoping that in the future I might do translational-type research or more cell and molecular biology-based work, or animal model-based research on a particular neurodegenerative disease,” Ning says.

Outside of the lab, Ning is a member of the Dancesports team, the co-treasurer and previous co-president Amber Dance Troupe, a Cornell Abroad Ambassador, an Arts and Sciences student advisor, and the founder of D.A.N.C.E. (Dance Nspired Cultural Education), an afterschool program for Burmese refugee children at Belle Sherman Elementary. She has served as the Vice President of Culture for SilkRoad and CURB’s Coordinator of Fall Events and has volunteered in Budapest and Warsaw. During her year at Oxford, she traveled to sixteen cities in eight countries. She hopes that further research concerning HGPS will result in both better treatments for the syndrome and better understanding of human aging.

Stephanie Yan ’18 is in the College of Arts and Sciences. She can be reached at smy43@cornell.edu.
In the past decade, social media has been rapidly expanding in usage and popularity. Networks such as Facebook, Twitter, Google+, and Instagram have millions of registered users, and those who do not have accounts have at least heard of these applications. This expeditious growth indicates that more people are opting to use social networks to connect and communicate. Marketing via social network in particular has become a preferable and highly effective method for businesses to advertise their products and services. The teams of student organizers for this year’s Hotel Ezra Cornell also recognized this and have been reaching out to potential guests and publicizing the event through various social media sites.

“Hotel Ezra Cornell (HEC) is an annual weekend-long educational conference held in March at the Statler Hotel and coordinated entirely by Cornell students of the School of Hotel Administration for leaders in the hospitality industry.”

Hotel Ezra Cornell (HEC) is an annual weekend-long educational conference held in March at the Statler Hotel and coordinated entirely by Cornell students of the School of Hotel Administration for leaders in the hospitality industry. In addition to educational seminars, this long-standing tradition is comprised of leisure activities and food and beverage events. The main purpose of this event is for hotel students to practice the skills they have learned in class and to showcase their talents to industry professionals. Paula Cai, a sophomore from the School of Hotel Administration, is one of the many hotel students involved in the planning of HEC and is in charge of managing the social media research that is used by all of the HEC teams.

After volunteering in the design team in her freshman year, Cai applied and was recruited this year to the marketing team, which manages outreach for alumni, sponsors, and current Cornell students. Working together with others in the marketing team, Cai was responsible for researching and tracking the current trends on a variety social media sites, such as Twitter, LinkedIn, Instagram, and Facebook. In order to increase awareness for the HEC event as well as attract more guests to attend, Cai examined and looked into various queries and details from a marketing standpoint: When is the best time to post on a site? Who are possible social media users we can connect with to promote the event? Who are potential guests that we should reach out to? One of marketing team’s biggest concerns was actually informing current Cornellians about HEC. “Everyone in the hotel school knows about [HEC] and if you don’t know it’s because you’re not a hotelie,” Cai elaborated, “It’s such a big thing for hotelies, but when I talk to my non-hotelie friends about it, they’d be like ‘What’s that?’” Using gathered information and their experiences, Cai, in collaboration with her marketing team members, wrote a research paper on the various marketing aspects for HEC.

Cai commented that it was her interest in marketing, which developed after enrolling in a marketing class the previous semester, and her love for social media, especially Instagram, that led her to join the HEC marketing team. She enjoyed contributing to the event and found everything being done meaningful and memorable. “After five or ten years, I’ll look back on it,” Cai reflected, “It’s something really special to the whole school and that’s the main reason it interested me.” In consideration for HEC next year, Cai is thinking of trying something different by joining another of the many possible teams.

Besides being involved in the planning of HEC, Cai actively participates in many other activities and organizations on campus. She is a member of Ellevate, a women’s business club, HSMAI, a sales marketing club in the hotel school, and the Cornell Gourmet Club. Cai is also a teaching assistant for the Managerial Accounting course this spring semester. Her personal hobbies include traveling, Instagramming, karaoke, and shopping. Though she is still figuring out what direction she wants to go in the future, Cai is interested in real estate development and finance consulting, but also wants to continue trying new, different areas of hospitality.

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Oscar Wilde once wrote that “life imitates art far more than art imitates life,” but this could not be further from the truth when it comes to the work that Andrew Moorman has been doing in the College of Architecture, Art, and Planning. Moorman, who is from Channahon, Illinois, is currently working in the Sabin Design Lab with Jenny Sabin, an Assistant Professor in the Department of Architecture, on a project called ColorFolds.

ColorFolds, an on-going project funded by the National Science Foundation (NSF), combines optical effects with dynamics inspired by Japanese kirigami, a variation of Japanese paper folding (or origami) that includes intentional cutting. The central parts of the structure are planes of plastic that are painted with dichroic film and nitonal springs. These springs consist of thermal bimetals that react differently to heat. These reactions produce kinetic effects, causing the metals to compress. Placing the springs near these computer-generated planes gives the planes the ability to fold in the presence of heat.

The exact folding pattern of the planes in the installation is dictated by microcontrollers embedded within the structure that react with one another. This interplay is modeled after the dynamic interactivity and folding that occurs between actual living cells. The dichroic film painted on top of the planes allows for the installation to reflect varying colors of light. The complete effect is an ever-changing colorful airy structure whose ability to fold and unfold is dependent on the presence of people in the area. The project was displayed in Sibley Hall for the Fall 2014 school semester, where passerby experienced the colorful folding and unfolding firsthand.

As a member of ColorFolds, Moorman works on the mechanistic aspect of the project. This semester, he will be spending his time working on fine-tuning the structure. This will involve improving the code that allows each microcontroller to interact with each other, testing circuits, and powering springs. He is eager to find out the degree of responsiveness present in the structure and the duration that these effects can be maintained.

Moorman had wanted to be an architect since middle school and says that attending Cornell had been a long-term goal. He states that the opportunity for researchers to integrate various disciplines into their projects is one of the best things about the Architecture program at Cornell. He says, “The [great thing] about architecture is that we always need buildings, and each building provides an opportunity to do something different.” Moorman particularly enjoys working with Professor Sabin, who has a reputation for using various disciplines – including mathematics, cell biology, and material science—in her work. “[With Sabin] it’s not a matter of rethinking what’s there, but about pushing the boundaries of what can be included in architecture, and what can be used for architecture,” he explains, “I very much admire her work and her research interests.”

In addition to working with Professor Sabin, Moorman has also worked with Professor Donald Greenberg, the Jacob Gould Schurman Professor of Computer Graphics, on new visual technologies at Cornell’s Creative Machines Laboratory. While there, he worked on projects in evolutionary robotics and computation. Moorman also helped to put together the panels for the needle structure placed on the Arts Quad for Cornell’s upcoming sesquicentennial. The structure, called A Needle Woman: Galaxy was a Memory; Earth is a Souvenir, was created by Kimsooja and consists of nanopolymers that reflect brilliant colors in the daylight.

As for his work on campus, Moorman likes the exposure he receives by conducting research. He comments, “[Research] really gives you an appreciation for the big picture and how things come together. You really become aware of all of the work that is going on around you.” After graduating from Cornell next year, he plans to pursue graduate education in computer science before continuing his career in research.

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Who knew that fish could be a model organism for studying how vertebrates produce sound? Yet this idea turns out to be true: fish usually have the simplest mechanism for producing complex, non-linear sounds, making them ideal study subjects. While humans produce sound by vibrating the larynx, toadfish vocalize by vibrating their swimming bladders, a more simple mechanism. By studying these sounds and analyzing them mathematically, one can discover a great deal about the vocalizations of different vertebrates.

Sang Min Han, a senior from Fairfax, Virginia, has been studying vocalization in vertebrates since his freshman year at Cornell. He is in the College of Engineering, and will graduate this year with a degree in Electrical and Computer Engineering with a minor in Applied Mathematics. He was involved in research even during high school, specifically at the Naval Research Laboratory in Washington D.C, where he conducted research in the field of radio science. His work during high school stimulated his initial interest in electrical engineering and ultimately led him to pursue the field at Cornell. As a Hunter R. Rawlings III Cornell Presidential Research Scholar, he has conducted research for all four years of his time at Cornell.

Han conducts his research with Professor Bruce Land in the Department of Electrical and Computer Engineering, who is also his major advisor. He also works with Professor Andrew Bass in the Department of Neurobiology and Behavior as well as Dr. Aaron Rice from the Cornell Lab of Ornithology, who is the Director of the Bioacoustics Research Program. His interdisciplinary research crosses boundaries and combines different fields of study, which Han considers a valuable experience. “There are just four of us in every group meeting.

Han has attempted to develop a mathematical model for how vertebrates make sounds. A slightly modified system-coupled oscillator modeled the sound produced by the fish. Han then attempted to fit the model on vocalizations of different species of vertebrates. Using a recorded call of the fish, he then minimized the difference between the model-generated and the recorded sounds. “The model parameters that correspond to the minimum that we find give us more biological insight. It tells us what makes different calls and about the physiology of vertebrate vocalization structure,” says Han. He has found that the simple model is adaptable to different species, not just fish. This could have strong implications in evolutionary biology, supporting the theory that a certain group of vertebrates have common ancestry with similar mechanisms of vocal communication. It also provides deeper insight into how sound is produced and the nature of sound in other animals. Han’s research is now nearing the publication phase, and will soon share the results of his findings to the rest of the world.

Han deeply enjoys research because of the challenge of tackling something new that nobody else in the world knows. “In classes you’re given a problem to solve and it has an answer. But research isn’t like that, and you can often be stuck at a dead end,” says Han. “You learn to be very self-motivated.”

Outside of the lab, Han enjoys listening to music and having fun with his friends. Han has been involved in many other research-oriented extracurricular activities, including The Research Paper for which he currently serves as a senior advisor. However, he has now stepped down from most of his positions due to his busy schedule and preparation for graduate school. He currently serves as the Treasurer for the Institute of Electrical and Electronics Engineers and is President of the Kappa Chapter of Eta Kappa Nu. Han hopes to continue participating in research and plans to pursue a PhD.

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