Fall 2018 Features
Media Literacy: The End of Fake News
A Window into Sustainable Architecture
Finding the Lost Colony of Roanoke Island
Reimagining the Prosthetic Hand
Family First
Hotels in Hospitals
Clues Hidden in the Paper
ABOUT THE PAPER

“Our vision as the founders of The Research Paper is to create a magazine that humanizes research on all levels. We believe that research is as much about self-discovery as it is about achievement. In addition to showcasing the outstanding research that is conducted here at Cornell, we also aim to highlight the uniqueness, creativity, and personality of each researcher to all of our readers. We do this by focusing our articles on who the researcher is, what they are involved in both at Cornell and in their local communities, and what their future visions and aspirations are.”

Letter from the Editor

Dear Readers,

Thanks for picking up the Fall 2018 issue of The Research Paper! This issue has 16 articles about Cornell undergrads doing research that ranges from architecture to molecular biology. I’d like to thank the entire TRP team for their hard work on this issue, and a special thank you to Sophia, Vivian, and Christian! One more thing: we’re always looking to improve our magazine, so please email je332@cornell.edu with any comments or questions.

Welcome to the inspiring world of Cornell research!

Sincerely,
Josh Eibelman
Editor-in-Chief

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Joining the Social Media Lab in the Department of Communications during the spring semester of her freshman year, Garcia has been involved in a variety of media-literacy-based projects. Currently, she is involved in the Social Media Test Drive project. Her group has created a fake social media website that is designed to educate diverse age groups in media literacy. The platform includes a simulated feed with different modules such as cyberbullying, fake news and clickbait identification.

One of the most enjoyable aspects of her time as a researcher is that the program has brought her out of the lab to actually test it on human subjects. She notes, “Last semester we actually had a bunch of middle schoolers on campus…so we got to sit there and pilot the program with middle schoolers. It was rowdy, but it was also fun.” Despite being a work in progress, Test Drive is currently used by approximately 200 middle schoolers in New York State. Garcia is very excited about the application of her work. She says, “It’s pretty cool in and of itself that its actually being used in an educational setting… I feel like I’m actually making a difference in kids’ educations.”

Garcia’s second project—The Truman Project—builds on the Social Media Test Drive project. It revolves around a simulation that creates a fake social media sites by means of bots; the bots create automated fake posts and replies so that the subject testing the experiment believes they are using a functioning social media site. Therefore, it allows the researchers to test the effects of changing site features or modes of communication.

A Florida native, Garcia continues her extracurricular activities from her adolescence when not giving presentations and conducting research. Being an avid rock climber as well as a hiker, she uses Cornell’s resources to her advantage by utilizing the climbing center as well as the many hiking trails that run through campus. Outside of the lab, Garcia also enjoys spending time with her fellow researchers.

As a result, she was saddened by departure of her mentor—Jessie Taft, Ph. D.— to Cornell Tech this past summer. Garcia conveyed these sentiments when mentioning the significant role that her mentor played in her life at Cornell: “She was super sweet. She did a really good job talking about helping me through things that I didn’t quite understand. She was always willing to meet me and go out of her way to help me.”

Even though Garcia’s mentor has departed, Garcia and her research team continue to make significant contributions to media communications and literacy. With most of society being integrated with technology and many individuals being involved in social media, research and education on modes of communication is crucial: “Even though social media is so relevant, I feel like it’s not really something that they teach in a classroom setting. Normally it’s just a hard curriculum [to get funding for], so it’s cool to put that in the classroom and have an actual curriculum.”

Garcia’s contributions to the Department of Communications and Media Literacy over the past three years have prompted her to heavily consider continuing her education as a graduate student studying communications. Her decision will ultimately be dependent on the climate of the workforce after graduating from Cornell. However, given the difference she has already made on middle schoolers and the significant impact that her projects will have on society for the better, it would not be unexpected for her to continue onto graduate school.

— Blake Martin
The older your grandfather gets, the more worrying it is when he loses his keys or forgets the glasses on the top of his head. Most likely it’s a simple case of forgetfulness – after all you misplace your keys occasionally at age 20. But in the worst-case scenario, he may be developing Alzheimer’s Disease, a devastating form of dementia.

The brain is an intricate structure that needs to be crafted with the proper building blocks. The protein composition of the brain can hint towards the risk for damage and disease, as is the case with Alzheimer’s. Stephanie Becker studies the roles that progranulin and amyloid beta, which are proteins associated with Alzheimer’s, play in causing the disease.

Becker is a senior Biology major in the College of Agriculture and Life Sciences, concentrating in Neurobiology and Behavior. She works with Professor Fenghua Hu within the Department of Molecular Biology and Genetics. Her senior thesis explores if and how a deficiency in progranulin leads to a different kind of cytokine protein signaling in microglia cells, which are the immune cells of the brain. Cytokines are proteins that play a role in the inflammatory response. Becker’s research involves comparing two groups of mice with Alzheimer’s: an experimental group consisting of mice that are deficient in progranulin, and a control group of mice that are not deficient in the protein. She is interested in looking at the effects of the specific cytokines interleukin 6 and interleukin beta.

Becker’s experiments show that progranulin-deficient mice have more microglia surrounding fragments of the Alzheimer’s-associated amyloid beta protein. This indicated a suppression of cytokine signaling and therefore less inflammation. Her immediate goal is to figure out why this occurs. Eventually Becker hopes that her lab’s work will contribute to the search for an Alzheimer’s cure.

“We really want to elucidate the function of progranulin in Alzheimer’s. This is a step towards basic scientific understanding of Alzheimer’s disease.”

Becker has a long-standing interest in science. She began doing research as a high school student and has had several research experiences since. She has done research in Germany and at the University of Massachusetts. She has always been interested in the intersection of neurobiology and immunology and this love has developed into a recognition of the importance of interdisciplinary science.

“Some scientists want to dig deeper in their [specific] field, but I think that people should consider combining different types of research and consider fields they are not comfortable in.”

In the spirit of interdisciplinary study, Becker’s favorite class this semester is a microbiology course.

Becker also believes in science outreach. Along with Cornell Undergraduate Research Board, she has created a mentoring program for high school students interested in research. This effort was inspired by her appreciation for beginning to do research at an early age. For anyone looking to gain lab experience, Becker recommends cold emailing. She says she found each of her research experiences by emailing professors who investigate interesting topics. When she is not studying or in the lab, Becker also likes to play the flute and play tennis.

— Rebecca Ebiana
With global temperatures steadily rising over the past few decades, Molly Huber says that “there is no doubt that human civilization is slowly but surely dooming itself.” But climate change may have met its maker with the research of Molly Huber ’19.

Huber’s research on climate change began in a biochemistry lab in Cornell’s Department of Natural Resources. There, she works with a series of soils from Panama that have been collected periodically since 1987. Huber looks at the changes in various aspects of soil structure such as aggregation in soil physical factors, isotopic ratios and chemical compositions to track carbon storage capacity in these soils over time. Though these soils currently act as carbon deposits, Huber says they are “threatening to become a source in the future,” potentially adding to the carbon dioxide accumulation which contributes to rising global temperatures.

Huber interned with the National Oceanic and Atmospheric Association (NOAA) during summer 2018 where she monitored carbon dioxide levels in South America. While working in the global monitoring division, she used a mathematical model to estimate carbon dioxide and other gas ratios in higher atmospheres of the Amazon. The current challenge with carbon dioxide monitoring in the Amazon is that there is only one tall tower that can accurately estimate gas ratios at altitudes between 25 and 40 meters. It turns out that, in a remote place like the Amazon where it is difficult to build tall towers, using existing smaller towers to extrapolate gas ratios to a higher altitude over a broad area is particularly useful.

Termed the virtual tall towers approach, this spatially representative measure of carbon dioxide levels had never been applied outside of temperate forests because of the fear that it use in tropical systems leaves too much room for error. The potential for error stems from the varying meteorological variables in the tropical system. But despite the skepticism among scientists, Huber was able to record accurate measurements and plans on presenting her data to other biogeochemical scientists at several conferences.

Huber has incredible work ethic, which has certainly contributed to her success in research. She was raised in Pelham, a rural town in Massachusetts with population 800. Throughout her adolescence, her father worked in construction, and Huber helped out as a construction assistant. When she was not helping with various painting and staining jobs, Huber spent time with her mother, a retired wetland biologist, in the wildlife reserves near her where she lived. Huber says this time with her mother sparked her initial interest in the natural sciences. When she came to Cornell, Huber continued to explore her passion for nature by working at the Cornell Botanical Gardens, which she says has the additional benefit of helping her relax.

Most of Huber’s family members did not attend college, but Huber has succeeded through devotion to her work. She personally attributes her success to the role her mentor, Dr. Joe Yavitt, plays in her life:

“My mentor is awesome. He’s my boss, my faculty advisor for my major and my professor. So he knows me really well and he’s kind of made it his individual goal to make me succeed because I don’t know a lot about the whole process of higher education in general,” Huber said.

Huber hopes to co-author many of Dr. Yavitt’s future publications, lending her credibility that will help her take the lead in the fight against climate change in the future.

— Blake Martin
Would you rather sit next to a window or under a lightbulb? Studies show that people prefer natural light to electric light. Natural light is considered desirable in a home, and it even plays a part in a home’s economic value. Looking at two different homes, it is relatively simple to compare the square footage or number of bedrooms. But is there a simple way to compare the amount of daylight in a building?

Daniel Park is a senior in the Bachelor of Architecture program in the College of Architecture, Art and Planning. Park works with Professor Timur Dogan in the Environmental Systems Lab to establish a metric that quantifies daylight in residential buildings so that architects can consider and compare natural light during the design process.

Determining the amount of daylight people inside a building receive is difficult because it depends on a variety of factors including the angle of the sun and the time of day. But while office buildings and schools are regularly occupied during certain times of the day, occupancy of houses and apartments tends to be much more variable.

Park has helped create a scientifically objective way to quantify how much daylight a home is expected to get over the course of the year. The metric has been tested in Europe, North America, and Eastern Asia, and it only works in temperate or cold climates so far. In warmer areas, undesirable heat gains from the sunlight need to be taken into consideration. Currently, Park is tweaking the metric so that it is universally applicable.

“The ultimate goal of this is to help architects and designers design buildings that are comfortable and desirable for the occupants: physically and psychologically of course, but also because daylight has a lot of potential to save energy costs,” Park explains. Increased use of natural light allows people to save on electricity, and can help provide heat in the winter.

Park began doing research his freshman year after an Environmental Systems Class sparked his interest in sustainable buildings and energy efficiency. He values a balance between the aesthetics and sustainability of architecture. Park enjoys revisiting known examples of residential architecture from a technical or sustainability viewpoint, seeing it as an opportunity to “become more critical and analytical about how you see architecture.”

Over the course of the project, Park has learned a variety of skills such as coding, finding creative ways to translate information visually, and analyzing daylight performance from diagrams.

Park says he is grateful for the opportunities the Cornell architecture program provides. “It is a great platform for people from different disciplines to have a Dialogue,” he says For instance, architects and planners can collaborate with computer science majors on various projects.

In the future, Park intends to continue his research and pursue a thesis year, the equivalent of a senior thesis in the Architecture school). He enjoys teaching, so after graduating in 2020, he would like to work as a teaching assistant at Cornell for a year. Then, he intends to work in the sustainable architecture field for a few years before beginning graduate school.

— Emily Woodward
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— Jeremiah LaCon
The citrus farming industry is in danger – their oranges have stopped turning orange.

In China, where it was first discovered, the culprit is called citrus greening disease, also known as huánglóngbìng or yellow dragon disease. In the face of this agricultural crisis, Stephanie Hoyt, a senior in the College of Arts and Sciences, is working to understand and combat HLB using a powerful tool: bioinformatics.

Bioinformatics, as Hoyt describes it, means “using computer programs to analyze large amounts of biological data, most commonly in genetics.” It is a rapidly developing field at the intersection of biology and computer science, both of which Hoyt is majoring in. She works in Dr. Lucas Mueller’s lab at the Boyce Thompson Institute, a plant genome research facility which is trying to better understand citrus greening disease. The disease is caused by a bacterium called Candidatus liberbacter, which is carried by an insect known as a psyllid. Psyllids carrying the pathogenic bacteria move from tree to tree, acting as a vector as they feed on the sap. The bacteria kill the tree, rendering the fruit unusable.

“If it gets into a grove, it could completely wipe out a farmer’s livelihood,” Hoyt explains.

Hoyt’s project specifically deals with three key bacteria which live in these psyllid vectors. Though the genomes of these bacteria have been isolated from some psyllids and sequenced, little information currently exists on the endosymbionts of the Florida psyllids in particular. With data produced from Dr. Michelle Heck’s lab, Hoyt is working to compare the genomes of the bacteria of disease-carrying psyllids with the genomes of the same species of bacteria from non-carrier psyllids. Results from these analyses could reveal potential proteins or genes of interest which could help future efforts to stop citrus greening disease from spreading.

Currently, Hoyt is working on assembling the genomes of these three bacteria from numerous smaller sequenced chunks. Bacteria have a circular genome, so much of her work has involved classification and scaffolding of the genomic chunks to reconstruct a genomic loop. Once the genome is assembled, she will be able to run the DNA sequence through computer programs that can show what proteins are encoded by that sequence. This allows for a more thorough understanding of the functional consequences of differences in the bacterial DNA. Hoyt hopes to find orthogroups, regions of the DNA that encode proteins which serve highly similar purposes in different bacteria.

“We’re expecting some differences [in bacterial genome sequences] because they’re from different regions,” Hoyt explains.

Hoyt hopes that her research will help contain the effects of citrus greening disease by better understanding the origins of the problem.

“By the time you realize your tree’s infected, it’s too late,” Hoyt says. Though a cure or direct treatment may be beyond the current scope, future findings will hopefully help keep the disease from spreading further, and perhaps slow the rate of infection.

Hoyt says her work has helped her view bioinformatics in a real-world perspective.

“It was the perfect combination of the two things I wanted to do. I feel like with this [project], I understand what’s going on in the biology side … I’m understanding the real-world impacts and where [the data] comes from. Sometimes you can get all that stuff from a screen and forget the significance of it, but it’s good to take a step back and remember that the data came from different places.”

Post-graduation, Hoyt hopes to go to graduate school, most likely for bioinformatics. Although she’s never tried it before, she is interested in getting more involved with wet lab research to better understand the data production and the biological aspect of her studies.

— Eugene Kim
Asia’s global presence is increasing. Those who are able to understand Asia’s history, culture, and domestic and foreign policy will likely play a crucial role in global economic and public policy. Sean Cronan, a senior College Scholar in the College of Arts and Sciences, is studying the world of early Ming China, seeking to understand the transregional interactions between China and its neighboring nations.

Raised in Reno, Nevada, Cronan developed a strong liking for Asian culture after taking Japanese in middle school and Chinese in high school.

“I had a pretty strong background in both Japanese and Chinese. I just loved both!” Cronan says. “Getting out of your English mindset and just going to a new language, no matter what that language is, allows you to explore new philosophies to life.”

Cronan’s research for his Honors College Scholar thesis focuses on tracing the development of trade and intercultural interactions between China, Southeast Asia, and parts of Northeast Asia during the 14th and 15th centuries. Cronan thought of the idea after he took a class in the Department of History department called Monsoon Kingdoms: Pre-modern Southeast Asian History.

“There are a lot of connections between Chinese history and their relations between countries like Thailand or Cambodia. I found that there are a few holes in the history of cultural relations, trade, and the movement of people and ideas in Asia - I just want to fill those,” Cronan explains.

Cronan’s research is not only answering important historical questions, but also helping Cronan further develop his critical reading skills.

“Instead of taking something for face value, I really have to look at what’s really going on between each sentence and assess what the logical jumps are,” he says.

Most of Cronan’s research leads him to the Kroch Library of Asian Collections at Cornell, which houses thousands of manuscripts, photographs, prints, and microfilms from 20 Asian countries. Cronan has even been able to learn about Kroch Library’s history.

With the guidance of three mentors, Cronan is currently working on the first chapter of his thesis, which looks at the history of the tribute system of ancient China. The tribute system was the practice of ritualized and regulated exchanges that the Imperial Court mandated for interactions between China and the non-Chinese world.

“The tribute system was a political system that the Chinese empire [used] to maintain a stable equilibrium in the international politics of Southeast Asia.”

The second chapter will look at the economic trade situation of China as it developed throughout the 14th-16th centuries.

Cronan credits his mentors, Professors Brett De Bary, Robin McNeal, and Eric Tagliacozzo, for his success in research. “All three of them have offered incredible insights to me in terms of areas of study and formulating ideas,” he notes. “My mentors have inspired me to the point where I am finding that some of the best moments of learning are in the classroom.”

After Cronan’s undergraduate work at Cornell University, he plans to attend graduate school in History and Asian Studies and pursue a career in research and teaching.

— Emily Woodward
It is no secret that college is a time for self-exploration and self-discovery. The person we come to college as is not always the same as the person that leaves it. Colleges across the country allocate resources to many different religious, cultural, and LGBTQ+ groups to ensure that people of all backgrounds and identities have a “safe space,” surrounded by other like-minded individuals. However, these resources are far from evenly distributed.

Karen Loya, a senior in the College of Arts and Science majoring in sociology with minors in inequality studies, Latina/o studies, and Spanish, is writing her honors thesis on how Latinx student identity is influenced and shaped both by the college campus environment and the resources provided by the university itself. She has partnered both with Cornell University and the University of Texas Rio Grande Valley, a university close to where Loya lives, in hopes of observing overarching themes of Latinx students’ experiences.

“The two schools are very different,” Loya explains. “The University of Texas Rio Grande Valley is at the US-Mexico border and the population is about ninety percent Latino.”

In contrast, the Latino population at Cornell is only around fifteen percent. Loya plans on interviewing students and asking how their identity has changed since they have come to college, whether resources on campus have helped in making it a comfortable space, and whether they feel there is a support system which allows them to freely explore their identities.

With data from both Cornell and the University of Texas Rio Grande, Loya hopes to uncover patterns on what is working and what is not with universities’ attempts to provide social support to their students.

“I want to see the good and the bad that universities are doing to help or hurt Latinx students,” Loya says.

With the information she obtains from her study, Loya hopes to interact directly with universities and bring attention to these issues head-on.

“I want to speak to the university system as whole and tell them what their students are saying and what they need to do about it.”

When asked about why she chose this project in particular, Loya says, “I want to go into education and public policy and when reading about college students there is always a lot of talk about self-belonging and ethnic identity. I thought this would be a really good way to combine my interests with Latinx identity and see its correlations that can be implemented in an educational way.”

Loya enjoys the research process immensely. She raves about her mentor, Professor Alvarado, who has guided her throughout this entire process.

“This is a really integrative area that you need to pull information and help from lots of people from different areas. My mentor has been really good at helping direct me to these people.”

In the future, Loya hopes to expand opportunities for low socio-economic status prospective students in receiving access to college education. After graduation, she plans to go to graduate school to obtain a PhD in sociology and hopes to one day be able to work at a think tank as a policy analyst.

— Ilissa Pipia
As the capabilities of 3D printing continue to advance and its practical application becomes seemingly limitless. The ability to combine hard and soft materials means there is an exciting opportunity to improve prosthetic body parts.

Michael Xiao is a junior in the College of Engineering, majoring in electrical engineering. Xiao is working on creating a 3D printed soft prosthetic hand with newly developed sensors and flexibility.

Xiao, a Rawlings Scholar, joined Rob Shepherd’s Organic Robotics Lab at the end of his first freshman semester. Although it was initially challenging to get oriented and train in the lab, Xiao has become deeply passionate about his research. The Shepherd Lab is interdisciplinary, with a variety of projects operating at once. Xiao works on soft robotics design with Kevin O’Brien, a graduate student.

“The fact that so much of the research comes back to design is something that I really enjoy,” Xiao says. “You’re always making things, and it’s a lot of fun.”

The structure of the 3D printed soft prosthetic is very compact. All of the electronics, including the motors, the microcontroller, and battery, fit into the palm of a hand. The softness feels natural and allows the operator to handle delicate objects. Another unique innovation is the “palm joint,” located between the knuckles and the base of the palm, which simulates our natural palms and allows for more freedom of movement.

As the fingers encounter opposing forces, the innovative mechanical transmission technology allows them to switch from high speed mode to high force mode, so when handling an object, the hand can quickly grab and squeeze. Sensor technology places a light guide around a finger, with LED light shining through one end and hitting a sensor on the other.

“As the finger bends, the amount of light that gets diffracted increases, and the light received decreases, so we can map that to the level of bentness of a finger,” Xiao explains.

Together, these advancements combine to form a soft, 3D printable prosthetic with extraordinary levels of control and precision, all produced from a combination of materials that cost less than 500 dollars.

Throughout his time in the lab, Xiao has gained a variety of new skills, including printed circuit board design, 3D printing techniques, and the details of the design process. He has learned to use computer-aided design and has worked as a campus representative for Autodesk, teaching computer-aided design to project teams and in design-based courses. He also works at REV hardware accelerator, which involves 3D printing and laser cutting.

The team has recently published a paper on their achievements in Science Robotics, and Xiao is optimistic about the future of the soft prosthetic hand.

“Hopefully we can see this being applied into prosthetics in the upcoming months and years,” Xiao says. Personally, Xiao plans to continue combining electrical mechanical engineering to make further advancements in research on mechatronics and robotics.

— Emily Woodward
Although Jessica Olsen is only a sophomore, she already has clear goals for her future. After getting involved in environmental science research in high school, she came to Cornell as a Rawlings Presidential Research Scholar, majoring in civil engineering with a minor in environmental engineering. Her interest in the practical applications of environmental research brought her to Professor Matthew Reid’s ecological engineering lab, where she works to address concerns about arsenic levels in food and water.

Last year, Olsen completed a project in partnership with the USDA to analyze the levels of arsenic in rice. Unlike other crops, rice is grown in flooded fields. But while this unique method results in more successful harvests, it also introduces problems. Contaminants can dissolve in the water and become biologically available for the plants to take up. One of the most common contaminants is arsenic, an ingredient in pesticides that can be found at any local hardware store. Though it is an effective pesticide, arsenic can also be harmful to humans, acting as a potent carcinogen and potential cause of other health problems such as skin hyperpigmentation and liver failure. Although arsenic levels in crops are not an issue in the U.S., it is a serious concern in other parts of the world such as Southeast Asia. These regions are especially at risk because of a rice-heavy diet and naturally high levels of arsenic in the soil.

Olsen monitored the arsenic levels of rice from USDA experimental fields in Arkansas across the three-month growing season. She spent her time in the lab dissecting whole frozen rice plants and separating out the rice grains from the pods. After pulverizing the rice into a rice flour, she used a nitric acid dissolution method to extract the arsenic. With the guidance of a postdoctoral associate, she measured the concentrations of the toxin and used the computer programming language MATLAB to analyze the data and create an arsenic curve over the growing season.

While she experienced frustration with the developmental stage of her project, she says, “Once you get the methods nailed down and can produce and analyze efficiently, that’s the greatest feeling in the world.” She appreciated being able to collect the data herself and produce publishable conclusions.

Her results showed that crops treated with arsenic-based pesticides contained levels that were higher than by acceptable standards, and that there was a linear increase in the arsenic levels as the growing season progressed. She also discovered that there were differences in arsenic levels based on how the crops were treated. Fields that were kept flooded all season allowed dissolved arsenic to move more freely and therefore had more arsenic in the crops compared to fields that were periodically drained. These results demonstrated that draining the fields was an effective method to reduce arsenic content in rice.

Olsen’s current project in the Reed lab focuses on designing a filter to remove arsenic from water. She is training to operate advanced machinery and instruments from Cornell’s Center for Materials Research and is working in conjunction with B9 Plastics, a non-profit organization based in Rochester, to develop the material for the filter media and thoroughly test it for use in the final product. This semester, she is experimenting with a biochar made from wood chips, which are burned at high temperatures to create a porous charcoal that can filter arsenic. The biochar will soak in different solutions of metals that can increase the ability of the filter to remove contaminants. Next semester, she will run a column experiment to model a filter working in real time.

Olsen hopes to pursue a career in research and consulting with the aim of designing environmentally friendly materials for building sustainable infrastructure. She was inspired by seeing the promising work of the professionals she collaborated with from the USDA and B9 Plastics.

“If I’m enjoying it now, there’s something really great coming along,” she says.

— Emily Yang
Many people may regard the family unit as the most important social unit of society. Our family is supposed to be everything from our greatest support system to our first and best friends. Unfortunately, we know that the family unit is not the fundamental support system for everyone. Many children across the nation live in neglectful or abusive homes where they are subjected to maltreatment their entire lives or are separated from their families that are deemed an unfit environment for the development of a child.

Pearlanna Zapotocky, a sophomore Global and Public Health Sciences major in the College of Human Ecology, is working on a number of projects, all relating to children at risk and the reestablishment of the family unit in these so-called “broken” homes. She is involved in both national and local efforts to help improve resources that help facilitate better familial retention rates and elucidate these rates’ relevance to other social and economic issues across the country.

One of Zapotocky’s projects involves an initiative that aims to help vulnerable children and their families. She uses the National Child Abuse and Neglect database in hopes of establishing a clear correlation between child abuse, neglect rates and the opioid crisis. In another one of her projects, Zapotocky is partnered with the William George Agency Youth Treatment Facility, a space that provides at-risk youth a safe environment to grow and develop. This program strives to reestablish the family by reconnecting program members with their families, while providing a stable support system. Interestingly, however, support staff employees at these types of establishment have some of the highest turnover rates in the country.

To combat this, Zapotocky interviews agency staff, identifying key strategies that can best re-establish parent-child relationships and reduce this high employee turnover rate. For example, staff of the agency have conveyed that the difference between whether or not you are “getting through” to family members is often very small.

“A lot of times when family members are contacted by phone they won’t even pick up, but if they’re contacted by text message they’ll answer right away. They just feel more comfortable,” Zapotocky explains.

Zapotocky and her research partners have also uncovered that employees presenting themselves as an outside entity and not Child Services clearly and repeatedly make family members more willing to cooperate. “They’re so used to people just wanting to take their kids away,” Zapotocky states. This is information that will be made available during staff training, hopefully reducing the employee turnover rate and creating a more stable support system for these children and their families,” Zapotocky says.

Zapotocky is also involved with Tompkins County Department of Social Services where, together with community leaders, she evaluates Child Protective Service records and other New York State records. She looks at different family retention programs and considers paths of improvement based off of determined ineffective patterns across the state.

From her research, Zapotocky hopes to bring public attention to the opioid issue and to youth at risk, as well as to influence legislation relating to the opioid epidemic and child care treatment. More generally, she simply wants to give back to her community as much as she can.

“I’m from Binghamton. And, because I’m from so close, I consider the partners we work with here in Ithaca a part of my community.”

Zapotocky hopes to become a public health educator at the community level or higher, where she will continue to conduct research and directly impact people’s lives.

— Ilissa Pipia
The United States currently spends over $3.3 trillion dollars annually on healthcare. Despite this, nearly 50% of Americans have at least one chronic disease, and the United States is ranked forty-third in the world for average life expectancy. In response to these lackluster outcomes, leaders in the healthcare industry have worked to create a new approach to healthcare. One suggested solution is the population health model.

A landmark 2003 research paper by Dr. David Kindig and Dr. Greg Stoddart defined population health as “the health outcomes of a group of individuals, including the distribution of such outcomes within the group.” To create positive health outcomes for patients, physicians must consider the social determinants that impact the patients. Medical institutions are now starting to think upstream when creating solutions. What kind of accessibility do their patients have to healthcare? How long is their commute to the nearest health facility? Is the facility itself optimal to provide the most efficient healthcare?

David Brodsky, a junior in the College of Human Ecology, is interested in exploring how the layout of a health facility influences the social interactions between patients and their staff. A Cornell Rawlings Presidential Scholar, Brodsky has conducted his own research on the infrastructure layout of health facilities under the mentorship of Professor Mardelle Shepley, the Department Chair of the Design and Environmental Analysis program in the College of Human Ecology. Starting in the fall of his sophomore year, Brodsky designed a questionnaire to understand the physical movements, communications, and behavioral responses of both patients and staff in a medical facility.

To conduct his research, Brodsky used his breaks to visit two brain care recovery centers in the Boston area. Using a computer program called Noldus, he created a custom coding scheme to monitor the location, movement, communication, and daily activities of residents with their staff and with other residents.

“Staff members can readily use the Noldus program while they are on the job. It’s simply a couple of questions that determine how a patient is acting and how they are communicating,” Brodsky explained.

Prior to this starting his project, Brodsky says he conducted extensive research on topics such as brain injury, heat mapping, analysis of the infrastructure of facilities, design of consent forms, and the metrics that could be used to monitor emotions. Now Brodsky spends a lot of his time creating spreadsheets from the data he collects. “It’s an extensive process,” Brodsky notes, “but it’s more enjoyable than the literature review.”

Brodsky hopes to submit his findings to be published in HERD, an academic journal that specializes in healthcare development.

“Healthcare development is a growing area,” Brodsky said, “it’s something that hasn’t been considered until the past 10 or so years.”

Brodsky also hopes to present at the 2018 Healthcare Design Expo, a conference that focuses on the intersection of architecture and healthcare. “I was able to attend the expo last year in Kissimmee, Florida, which was truly a rewarding experience. I would like to be an actual part of it this upcoming year,” he stated.

Overall, Brodsky says that being able to finish a project independently has been eye-opening. “It really has expanded my horizon. I’m heading down a completely different path than where I thought would be heading.”

Brodsky hopes his research will help provide insight into creating better medical experiences for patients. “There are so many ways to make a difference in the healthcare industry. I really just wanted to be a part of this whole new upstream way of thinking and help redefine what it means to provide healthcare.”

— Nick Matolka
Patients deserve better. Long waiting lines and feelings of neglect, coupled with bare walls with minimal décor, are ubiquitous in hospitals, but they are rare features in hotels and the hospitality environment.

Sandra Lee is a sophomore majoring in Hotel Administration in the Cornell Hotel School and minoring in hospitality healthcare design in the Cornell College of Human Ecology. As a Hunter R. Rawlings III Cornell Presidential Research Scholar, Lee enthusiastically engages in academic research on campus as she attempts to improve the quality of patient care by exploring the mechanisms required to integrate the customer satisfaction-driven hospitality experience in hotels with healthcare systems and environments.

Lee’s research interest in the intersection between hospitality and healthcare stems from her experience during a research project she conducted at Boston Children’s Hospital. Her daily interactions with patients and family members affected by neuromuscular disease made her realize that she really values human interaction.

When Lee arrived at Cornell and began the Rawlings research program, she had to schedule three meetings to meet with leading professors in their fields. After hearing about Lee’s research interests in healthcare and hospitality, her faculty advisor suggested that she liaise with Professor Rohit Verma, Dean of External Relations for the SC Johnson College of Business and Singapore Tourism Board Distinguished Professor in Asian Hospitality Management.

Earlier this year, Lee began working on her research project at Cornell alongside her mentor Alexis Strong, a PhD candidate working with Professor Verma. Previous studies conducted by Lee’s mentors examined factors which affected customer satisfaction in the healthcare experience, such as long waiting times for appointments. These surveys identified some key traits such as tangibility, reliability, communication, and security. Lee is working with her mentors to use these findings to help effectively apply hospitality principles to healthcare.

Lee’s research emphasizes the need to clarify and address the emotional needs of patients in ways similar to current practices in the hospitality industry. When we check into a hotel, we naturally expect to walk into a beautifully crafted, spacious lobby with an efficient check-in system. We expect excellent internet coverage and speed, and for the hotel staff to foresee what we will need. A client-driven hospitality system would similarly emphasize the patient’s satisfaction.

To accomplish this, it is important to understand the emotional needs of patients. Hospital patients do not have the same emotional needs as hotel guests, and Lee explains that it can be difficult to measure patient satisfaction in a healthcare environment. Thus, Lee looks at the way questions must be crafted to obtain more informative survey results.

Currently, Lee is poring over piles of research journal articles examining different ways of analyzing patient satisfaction. Lee has been looking at significant trends highlighted by the five most highly cited articles about patient experience at healthcare facilities, patient perception of their treatment experience, and about healthcare staff satisfaction.

Through her literature review, Lee has learned of interesting examples of hospitality-inspired changes that can be applied to hospitals. For instance, environmental design and artwork displays greatly affect patient experience. Ward features including the presence and placement of windows have been shown to also influence the patient experience. And digitizing check-in systems may help hospitals and medical centers drastically shorten waiting times.

As an emerging new researcher, Lee is passionate about affecting change in America’s healthcare system to enhance the quality of the patient experience by treating patients as clients and focusing on their satisfaction.

— Mei Zhang
Are you an art enthusiast? An etchings collector? A Rembrandt fan? Then you would be interested to learn about a new research project that is ongoing at Cornell called the Watermark Identification in Rembrandt’s Etchings (WIRE). WIRE aims to create a more complete and accessible digital database for scholars and collectors to identify the date of their Rembrandt possessions using the watermark method.

The Dutch artist Rembrandt Harmenszoon van Rijn, considered to be one of the greatest visual artists, made more than three hundred copper printmaking plates along with thousands of “impressions” during his lifetime. The variations among the impressions Rembrandt made, such as in paper use and watermarks created by different papermakers’ molds. Scholars can use these differences to identify the approximate date of print and discern Rembrandt’s original works from copies.

Katrina Ferreira, a junior in the College of Industrial and Labor Relations, joined WIRE her freshman year. Ferreira recounted her freshman writing seminar class trip to the Johnson Museum where she was offered the opportunity of joining the research team. Ferreira decided to participate because of her strong interest in the arts which she felt was lacking from her everyday academic life.

“I have always kind of liked arts, but obviously as an ILR student, I am not going into that as a career path,” Ferreira said. “But I thought it was something that I was interested in and I wouldn’t really get that exposure anywhere else in my coursework.”

According to Ferreira, Dr. Erik Hinterding’s taxonomy is regarded as a “holy bible” in her research area. Hinterding’s work classified watermarks into three categories: types, variants, and subvariants. Ferreira, along with her teammates, used the taxonomy to develop the digital WIRE decision tree, which simplifies the process of identifying the date of print for Rembrandt’s work. Collectors used to match watermarks from Hinterding’s voluminous book to date their Rembrandt copies. Now it takes just a few clicks on the WIRE website. They only need to upload a photo, compare their copies to the sample image provided on the website, and answer a series of carefully designed questions based on decision tree models.

Ferreira’s team consists of a group of researchers, each of whom is assigned to a few branches of watermarks, along with several members with computer science expertise to design the WIRE website. One of the greatest challenges that the team encountered was how to describe subvariants of watermarks in an accessible and clear way. The differences between twinmarks, for instance, are miniscule. Twinmarks are pairs of nearly-identical paper molds that were made at approximately the same time, so it is essential that the questions of the decision tree are highly specific. Even one small confusion about subvariants can lead to an eight-year mistake.

“When phrasing all of the questions, we want a clear yes or no. We don’t want there to be ambiguity.” A sample question would be: Do the phoenix’s wings point downwards?

When phrasing the questions, the Ferreira and the team found that it is inevitable to include some difficult terminologies. Aiming to provide a user-friendly experience, they also developed an add-on terminology dictionary on their website where users can double-click any word to view its definition in terms of etching. Aside from precisely-worded questions, Ferreira emphasized that it is crucial to provide standards that scholars can refer to when comparing their prints with the samples provided on the website. The WIRE website includes sample images with descriptive terms such as “stripe” and “peak” and marked redlines that indicate the placement of watermark with respect to other factors.

“The point of the project is to be able to more accurately date Rembrandt’s etchings and prints and establish chronology for the creation of an artist’s works. [This] is one of art history’s most important documentary task,” Ferreira explains.

— Alexia Ge
Most of us generally do not associate the elderly with sports or exercise. While this may seem like a justifiable assumption, it turns out there is more behind this widespread belief than declining physical ability.

Ji-Ho Lee, a sophomore Industrial Labor Relations (ILR) major with a double minor in Psychology and Business, spent a semester exploring this topic. As a varsity baseball player and sports fanatic, Lee was able to combine his passions into a research project with Dr. Emily Zitek, an ILR professor with a focus in sports psychology. Under the Rawlings Cornell Presidential Research Scholar program, Lee spent a semester studying the psychology behind why people stop exercising as they get older.

“Given that there’s so much research that exercise is good for you, especially as you get older, I wanted to find out why the older population is so inactive,” Lee said. He worked closely with Dr. Zitek to conduct a meta-analysis of previous research that has been done on exercise and the elderly. He compiled data and found that a wide variety of social factors can impact whether or not an elderly person exercises.

One of the factors he explored was stereotype threat, which concerns how individuals are influenced by negative stereotypes about their group. There are stereotypes that older individuals are less athletic and should be less active, and Lee found that the elderly will internalize these beliefs and act according to them. The more the stereotypes are internalized, the more likely they are to have harmful effects.

Lee also examined ways to combat these stereotypes and to encourage older people to continue to exercise. He saw how different ways of doing so can affect the elderly. According to Lee’s research, descriptive norms are the behaviors of a majority of the group, or what others do. Prescriptive norms are the behaviors the majority of the group approves of, or what you should be doing. Lee found that giving advice following descriptive norms was more motivating than giving advice following prescriptive norms. Telling the elderly that they should exercise because it is good for them is not as effective as telling them, for example, that 85% of people their age do a particular exercise.

In addition, tone of voice and vocabulary can have a powerful impact on exercise behavior. Lee gave an example of an older person in an exercise class with mostly younger members. A comment implying that he or she might be slower than the others because of age would be highly discouraging.

“One negative experience can completely deter somebody from doing any sort of exercise for a long time. Those small variables that are often taken for granted have impacts,” Lee explains.

Many other seemingly small social factors can also affect whether or not an individual exercises, including attribution, the age of others, and outcomes. As people get older, they tend to attribute limiting health problems to their age rather than other, controllable factors. Also, an older person is more likely to continue with an activity if other participants are of a similar age. And if an elderly person performs an exercise poorly and believes it is due to their age, they are less likely to continue than if they performed well.

Although Lee does not see himself pursuing a research-focused career, he says he learned highly valuable and applicable skills about data analysis and discerning between reliable and unreliable sources. Lee’s research also had a personal impact. His study caused him to think about the differences between the lifestyle of his grandmother, a national table tennis player, and that of his other grandparents. He says he this led him to encourage his more sedentary grandparents to exercise more.

— Emily Yang
The United States has roughly five percent of the world’s population, yet it has twenty percent of the world’s prisoners. These stark statistics suggest that there exists a mass incarceration problem in the U.S., a problem with potential repercussions that resound beyond prison walls. What are the intergenerational effects of mass incarceration on Americans and how does mass incarceration lead to a cascade of issues prevalent in our society today?

Anna Lifsec, a Hunter R. Rawlings III Cornell Presidential Research Scholar and sophomore studying at the School of Industrial and Labor Relations (ILR), examines these questions in her work with Professor Christopher Wildeman, Sociology, and his research group in Policy and Analysis Management (PAM). Over a period of eight months, Lifsec helped develop a nationwide survey which aims to estimate impacts on family of the incarcerated. The survey, released this past September, is the first to thoroughly examine this issue.

Each member of Lifsec and Wildeman’s research group contributed survey questions which were sent to Forward U.S. (FWD.us), a non-profit organization funding research driving immigration and criminal justice reforms on local, state, and federal levels. Afterwards, Amerispeak, a scientifically rigorous collection of survey respondents that represent households in America, finalised and released the nationwide survey.

Lifsec’s research team has found that around 44.7% of American families have had at least one family member incarcerated. However, this statistic is likely an underestimation due to the exclusion of cases in which the affected family member’s relationship with the incarcerated individual was not specifically identified.

Lifsec hopes that the study results will help bring about a more focused effort by organizations such as FWD.us in bringing about criminal justice reform.

“Mass incarceration is highly racialized in the US, with black and hispanic communities being more frequently targeted by our criminal justice system,” Lifsec notes. “The survey will shed light on the prevalence of family incarceration among different groups based on factors such as citizenship status, race/ethnicity, income, education, and other demographic identifiers that affect how likely an individual is to be targeted for mass incarceration.”

In addition to her work on the family dimensions of mass incarceration, Lifsec has engaged in many other research questions centered on the impact of incarceration. Over the summer break, Lifsec completed a research internship with Professor Megan L. Comfort in San Francisco, working in a probation office to use qualitative interviews to understand the healthcare access for women on probation.

During the Fall 2018 semester, Lifsec began working with sociology professor Anna R. Haskins to qualitatively analyze the lack of communication between teachers and parents who have previously experienced incarceration or have been contacted by child protective services. Lifsec’s research also seeks to understand how this lack of communication impacts a child’s potential in their learning environment.

During the fall 2018 semester, Lifsec also began working with Professor Jamila Michener to examine how marginalized residents of Tompkins County, such as the homeless and opioid users, experience bias in criminalization and to provide suggestions for improvement to the Tompkins County legislature. A common example of the current unjust system, according to Lifsec, is that “individuals who cannot pay for bail are pressured into accepting plea deals so that they can get out of jail and go back to their jobs, families, and lives. Later, their criminal records will permanently disenfranchise them by limiting their job options, housing, access to government benefits, and sometimes, the right to vote.”

As an emerging new researcher, Lifsec is passionate about affecting change in America’s justice system and is excited to work to help solve these issues both nationally and globally.

— Mei Zhang
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