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What does it mean to be a researcher? For Aaron Ong—a senior Urban and Regional Studies student in the College of Architecture, Art, and Planning, research is the application of knowledge to improve the lives of others. Hailing from Singapore, Ong attended a high school heavily focused on STEM and research where he developed strong foundational research skills. Admitted to Cornell as a Hunter R. Rawlings III Cornell Presidential Research Scholar, Ong found his home in the lab of Professor Nancy Wells in the College of Human Ecology.

As the current lab manager of the Wells Lab in the Department of Design and Environmental Analysis, Ong is working with Professor Wells and a team of seven research assistants to look at the effects of nature exposure on chronic pain management in geriatric people. The current literature suggests that nature acts as a catharsis for the elderly by serving as a distraction and strengthening the capacity to focus on matters other than their pain. Ong is analyzing whether exposure to nature via virtual reality could serve as a substitute, and if that elicits the same response among the elderly. Establishing such a link would have profound implications for both public health and senior care.

In addition to his work in the Wells Lab, Ong actively investigates the growing trend of installing sidewalks in rural neighborhoods. In a recently completed manuscript awaiting publication, Ong looked at the controversies surrounding the installation of sidewalks in small communities through two case studies in Ithaca, NY. Laws in most U.S. cities require property owners to pay exorbitant fees for sidewalk installation and maintenance, and Ong questions the reasonability of such a policy in light of the consideration that people living in less dense, rural areas are less likely to use sidewalks. Talking to city planners at the city and county levels, Ong studied potential alternatives for funding the construction of sidewalks that will inflict less fiscal burden on the homeowners.

From his research work, Ong experienced the intricacies involved in being a planner. Experts such as government officials, engineers and architects have a natural communicative advantage over city residents when town halls are called to discuss projects. Therefore, Ong argues that it is the responsibility of the planner, who oversees these projects, to ensure that they adequately capture residents’ concerns in order to ensure that their interests are fairly represented and accounted for in the planning process.

In his coursework, the Intergroup Dialogue Project was integral in fostering a commitment to taking social action to address inequalities. Taking the course his freshman year, Ong became a facilitator for two years after and this year serves as a teaching assistant. The course has heavily influenced the way Ong sees city planning and has triggered his interest in resolving inequities in the practice.

When asked about what he values as a researcher, Ong explained his passion about being able to discover new knowledge through research. The thrill of solving complex problems and understanding of advancing new knowledge drives Ong to look at various projects from a wide variety of fields. During his time at Cornell, Ong has conducted research in urban design and policy, writing assessment, social psychology, and environmental psychology.

After he graduates, Ong will return to Singapore to begin a career as an urban planner. Afterwards, he is potentially considering a return to academia and to continue research. From his experiences through research and the Intergroup Dialogue Project, Ong recognizes that society is rife with inequality. He hopes that through his continued work he will balance the scales a little more for the people unable to do so themselves. Alexander Ni ’17 is in the College of Arts and Sciences. He can be reached at an379@cornell.edu.
Could you imagine your life without Uber or Lyft? For those of us living in the city, especially for college students, calling an Uber has become second-nature to such an extent that it has become another phrase added to our daily conversation.

William Wong, a senior majoring in Urban and Regional Studies in the College of Architecture, Art, and Planning, has spent almost all of his life in big cities, from Hong Kong to New York City. Growing up in cities sparked his interest in urban planning, specifically in transportation. In his junior year, he received an invitation from his department supervisor to do an honors thesis in order to graduate with a bachelor’s degree with honors. Wong was delighted at the opportunity and happily began his work with Professor Michael Tomlan. The focus of Wong’s work has been on transportation issues in New York City. His research specifically focuses on how Uber and Lyft affect other transportation services such as the taxi industry and the Metropolitan Transportation Authority (MTA), which is the corporation responsible for public transportation in New York. Thus, Wong has been exploring the social, economic, and environmental impacts of Uber and Lyft.

2011 marked the rise of Uber, and it has been rapidly growing ever since. This has led to a fierce competition between taxis and Uber. In New York City, there are green taxis and yellow taxis. The major market for yellow taxis is Manhattan, while the green taxis mostly serve Brooklyn, Queens, and outer boroughs. Uber and Lyft also serve both areas, leading to an overlapping market. The rise of on-demand car services has taken away passengers from the taxi companies, and the investors in these companies have also taken a huge hit. The drop in cab hails has resulted in a decrease in the job market for the taxi industry.

Subways also seem to be transporting less and less people as Uber has become more accessible. With just the click of a button, passengers can get a ride and bypass the congestion of the subway system. However, Uber is not accessible for everyone. Take, for example, the handicapped in wheelchairs. Taxi companies are more accommodating. Furthermore, Uber has recognized that most of their passengers are wealthy and come from Manhattan. The wealthy have an advantage and the low-income are left out of the ordeal. Not only has the rise of Uber perpetuated this dichotomy between the upper and lower class, but it also seems to have worsened air quality, which has become increasingly more apparent in many large cities across the world since Uber vehicles release more greenhouse emissions than their taxi counterparts. The impacts of Lyft are very similar to those of Uber.

When asked what Wong envisions for the future, he replied “I suggest that planners and other stakeholders of the city should cooperate in order to understand the impacts of Uber and Lyft on the city. If the impacts are positive, then they should find any possible way to maximize those benefits, and if they are negative, then they should try to minimize those impacts.”

With graduation only weeks away, Wong looks forward to working in the transportation industry. He has a few job offers on the table and faces a difficult decision in the coming weeks. In his spare time, Wong enjoys singing and photography.

Pooja Patel ‘20 is in the College of Arts and Sciences. She can be reached at ppp28@cornell.edu.
Art and science often seem like two diverging paths—one ostensibly whimsical, free-form, abstract, and the other seemingly structured, methodical, and systematic. After all, how can we compare the success of a Monet hanging in the Metropolitan to that of a research paper about radioactivity that resulted in a Nobel Prize for its authors? However, for Hannah Lang, a junior Science of Earth Systems major with a concentration in Geological Sciences and a Fine Arts minor in the College of Arts and Sciences, science and art are quite convergent. Lang incorporates pictures of her results from research on a rock formation conducted in the lab of Professor John Thompson into her printmaking imagery.

Lang initially became interested in geologic research when she took a class titled “Interior of the Earth” with Professor Katie Keranen, who later introduced her to her current mentor, Dr. Thompson. Thompson took her under his wing, and along with his wife Anne, introduced her to petrography, the analysis of mineral content and textural relationships within rock. She learned the extensive technical skills needed to analyze different rock formations, such as x-ray diffraction, spectrometry, and microscopy. Lang is currently using these skills to investigate a black Shale formation in British Columbia known as the Quock formation. The samples that she analyses were acquired from Pretivm, a mining company in British Columbia.

The primary focus of Lang’s work involves using a petrographic microscope to analyze thin sections of rocks to determine the nature and potential origin of metal enrichment in the Quock Formation. Last semester, Lang catalogued, described, and photographed the rock samples that Pretivm provided her, placing them into a geologic context, also developing thin sections to be used for her petrographic analysis. She then used this data, and the historic context given, to establish the conditions under which the black shale was formed, and determine any geochemical properties that these rocks may have. Currently Lang is gathering more background knowledge through petrographic analysis of the thin sections, X-ray diffraction, and spectroscopy. Although Lang has not arrived at a single conclusion yet, she will continue to work with these samples over the course of next year to deduce more about the history of the formation.

The results from Lang’s work can be applied in innumerable ways, as little work has been conducted on this specific formation. As Lang is currently studying a rock formation that underlies Pretivm’s current mining site, her research may help inform the company about potential risks and opportunities related to their drilling. Learning more about the geologic history of the area can better help the company locate other areas with similar formations, and predict how these rocks may respond to mining. This will help miners make the most of the natural resources they are given to work with and advance our geological understanding of the area.

Lang’s research is not only geologically beneficial, but also extremely artistic. She describes the first time she saw thin sections of her formation under a microscope as a “moment of realization” of how beautiful nature is and how science could be so exquisite. Her research artistically inspired her so much that she decided to conduct an art independent study in printmaking that integrates petrographic thin section analysis and printmaking. Her project involves incorporating both digital pictures and manipulated imagery of thin sections into prints using the technique of lithography, and aims to display the beauty and intricacy of thin section microscopy to people of all backgrounds. Through this, Lang truly shows that art and science are interdisciplinary, and that there is much beauty in science that few are privileged to experience. By sharing her art with the general public, Lang effectively and uniquely uncovers this hidden beauty of science for all to see.

Joyce Bi ’20 is in the College of Arts and Sciences. She can be reached at jb2338@cornell.edu.
Have you ever wondered, “What exactly can I do for my community using my education? How can I give back with the knowledge I’ve gained?”

Erica Marroquin, a junior Environmental Engineering major in the College of Engineering, has been asking herself the same question her whole life. The coach of a church basketball team during her high school career back home in Long Island, Marroquin searched for a fulfilling way to get involved with service upon coming to Cornell. She found just what she was looking for last year when she joined AguaClara, an engineering project team focused on gravity-powered water treatment plants, after a friend on the team suggested she try it out. She has loved being a part of AguaClara ever since.

This past winter for two weeks, Marroquin traveled with AguaClara to Honduras, where they have fourteen different water treatment plants in different communities. “The trip gave me a chance to see my work in action. Community members talk to you and tell you just how much it’s impacting their life.” Leading up to the Honduras trip, Marroquin helped build a new one-liter-per-second water treatment plant that was then implemented in Honduras in AguaClara’s lab in the Department of Civil and Environmental Engineering. She also researched the plant’s efficiency before it was shipped to Honduras, where the plant is currently in use.

Marroquin has since been working on methods to make the plant more efficient, such as reducing its need for large amounts of coagulant in order to reduce expenses for the Honduran community. Her team is currently testing a new tapered flocculator, which induces mixing within the plant. The tapered pipes have the potential to reduce the amount of coagulant needed to make particles stick together in the flocculator.

Stepping into a leadership role this year, Marroquin now advises this new plant project. She got to see the impact first-hand on the Honduras trip and hopes to help the team make technology that can help as many people possible: “I always see the outcome before anything and worry about how it’s going to affect the people,” she said. The team is currently trying to improve the plant’s performance so members heading to Honduras this summer can work on replicating and mass producing the plant. They are also considering getting the plant into Honduras’s neighboring country, Guatemala.

According to Marroquin, Central American countries are great candidates for this new plant because their mountainous terrain can provide a great deal of head, the height difference between where water comes from at the top of mountains and where the plant is located. The plant requires a considerable amount of head for maximum efficiency as it is electricity-free and gravitationally-powered by the water itself as it flows down the mountain. “We don’t want to send them things they don’t have. Our plants use concrete, plastic, and PVC: all local materials,” Marroquin said. “We want them to have everything available down there, so we keep that in mind when improving the plant.”

AguaClara has allowed Marroquin to combine learning skills related to her major with hands-on research that has far-reaching implications for people across the globe. “That’s what I like about environmental engineering: we’re not so much behind the bench. We’re out in the field getting muddy or cutting things in the power lab,” she said. “I now know how to use a lot of different power tools, so I’ve become handier, and working in a team environment and taking on a leadership position has taught me to think more critically.” After her experience with AguaClara, Marroquin is considering going into a more research-oriented job, such as one with the United States Geological Survey, after graduation. “I have a year to decide,” she said.

In her spare time when she isn’t conducting research, Marroquin knits, hikes, and serves as the social chair for Cornell’s chapter of the Society for Advancement of Chicanos and Native Americans in Science.
Taiwan is a site of cultural collision formed out of its checkered history under Indigenous Tribes, Dutch, Japanese, Chinese, and Spanish rule. These influences have come together to create a distinctively Taiwanese style that has become something all of its own. But in the Rende District of Tainan City, one building sticks out like a sore thumb – the Chi Mei Museum, with its Greco-Roman, decidedly un-Taiwanese architecture.

For her senior thesis, Cheryl Kuo, a senior Urban and Regional Studies major (in the College of Architecture, Art, and Planning) from Taiwan, researched the Chi Mei Museum and conducted personal interviews to uncover the motivation for the Chi Mei Museum’s appearance and to develop an opinion on the museum’s stylistic choices. She conducted the research under the mentorship of Professor Jeffrey Chusid in the Department of City and Regional Planning.

Kuo was born in Kaohsiung City and regularly traveled to Tainan City. Whenever she returns to Taiwan, the Chi Mei Museum always stands out to her. With its white dome and statues, the museum is reminiscent of the Palace of Versailles, the Capitol, and the Vatican – all landmarks from Europe and America. It looks like a Western building, and its French, Italian, and Greco-Roman influences do not seem to have historical precedent. The building is not in the local Taiwanese style; simply put, Kuo says, “It doesn’t seem to fit the context.”

Initially, Kuo was disappointed by the lack of Taiwanese influences in Chi Mei Museum’s architecture, a feeling shared by her mentor, Professor Chusid. However, as Kuo began to dig deeper into the history of the museum and spoke to actual Taiwanese involved in building the museum, she realized that the issue was more complex than she had imagined.

In researching the history of the museum, Kuo discovered that the founder of the museum, entrepreneur Shi Wen-long, wanted to build a Western style building to match his collection of ancient Western art, including an ancient violin collection, sculptures, fine art, and weaponry. Shi Wen-long was motivated by communist ideas to make a “museum for all,” says Kuo. He wanted to give Taiwanese people an opportunity to understand Western art and culture.

To better understand this point of view, Kuo sought to look at the building from both a Western and Eastern perspective. To gain an Eastern perspective, Kuo interviewed a wide range of people working within the museum foundation, including the museum’s primary architect, Tsai Yi-Chang. “From an urban planning perspective it’s about mediating between different groups,” notes Kuo. “Tsai Yi-Chang, the Taiwanese architect was a “nobody” at the time of his commission. This imbalance of power forced him to give up his ideas, and listen to what Shi wanted.” Kuo notes the ironies inherent to the situation; Shi was proud of hiring a local Taiwanese architect, but did not allow Tsai to build according to local styles; Tsai is now best known for the Chi Mei museum, which is very different from his usual style.

Even the classification of the building itself as Eastern or Western is inconclusive. Though the style seems Western, Kuo notes that as an exact replica of the past, the building is more in line with the Eastern belief that “time is cyclic.” Meanwhile, Western history is linear, and a true Western style is all about “adapting the old to a new style.” From a Western perspective, replicating the past has more negative connotations.

Ultimately Kuo has decided that there is no one answer; it is too simplistic to assign the Chi Mei’s style to “good” or “bad.” The process of writing the thesis helped Kuo to grow academically. She practiced “forming my own opinions as an academic without being overly influenced by all the different voices out there.” In addition, she was able to gain a greater understanding of her hometown, her identity as a Taiwanese American, and the importance of considering different perspectives.

“I also learned to ask difficult questions, and to be introspective,” says Kuo. This insight led her to weave her thesis around the importance of incorporating insight from a range of perspectives; particularly those with different views from her own. Interviewing and hearing from stakeholders both with and without power helped her understand how this seemingly out-of-place monument was built with the best of intentions.

This research is conducted in the College of Architecture, Art and Planning in the Department of City and Regional Planning under the supervision of Dr. Jeffrey Chusid. To contact the researcher e-mail ck527@cornell.edu.

Jane Wei ‘18 is in the College of Arts and Sciences. She can be reached at jmw487@cornell.edu
According to the 2010 census, the multiracial population is 2.9% of the U.S. population. This number seems pretty small, but by 2050, we are expected to see one in every five people identify themselves as multiracial.

Summer Lopez Colorado is aware of this increase in multiracial identification and is intrigued by the stories behind this change. Originally from Duarte, CA, Lopez Colorado is a junior majoring in Sociology in the College of Arts and Sciences. Funded by the Ronald E. McNair Post-Baccalaureate Research Scholars Program, she worked with Professor Steven Alvarado in the Department of Sociology last summer. Lopez Colorado performs research in areas including inequality studies, race and ethnicity, and sociology of education.

Coming from a mixed background and having always been curious about multiracial experiences, Lopez Colorado conducts research to answer two main driving questions. First, how do the overall educational outcomes and educational experiences of multiracial students feed into racial formation and stratification processes in the U.S.? And second, how does the way these multiracial populations are measured shift our understanding of the causes of racial educational inequalities?

Lopez Colorado has access to survey datasets on multiracial and single race populations, from which she isolates the factors that might contribute to educational inequality in these populations and possibly finds ways to address these factors. One way she approached the question was looking at whether the students identify themselves as multiracial in comparison to the answers from their parents. The next steps of Lopez Colorado’s research involve interviewing multiracial students. While the study is still in progress, preliminary results from the research indicates that racial identity amongst multiracial individuals is strongly influenced by peer perceptions throughout schooling, which has both negative and positive consequences on their educational outcomes.

Lopez Colorado enjoys having discussions on how race functions with her interviewees and listening to a diversity of experiences. “I want to make sure that voices more than mine are heard,” Lopez Colorado said. “I am in a privileged position where I’m putting together everybody’s voices and I want to bring justice to those voices and represent them as accurately and as justified as I can.”

Lopez Colorado hopes to see her research help reform K-12 educational programs and revamp educational surveys. She wants to determine what questions can be added to surveys to create better research and provide information to benefit future research. She also hopes to change how multiracial populations are measured and discussed in larger scale policy topics.

After graduating from Cornell, Lopez Colorado plans to attend graduate school for a Ph.D. program and eventually become a professor. On campus, Lopez Colorado is involved in Community Intersectionality Advocates and Cornell Union for Disability Awareness, is a peer mentor in the CURB peer mentorship program, has interned at the Center for the Study of Inequality, and works at the 626 Center for Intercultural Dialogue. Her hobbies include juggling and watching mushrooms.

Freya Zhang ‘20 is in the College of Arts and Sciences. She can be reached at yz345@cornell.edu.
How fast was that pitch? That’s the question that Dan Gastin, a junior Communication major in the College of Agriculture and Life Sciences from Poughkeepsie, New York, is asking participants in his study of perception in sports. The catch: participants never see the actual throw — only the pitcher’s expression.

Gastin, who participated in last summer’s Olympic Bobsled Combine, has always been involved with athletics. However, his passion for hands-on athletics didn’t always translate over to academics, especially when it came to research — at least initially. He tried coding for the first time last semester, when he joined Professor Andrea Stevenson Won’s Virtual Embodiment Lab in the Department of Communication. Several tutorials later, he discovered that virtual reality research wasn’t for him. Stevenson Won told him not to give up on research just yet, though. “She encouraged me to research things that did interest me and guided me in the right direction until I found a project I was passionate about,” Gastin says.

In his time at Cornell, Gastin noticed a distinct lack of anything sports-related in SONA, Cornell’s research study management system. He saw an opportunity to add to the variety of topics available to him and began to explore sports materials in academic literature. As he read, he came across the topic of perception in sports: the way people can often anticipate other people’s actions just from their body language. Gastin developed a study to research the way that facial expressions affect decision-making in athletics. He said he was excited about the opportunity to tie his passion for sports into his academic work. “Bringing sports into things is definitely a different approach to research. It’s interesting trying something different out,” he says.

To create the content for his study, Gastin first found footage of baseball games on YouTube. He then used Adobe After Effects to trim clips of pitches from the YouTube footage so that they zoomed in on the pitcher’s face, but cut off right before the pitch. He also used the software to black out any scoreboards or player statistics shown in the footage.

Gastin shows these video clips to participants and asks them to guess the velocity of the pitch based on only the pitcher’s facial expression. Participants do this for each of the fifteen clips in the study and then answer how confident they are in their guess, if they have previously seen that specific clip, and if they watch baseball regularly.

His study is still active, but Gastin hopes that when it concludes, he will have gained insight into people’s perceptions of body language in athletics and whether these perceptions are accurate. Depending on his results, he may explore different angles of his project in the future, such as whether different periods of the game play a role in perceived pitch speed. In addition to sparking an excitement about academic research, he says the project has also taught him several new skills. “I learned how to create the survey on Qualtrics and how to use Adobe After Effects,” he says. “The project has been really hands-on every step of the way. Cornell’s Communication department is really exciting because of how hands-on and theory-driven it is.”

Gastin says he is unsure of what he hopes to do after graduation, but plans to work this summer as an ad sales and marketing intern for AMC. He is also interested in reporting on ESPN or potentially continuing into research if his study yields interesting results. “How people visually perceive human interaction and anticipate someone’s actions relates to all aspects of life, so this data could potentially open avenues for future studies,” he says.

In his spare time, Gastin hikes, cooks, and is a member of Ho-Nun-De-Kah, the official honor society of the College of Agriculture and Life Sciences.

Keri Heuer ’19 is in the College of Arts and Sciences. She can be reached at kh593@cornell.edu.
Bright lights, honking yellow taxis, skyscrapers, street peddlers, and rushed pedestrians with important places to be—we have all experienced the seemingly everlasting hustle and bustle of a city. However, not all concrete jungles can maintain their viability. Many are slowly fading into obsolescence as these former industrial centers rust and erode into empty shells of their former glory. Such metropoles include those found in the Rust Belt, which face population loss, economic decline, and urban decay. Angela Moreno-Long, an Urban and Regional Studies 2016 graduate in the College of Arts, Architecture, and Planning, made it her mission to assess the existing sustainability and urban character conditions of a downtown area in one such city, Utica, NY, for potential revitalization.

As a Hunter R. Rawlings presidential research scholar, Moreno-Long knew that she wanted to get involved with research upon entering Cornell. She began her investigations with Paula Horrigan, an emerita professor of Landscape Architecture, during her senior year, learning about placemaking, regional planning, urban design, and landscape architecture to better understand how urban and public space could impact the livability and success of a city. For her senior thesis, Moreno-Long began doing research in the Community and Regional Development Institute (CARDI) in the College of Agriculture and Life Sciences in the Rust 2 Green program as a Creative Placemaking Fellow.

Through this program, Moreno-Long worked on a collaborative project with engineering, planning and landscape architecture professors and students to demonstrate the catalytic potential which downtown Utica possesses for urban revitalization. Using LEED-ND (Leadership in Energy and Environmental Design for Neighborhood Development) as an audit tool, she evaluated the existing urban conditions of downtown Utica. Rather than focusing solely on economic development in the area to mitigate poverty, urban declines, inequality, and infrastructure problems, Moreno-Long used sustainable development principles to create a plan for a resilient and livable Utica. This approach takes into consideration environmental quality, economic opportunity, and social wellbeing as part of one system—an extremely strategic vision in response to modern challenges such as rapid urbanization and climate change impacts.

Based on her research on the livability of the area, Moreno-Long gathered evidence which suggests that the downtown area of Utica has a lot of potential for revitalization. Livability refers to features of the environment, such as the types of activities available to inhabitants, accessibility of grocery stores and other necessities, as well as proximities of residences to parks and schools, along with many other aspects. Consolidating these results with her ideas and research regarding sustainable development, Moreno-Long created a report for the city which outlined potential steps meant to help redevelop downtown Utica. While this project is still ongoing, her results regarding environmental sustainability will be part of a much greater plan regarding sustainability in cities.

The applications of Moreno-Long’s results are innumerable—her identification of the city’s existing strengths and weaknesses could impact future development decisions, as well as provide a baseline metric with which to compare future improvements and development. Additionally, her report outlining Utica’s catalytic potential for revitalization using sustainable neighborhood development can be used if local leaders apply for funding.

Moreno-Long thoroughly enjoyed her research under CARDI in the Rust 2 Green program, describing it as the “perfect combination of independent work and collaboration with a group.” During her time in Utica, Moreno-Long bonded with her team members, and acquired skills such as using Geographic Information Systems, project management, and time management. She encourages others to pursue research, as “research and the ability to independently do research apply to everything” and “finding information and being able to figure things out without checking in with someone is really valuable in any setting.” Moreno-Long now works in public space design and public policy research at Project for Public Spaces in New York City and is currently working on the Citizens’ Institute on Rural Design program. She accredits much of her success to her research experiences.

In her free time, Angela was also passionate about photography, working in the Jaden art room, and was the Editor in Chief of Medium Design Collective. Jane Wei ’18 is in the College of Arts and Sciences. She can be reached at jmw487@cornell.edu

This research is conducted in the College of Agriculture and Life Sciences in the Community and Regional Development Institute. To contact the researcher e-mail amm495@cornell.edu.
Ithaca is known for its natural beauty, with its forests, waterfalls, and wildlife. But did you know that Cornell has a collection of oak tree specimens that is one of the largest in the world? It is this oak collection that piqued the interest of Nicolas Glynos, a senior in the College of Agriculture and Life Sciences majoring in Plant Science with a focus on evolution. Originally from Kansas City, he has traveled all around the world, from Panama to Australia, in pursuit of his interests in evolution and conservation.

At Cornell, Glynos works in the lab of Professor Kevin Nixon, who studies phylogenetics, the science of mapping the evolutionary relationships between different species of organisms. Glynos first became involved in his research due to his love of biodiversity. His current project focuses on the fields of adaptive evolution and phenotypic diversity, which he is studying by looking at broad evolutionary patterns across oak trees.

According to Glynos, oaks are especially good subjects for this kind of research because they are extremely diverse in terms of their number of species, morphology, geographical distribution, and growth behavior. These trees inhabit ecological zones from Canada to Asia and Europe. Previous research has shown that their leaves are diverse and can help determine each tree’s ecological habitat and climate, and Glynos is using this knowledge to study how the diversity of the oaks correlates to their geographic distribution. Although his research is still in progress, Glynos hopes to use the data he collects to investigate the way oak leaf shape has adapted to climate change. If he is successful, he also plans to apply his research to fossilized leaves, making inferences about their paleo-climate based on their shape.

Through his research, Glynos has been able to learn new skills and experience new things. For example, he says that he learned programming — including computational methods for producing phylogenies, conducting morphological measurements, and image manipulation — from Professor Nixon, whom Glynos said is very skilled in data mining and coding. While most of his time is spent in the herbarium, Glynos also enjoys the fieldwork aspect of his research because it allows him to observe biodiversity in real life and travel to see specimens. This summer, he plans to go on a specimen-collecting trip across the Western United States, collecting and photographing oak trees. After graduation, he is considering obtaining a PhD in the evolution and systematics of plants.

Outside of academics, Glynos loves to run and cook, and has begun home-brewing his own beer after taking a course about beer at Cornell. He is also an avid rock climber.

Anita Jegarl ’18 is in the College of Human Ecology. She can be reached at amj58@cornell.edu.
All life shares a common language written in the nucleotides of DNA. Because of this shared genetic code, scientists can mix and match genes to create mice that fluoresce like jellyfish or goats that produce human insulin in their milk. The production of transgenic animals has only become more sophisticated with time. Today, transgenic animals are used to understand the complex and dynamic physiological properties of the body.

Calvin Schuster works on a project that develops transgenic mice using optical genetics: the Cornell Heart Lung Blood Resource for Optogenetic Mouse Signaling (CHROMus). CHROMus is run by Dr. Michael Kotlikoff in the Vet Research Tower. A sophomore biology major and creative writing minor in the College of Arts and Sciences hailing from the Boston area, Schuster was drawn to the Kotlikoff Lab and CHROMus because of his interest in cutting-edge genetics and biotechnology. Now his work complements his genetics concentration by allowing him to take what he has learned in the classroom into the lab.

Schuster’s work is part of the larger CHROMus project which “creates mice that express genes that can make physiological processes visual, so that biological events like cell signaling can be actively observed,” Schuster explains. The overarching goal of the CHROMus project is to develop transgenic mice that are “color-coded” to study cell signaling in different body systems. The process begins with insertion of a gene under control of a tissue specific promoter into a mouse genome through pronuclear injection. The inserted gene will either allow for visualization of cell signaling activity or activation and deactivation of specific cells using light. Founding individuals are then mated to produce transgenic mouse lines, which are analyzed using molecular biology techniques. By crossing two transgenic mouse lines, researchers can explore how two processes interact and use optics to effect changes and visualize the results.

Schuster has developed many practical skills in the twelve hours a week he spends in lab. He conducts mouse genotyping to confirm transgenic mouse lines by extracting DNA from transgenic mouse tissue samples, Polymerase Chain Reaction (PCR) to amplify the gene of interest, and gel electrophoresis to confirm the expected transgene’s presence. Offspring of the founding individuals are genotyped to ensure a reliable line. Schuster also does a significant amount of mouse husbandry, which involves setting up matings, weaning pups, and collecting tissue samples for analysis. In reflecting on the skills he has gained, Schuster says, “it’s one thing to learn about tools like PCR and gel electrophoresis in a textbook, but to actually sit down and work through the process regularly in lab is a completely different ballpark... [working in lab] really teaches you good scientific practices, and how to think critically about your work.”

Schuster’s two mentors, Shaun Reining, a lab technician, and Jane Lee, a research support specialist, have helped him develop these good scientific practices. In fact, Schuster finds that the entire lab is very supportive. Everyone is willing to lend a hand and this makes it a “really great learning environment.”

This environment, after all, was why Schuster decided to come to Cornell in the first place. After taking a high school biotechnology class, Schuster decided on Cornell because he noticed the university’s investment in biotechnology research. His interest in applying theory to research has only grown and he is excited “seeing all these concepts actually happening, and knowing that I’m a part of, and contributing to, this overall goal of furthering our understanding.”

Just as research informs the future, Schuster hopes his future will include research. He wants to go to medical school while doing clinical or biomedical research. “Research is the most dynamic way to learn more about the world around us – and the world inside of us,” says Schuster. Through research, the shared language of life can be utilized to answer questions about the unknown.

Schuster is an advisory board member for Biology Service Leaders, a founder of the Cornell Health Initiative, copy editor for TRP, and a CURB peer mentor. In his free time, he enjoys attending film festivals and exploring Ithaca’s restaurants.

Jane Wei ’18 is in the College of Arts and Sciences. She can be reached at jmw487@cornell.edu

This research is conducted in the College of Arts and Sciences in the Department of Biology under the supervision of Dr. Michael Kotlikoff. To contact the researcher e-mail krs256@cornell.edu.
Cornell University is filled with various beautiful buildings, from libraries to classrooms and quads. Many students may take advantage of the inviting and awesome campus, but some take the time to analyze the buildings for efficiency and economic viability.

Patrick Braga does just that. Braga is a fifth-year dual-degree triple major born in Rio de Janeiro, Brazil. Braga grew up in Sarasota, Florida, and is pursuing a B.S. in Urban and Regional Studies through the college of Architecture, Art and Planning, and a B.A. in Economic and Music from the College of Arts and Sciences. While this sounds hefty, Braga is also the section leader in the Cornell Glee Club, a Cornell Rawlings Presidential Research Scholar and a Mellon Urbanism Fellow. He was formerly involved with the Student Assembly Infrastructure Fund Committee and Diversity Affairs Committee, and is the Mayor-appointed voting member of the City of Ithaca Bicycle/Pedestrian Advisory Council, an AAP Ambassador, an Arts and Sciences peer advisor, and an orientation leader.

His hefty schedule, however, does not limit him from pursuing his current research on “Transportation and land use planning as well as histories of urbanism in thought and practice”. He is currently working on a book examining bicycling in Boston through the lens of experience and nonprofit community-building.

He first became involved with this type of research right before college, as he spoke with a real estate developer who posed the question, “Why do some developments that try to be walkable not generate the same levels of pedestrian activity as more successful environments?” Braga concentrated on answering this question and eventually presented his work at the Congress for the New Urbanism conference in Buffalo. At Cornell, he became a Rawlings Presidential Research Scholar.

Braga claims that he has “come to find that a lot of what is taken for granted as standard practice in land use and transportation planning today throughout the Western Hemisphere is the product of specific processes of geographic diffusion of information along the twentieth century that shaped contemporary planning thought”. With a specific focus on Rio de Janeiro, Braga uses this critique of how urbanists think to produce “sharper criticism of poorly conceived real estate development and transportation projects, or to support solutions that might seem counter-intuitive”. By drawing on research that is notably less referenced and utilizing those as a baseline for which he develops his own critiques and understandings of urban development and planning, Braga thus evolves his own set of theories and conventions.

His goals are therefore to understand the historical roots of contemporary urban planning, and to study historical factors that have generated ideas and practices about land use and transportation planning today in both Latin America and the United States. Just this year, Braga has completed a variety of projects, including “Suburbanizing Rio de Janeiro” and “Formulating Responses to Brazilian High Rise Sprawl”, which discusses Brazilian zoning codes that do not guarantee economically productive commercial streets and in fact put them at risk.

Braga believes that research gives him the opportunity to employ existing primary sources that have not been studied much and to draw new conclusions from them. He has had several mentors that helped him through the Rawlings and Mellon programs (Thomas Campanella, Jennifer Minner, John Forester, Michael Manville, Tao DuFour, and Tom McEnaney).

Braga is currently contemplating getting a Ph.D. in city planning or history of architecture, but is primarily focused on law school in hopes of influencing cityscapes for years to come.

Joanna Hua ’20 is in the College of Arts and Sciences. She can be reached at jh2278@cornell.edu

This research is conducted in the College of Architecture, Art and Planning in the Department of Urban and Regional Planning. To contact the researcher e-mail pcb68@cornell.edu.
Helping a Man’s Best Friend

By Joyce Bi ’20

Soft, lovable, and loyal, dogs are truly a man’s best friend. We cherish our canine friends dearly, pampering them with squeaky toys, hugs, companionship, and kisses. Naturally, we care about our dogs’ health as well as any potential diseases that may plague them. Because their bodies respond differently to disease than ours, research is done to ameliorate the pain and distress that sickness brings in dogs. Morgan Shelton, a senior Animal Science major with a biomedical science minor, started researching the pathology of Canine Herpes Virus (CHV), a common infection afflicting many dogs which causes respiratory, ocular, and genital issues in full-grown dogs and premature death in puppies.

As a Hunter R. Rawlings III Cornell Presidential Research Scholar, Shelton knew coming into Cornell that she wanted to pursue research on campus. Having dabbled only briefly in conservation research during high school, she entered the biomedical lab of Dr. Andrew Miller without much experience or background knowledge of the extremely technical work she now performs seamlessly. Under his guidance, she gradually learned the techniques necessary to perform histopathologic work on dog tissues infected with CHV such as polymerase chain reactions (PCR), microtome, and immunohistochemical protocols.

Histopathology is the study of how tissues and cells change with the progression of a disease. In Shelton’s current project under a pathology resident of the Miller Lab, she uses her histopathologic skills to determine the distribution of CHV in the brain. Shelton describes the goal of her research as “complementing older studies done on experimentally CHV-infected dogs with new studies regarding naturally acquired CHV infections” as well as “better characterizing natural acquired CHV infections in a histological, pathological, and immunohistochemical sense.” After confirming the presence of CHV in various samples of dog by PCR, Shelton is now analyzing the virus’s tendency to localize in certain areas of the brain. So far, she has found that the virus often localizes in the cerebellum although the reasoning behind it is not because of her original hypothesis that CHV is drawn to actively dividing cells.

The implications of Shelton’s work can be extremely helpful as they add to existing knowledge of canine herpes virus, which could ultimately go towards finding a cure or remedy. As Shelton asserts, it opens up “new avenues of research to go into” which could help researchers understand the virus and its mechanisms to an even greater extent. While CHV is not lethal for full-grown canines, the results from Shelton’s research could potentially save innumerable puppy lives, as well as be applied for similar viral diseases, such as feline herpes virus.

Shelton enjoys her research in the Miller lab, commenting how she has learned about and admires the resilience of Mother Nature: “a lot of samples we work with, the animals have already passed on, but it’s really cool to see how much the body can speak even after death, and how we can further help other animals in the future. It’s inspiring to think how even once something is gone, its impact on society can still be so profound.” This is one of the many reasons Shelton wants to continue with research in the future while studying to become a veterinarian. As a veterinarian, Shelton hopes to help all sorts of animals. Including, of course, man’s best friend.

Joyce Bi ’20 is in the College of Arts and Sciences. She can be reached at jb2338@cornell.edu
Many students hear the word “sperm” in their middle school and high school health classes and giggle. The beginning of life is hard to fathom and is often a taboo subject to discuss, and most people brush their health classes to the side once they’re over.

Junior Sarah Wright, however, went in the opposite direction. From Bath, New York, Wright studies Animal Science in the College of Agriculture and Life Sciences. When she isn’t holding public lessons about raptors and teaching about bird biology in the Cornell Raptor Program or writing poetry outdoors, she spends her time in the Cornell Nanoscale Science and Technology Facility in Duffield Hall. She first joined the lab of Professor Soon Hon Cheong — which is affiliated with the College of Veterinary Medicine — in the fall semester of her freshman year, despite not having much research experience in high school.

After spending months training to use the lab’s equipment (the lengthy list includes AutoDesk Inventor, L-Edit, Class II Resist, ABM Contact Aligner, Profilometer, Heidelberg 2000, Hamatech Mask Processor, Hot Resist Strip Tanks, Piranha, I-Line Stepper, and the YES Polyimide Bake Oven, to name a few), Wright was able to develop her own research project and become almost completely independent, although she still relies on Cheong for advice on some of her lab procedures. According to her, she plays a complicated role currently researches for credit and arranges her own hours.

Wright’s project focuses on improving the design of sperm sorting chips — a chip about the size of a CD that utilizes grooves and channels to sort viable sperm from dead sperm in bull semen. In the animal industry, “collected semen from bulls are frozen, then thawed when sold to farms to artificially inseminate cows,” according to Wright. Sperm sorting optimizes this process, flushing away the dead sperm and picking out the less viable ones with damaged membranes, and leaving the healthy sperm for insemination. Wright hopes to use microfluidics — a science that focus on the behavior, precise control, and manipulation of fluids on a microscopic, sub-milliliter scale — to optimize this process. Because sperm have known swimming traits that have been studied (for example, they tend to swim in the corners of small paths), she can use these traits to separate them.

Wright’s research project is also linked to Weill Cornell Medical College in New York City, as it has potential applications to fertilization in humans. Those involved at Weill Cornell are awaiting results of the efficiency of the bovine sperm sorting study before discussing whether to move onto a medical application, which could enhance the fertilization process via sperm donations for women who have trouble becoming pregnant.

For Wright, the best part of doing research is having the “independence and responsibility” for her own project, because it provides an incentive to work and learn procedures. Although she came to Cornell on the pre-veterinary track and wanted to work in a clinic after graduated, joining Cheong’s lab has changed her future plans. She began taking reproduction-specific courses along with conservation-specific ones and realized that there was much overlap between the two. Wright explains that “maximizing production of viable embryos and offspring (i.e. reproductive success) in endangered and captive species can be extremely challenging”, and because reproductive success is usually low in species facing threatened survival, this presents a risk to biodiversity on a global scale. Because her research on reproduction is applicable to various fields, she now plans to obtain a Ph.D. in reproductive physiology and work for conservation efforts and a D.V.M. to translate her work into a form that is accessible to the general public and allow others to work for the greater good of this planet.

Joanna Hua ’20 is in the College of Arts and Sciences. She can be reached at jh2278@cornell.edu.
Vocal Learning with Remote-Controlled Cars
By Freya Zhang '20

In the field of psychology, a group of nativists believes that people were born with the innate ability to learn language and that humans should be the only social partners that people can learn from. However, there is another group of people who thinks that humans learn from patterns and can do so from species that are not human. Reade Otto-Moudry is working on a project that is investigating if a person and a remote-controlled car could play the same role in infant vocal learning.

Otto-Moudry, a Senior majoring in Biological Sciences with a Neurobiology and Behavior concentration in the College of Arts and Sciences, conducts research at Cornell’s Behavioral Analysis of Beginning Years Laboratory, or B.A.B.Y. Lab, in the Department of Psychology (http://babylab.cornell.edu/). With no prior research experience, Otto-Moudry became interested in the topic after taking PSYCH 2090: Developmental Psychology taught by Professor Michael Goldstein, one of the PIs in the B.A.B.Y Lab. The lab has a research path on human infants and another on songbirds; Otto-Moudry is interested in the social and vocal learning of human babies.

At the B.A.B.Y. Lab, Otto-Moudry has several responsibilities, including recruiting research participants, running studies, and coding videos. As a research assistant, Otto-Moudry co-runs a study with another Senior, Rondeline Williams, on infant vocal learning with new social partners in order to find out what features of social interaction are important to vocal learning. With cumulative efforts from PIs and research assistants, the study involves almost 200 infants aged 7-8 months old. The infants come into the lab individually with their parents and participate in two sessions of experiments that are designed to assess the degree of parental responsiveness and determine whether learning is dependent primarily on the humanness of the social partner or the qualities of the interaction.

The preliminary results from the experimental group seem to have a general trend in support of the prediction that the most important social aspect of vocal learning is contingency. However, the study is still in progress with the second set of babies serving as the yoked-control group to check whether the significant result is just a product of the degree of responsiveness or other confounding variables. Otto-Moudry’s project is inherited from PI Michael Goldstein from the B.A.B.Y Lab, while PI Jennifer Schwade oversees the project and assists with statistical and data analysis.

The implications of Otto-Moudry’s work could help parents to produce high quality interactions with their children. Especially now that technology is ubiquitous, the results from this study could warn parents to be mindful of delayed feedback when interacting with children. Otto-Moudry said that being in the lab gives “a much more realistic understanding of the complexity of the research process.” He finds his research rewarding “because the result can have an immediate and positive effect on our understanding of learning.”

Otto-Moudry has been working in the lab since the summer of his Sophomore year. Through his research, Otto-Moudry has mastered the use of Final Cut Pro and ELAN, video coding and audio mixing software. After graduating in May, he plans to take a gap year before attending medical school.

Aside from doing research, Otto-Moudry plays the Principal Horn in Cornell’s Wind Ensemble, is a Student Advisor and a member of the Advisory Board within the OUB, and is a Student Assistant in the Carl Becker House. In his spare time, he likes to swim, read, and draw.

Freya Zhang ’20 is in the College of Arts and Sciences. She can be reached at yz345@cornell.edu.
College is a unique time where students can explore different topics outside of their interests. Sometimes, this exploration can lead to changes in perceptions that can result in different career paths. Madeline Rich, a junior marine biologist in the College of Agriculture and Life Sciences, came to Cornell with a background in marine biology. Her previous research from summer programs and the Shoals Marine Lab involved many different marine biology subjects, from stream ecology — looking at guppy response to predation to discovering new species of electric fish off the coasts of Africa. Her fascination with marine life began with her parents; both of Rich’s parents are scuba divers and she became certified at the age of 12. Shortly afterwards she became certified to be an instructor at a very young age.

Rich took a course with a professor who was looking for a research assistant in their lab. In this class, she came to understand the human-ecological viewpoint. In essence, it looks at problems by the components and diversity present in the system: the relationships, networks, and connections that build the context behind an issue. Science isn’t the absolute approach to the big questions and it’s important to understand the multifaceted approach to problem solving that research allows for.

She is a research assistant for the Kassam Lab, looking at different ways of learning in collaboration with the 4-H Youth Program. As Rich explains, there’s an innate way of learning that is picked up regionally and outside of formal institutions. For example, children growing up on farms may inherently pick up and come to understand the mechanics and complex engineering processes behind operations. In another case, native arctic peoples know precisely when and where the sea ice they hunt upon will break using cultural and experiential knowledge; not because they have computer-generated models of current and wind flow patterns. It is from that basic understanding of big-picture processes which teaches people how to live in this world and Rich wants to help both understand and foster that sort of learning. Currently, Rich is helping develop the curricula that will be utilized by instructors on-site for the 4-H program. Specifically, her project involves investigating place-based knowledge. Ultimately, she wishes to implement the findings of her study into developing new ways of fostering a way of knowing in children.

When she first came to Cornell, Rich planned to become a marine biologist by pursuing a PhD in this field. Now, Rich plans on pursuing a Professional Master’s Degree in Environmental Management, which would allow her to work with policy makers and communities by explaining the policies and the background to help people understand the issues. She believes that simply knowing facts is useless if no one cares for the significance. She believes in the world where individuals build a community around a central message or a common understanding.