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Every year I write many emails and make numerous phone calls and personal visits to inquire whether professors and professionals will host our bright, eager students. I am always humbled by their acceptance. Whether in a laboratory, clinic, agency, or business, the breadth and scope of student experiences offers a window in to truly enriching, extending education (EEE). These opportunities have allowed our students to branch out and explore their interests, their “what ifs.”

Great lives are built from great decisions, and the opportunities our community provides these students will inform significant life decisions. The reflections that follow are diverse, scholarly, and insightful as are their authors.

These students have not only explored specialization in their area of interest, but they have been required to write a top-notch resume, interview and acclimate to their host’s setting, perform at a professional level, and master the art of the heart-felt thank you note.

Ultimately, my goal for them is a professional connection and reference that will serve them for the rest of their lives. Marilyn Toalson, the first teacher of Gifted Education at Rock Bridge and Kathryn Fishman-Weaver, my predecessor, were mine. I continue to be grateful for their sage advice and counsel.

We are indebted to Columbia Public Schools and all of the parents and teachers who support Gifted Education in our district.

A special thanks to Robin Stover, journalism and yearbook teacher extraordinaire, whose masterful InDesign skills added significant visual appeal to this book. Robin, you are proof of the adage “a friend in need is a friend indeed.” Thank you for your keen eye and generous heart.

Gwen Olson Struchtemeyer
Gifted Education
While selecting classes for my sophomore year, I was disappointed that I couldn’t take an AP Psychology class. I want to go into the field of psychology, so I began looking more closely into the fundamentals of this field. Thankfully, this dilemma was short-lived because I learned about EEE Internship and I learned I could do this with my spiritual counselor, Lynn Roush.

In the United States, almost forty-four million people suffer from mental illnesses each year, yet it is an avoided subject, a taboo no one wants to talk about. I have experienced firsthand that unacknowledged mental illness can lead to many negative outcomes. When dealing with mental illness, it is critical that the individuals and their support system have a full understanding of the disorder. From there, they will be more open to possible treatments and their view of the issue will shift from confusion and worry to a sense of hopeful preparedness. Within this internship, I hoped to become someone who could assist those who were suffering and help them see hope and create a different and better for themselves.

The summer of 2016, I spent close to a week with the staff and students at Tennyson Center for Children in Denver, Colorado. This school not only provides an education to students, but also helps them to work through traumatic life experiences. Tennyson additionally provides housing, as many of the students do not have a safe place to stay. Building relationships with these kids who had been through difficult situations helped me to realize the great need for people who are willing and able to help. This experience assured me that working with suffering children is definitively something I wanted to do.

I could not bring the children from Tennyson back home with me, nor could I delve directly into helping the kids in need in my own community, because first and foremost, I had to be prepared through education. The first person I looked to was Lynn Roush. Roush studied psychology at Taylor University, and after graduation went to Trinity Evangelical Divinity School where she obtained a Master of Arts in Counseling Psychology. She specializes in helping those who suffer from depression, anxiety, eating disorders, generational cycles of dysfunction, and relational conflict.

Through her help, I was able simultaneously work with the two things I am most passionate about: psychology and faith. She selflessly offered to guide me through my internship this past year. In the summer I began my work, reading a series of books and gathering information. I began with psychology’s history, reading books such as Fifty Key Thinkers in Psychology by Noel Sheehy and Andy Warhol was a Hoarder by Claudia Kalb. Fifty Key Thinkers in Psychology laid the groundwork of where the study of psychology began. It introduced me to some of the main focuses within the field, such as grief, depression, anxiety, and attention deficit hyperactivity disorder (ADHD). Andy Warhol was a Hoarder showed me some of the basic disorders and what they encompassed through real life examples of well-known individuals. These books provided a foundation and helped me to ask thoughtful questions.

When the school year began, I met with Roush and we planned out my work load. To begin, I read through Psychology for Dummies. This laid out everything I needed to know on a basic level, connecting neurology, psychiatry, and counseling to the content. Next I read Beyond Boundaries by Dr. John Townsend, which studies the consequences that happen when boundaries are crossed and trust is broken. Townsend explains how to recover from these often traumatic events in order to cultivate meaningful relationships. He discusses how faith plays a role in the importance of boundaries, and the reasons that there are even issues to begin with. This book gave me information that I hope to share with the children I work with in the future. Beyond Boundaries reminded me a lot of the issues I saw in the kids at Tennyson, as well as the things that needed to happen in order to resolve those problems.

Throughout the entire process, Lynn Roush answered tough questions for me and helped me broaden my view on many subjects. This internship has shown me that mental disorders are much more complex than most think. There are often many reasons that a person will develop a disorder that a simple pill cannot entirely fix. Through the entire process, Lynn Roush answered tough questions for me and helped me broaden my view on many subjects. This internship has shown me that mental disorders are much more complex than most think. There are often many reasons that a person will develop a disorder that a simple pill cannot entirely fix.
ed me with knowledge that enables me to more effectively show God’s unconditional love through helping others. I am excited to continue my journey of learning through AP Psychology next school year and later at a college that will facilitate my career choice in spiritual counseling. I am grateful to Lynn Roush for her time and mentorship and am reminded that a strong faith “heals the brokenhearted and binds up their wounds” (Psalm 147:3).
I’ve been shadowing at Columbia Orthopedic Group since the end of November, and I have absolutely loved the experience. Every Wednesday I work with Dr. Joshua Hamann in the clinic, and on Thursdays I watch him perform surgeries on shoulders and knees. As far as the clinic goes, I think my favorite aspect is observing and noting how Dr. Hamann solves complex issues with only a couple of MRIs, tests, and patient reports. After many months of shadowing, I’ve noticed the specific routine that Dr. Hamann uses to almost always ensure success and comfort for his patients.

Before meeting the patients, we always review their medical histories and other supplemental resources like MRIs and X-Rays. From these scans, we look for tears in tissue, absence of tissue, bone spurs, and much more. This review process shows Dr. Hamann exactly what’s giving the patient trouble. Eventually we meet the patient, and Dr. Hamann proceeds with questions like “Where’s the problem? What causes or triggers it? When does it hurt the most? How physical are you?” Although Dr. Hamann might already have an idea of what’s wrong, asking the patient for his or her personal experience gives a different perspective so that Dr. Hamann can confirm or expand his understanding of the situation. After this, a series of tests, like the Lachman Test, evaluates how intact a patient’s ACL is, can be done to assess the level of the patient’s issues. Dr. Hamann will say things like, “Lift your arms as high as possible. Good. Now behind your back. Good. Out to me. Don’t let me push them down. Good.” etc. These tests make the patient go through a series of motions that depend on different muscles, tendons, and ligaments. By the end of consulting, Dr. Hamann has a good suspicion of what exactly might be wrong. Sometimes patients just need cortisol (steroid) shots to support tissue growth and stability, and other times they need lengthy surgeries. Overall, the systematic problem solving, combined with the compassion toward each and every patient, has really impressed me and has made me very eager to practice medicine myself. Every day comes with different situations, some simple and some extremely complex, yet Dr. Hamann has showed me how to successfully combine scientific reasoning with social analysis to do an efficient job.

The most surprising thing to me is that many times after the review process, we concluded that some patients were actually perfectly fine. The pain or symptoms they present are minor strains that will heal themselves with rest and time and intervention is not actually necessary. Sometimes, Dr. Hamann ends up having to do minor exploratory surgeries to figure out what could be causing the problem. But many times, he ends up only needing to prescribe physical therapy or perform a general “clean up” scope to enhance natural healing.

I’ve been fortunate to see a wide variety of surgical procedures that range from rotator cuff repairs to meniscectomies (where part of the meniscus is removed). My favorite surgery to watch was a biceps tenodesis. Here the surgeon cuts the attachment of the biceps tendon to the labrum and then reattaches it to the humerus bone. The theory behind why this surgery works is simple and I find it very clever. These surgeries help with tendinitis in the biceps and relieve pressure simply by moving a tendon from a cramped space at the shoulder to a more spacious area down the arm. This consequently relieves pain in the shoulder area and is very effective.

All in all, the surgeries are surprisingly clean (laparoscopic and relatively blood-free), which makes them enjoyable to watch. Additionally, seeing what the human anatomy looks like in real life instead of just looking at drawn pictures in textbooks is amazing. The application of what I have learned in biology and anatomy to the real world gives me a lot of hope, as I’ve now experienced and seen what I’m working towards. I can’t wait to continue my medical experience past this internship, and I deeply thank Dr. Joshua Hamann and his secretary Jamie Threlkeld for their help and guidance through this unique opportunity!
This past year, I have interned with two other students at Columbia College with Dr. Yinshiang Liow. We met every Wednesday for two-three hours in the evening. Our internship focused on computer science, as expressed through C++. It has taught me a lot about programming skills, collaboration in software engineering, the deep thinking required for computer science, as well as more about the specific problems we solved.

We began in September with a few practice problems. One of these was to multiply all the numbers from 1 to 15000 together. Normally multiplication isn't very difficult—just a problem of typing in what you want to multiply—but here, the numbers were far too big for any pre-built systems. Instead, we had to build and optimize our own systems to calculate the output for this number. This intriguing problem both introduced us to the system we were using (a Linux virtual machine, for standardization), and told us what to expect for the next problem—building a neural network.

Neural Networks are the basis of most of the Artificial Intelligence (AI) research in the past decade—everything from self-driving cars to speech recognition. At their core, they are very simple—weigh inputs of different amounts to decide on a few hidden factors, and use those to make the decision. However, because of this simplicity, they can be created and adjusted by a computer program. This is why they’re so valuable: a programmer can tell a program what they want accomplished, and the program tries neural networks until it finds one that works. This is useful for when a programmer can’t put a complicated process—like recognizing an object—into an implementable algorithm.

Making a neural network is easy. The challenge comes when trying to find a good neural networks. We first approached this through an evolutionary model. We tried a bunch of neural networks, kept the best ones, adjusted them slightly for specific outcomes, and repeated the process. We were able to identify written numbers to 95% accuracy using this method. Next we tried a method known as Gradient Descent, in which calculus is used to change a single neural network to be slightly better, over and over again. Using this method, we were able to classify several different species of flowers with almost perfect accuracy.

Through this internship, I have gained valuable experience about programming and computer science. I learned how to use the Linux system, and the software engineering-related programs within it. With Dr. Liow’s help, I also learned a lot about debugging and what to do when a program stops running efficiently or stops running altogether. Additionally, the focus of this year’s internship was very aptly chosen, as neural networks will surely be relevant in my future computer science career. I’ll be attending MIT in the fall, and I’m glad to get an enormous head start learning about the possibilities of neural networks. I’m very grateful to Dr. Liow for sharing his time and experience with us.
My internship experience was with several different people in the Athletic Administration field. I am aspiring to work somewhere in the general field due to my passion for sports. Thankfully everyone in this field welcomed me, described the joys and challenges of their daily lives giving me an insight into their positions and athletic administration in general.

With Jim Sterk, head athletic director at MU

I started my experience off working with Jim Sterk the current Head Athletic Director at the University of Missouri. It was incredible getting to work with someone as high caliber who made it to the very top of this competitive field. I was able to ask him many questions and got a lot of good insight. I learned that becoming an athletic director takes time and dedication: It usually takes 10-20 years to become a D1 athletic director because of the scarcity of positions. You have to work your way up through departments and make critical connections because all of the jobs Mr. Sterk obtained were because of networking and making positive impressions on new people.

One key takeaway from working with Mr. Sterk is that if you want to be successful in this field you must treat everyone with the utmost respect and do things the right way. He prides himself on his integrity, and I believe that is what has made him so successful. It is critical to his job because it is all about dealing with people and trying to keep them happy. If you treat everyone with respect then it makes your job a whole lot easier when they respect you in return. He has really become a role model for me because of how he opened his office to me. In early January I emailed him on the chance he might be open to talking with me. To my great surprise, he responded positively within a few hours. Most people of his status wouldn't give the time of day to high school sophomore like me but it really resonated with me when he responded because it showed that he truly cared for his job and for the success of those who look up to him.

With Drew Grzella & Bryan Curtis, athletic directors at Columbia College

The next portion of my internship was in the Columbia College athletic department where I worked with Assistant Athletic Directors Drew Grzella and Bryan Curtis. They were eager to let me come work with them as a “Gameday Assistant” and I got to follow them around at soccer and volleyball games this winter and spring. This experience really showed me what it was like working in a small college athletic department and how their jobs differed a lot from Mr. Sterk. Mr. Grzella and Mr. Curtis work directly with students and they have to do a lot more of the setting up for games and work during games. They wear several different hats because they don’t have operations crews with coaches and assistants like at Mizzou. In my experience we had to set up sound booths, tables, and even corner kick flags before soccer games. This was fun because I felt really a part of “the show” and it was clear to me that they both really love their jobs because of how involved they are with all of the guys and the production at all of the sporting events. It really gave me a totally different perspective of the field and was very interesting to me how two people with the same title can have such very different job descriptions. I was able to notice the pros and cons of each because although Mr. Grzella and Mr. Curtis may have a lot more hand-on work than Mr. Sterk, his work seems to have a lot more pressure and the decisions he makes affect a much larger group of people and have a more lasting impact.
With David Egan, Athletic Director at Rock Bridge

For the last portion of my internship I worked at Rock Bridge with the Athletic Director David Egan. He was very good to me to always be available to talk and I learned a lot from him. He gave me a lot of good insight and showed me Athletic Departments at the high school level. In high school, the job entails scheduling games and spaces and taking care of problems during the school day. He is also responsible for making sure Rock Bridge complies with Missouri State High School Activities Association (MSHSAA) game and playing protocols. Mr. Egan’s biggest challenges are dealing with team or playing conflicts with students and parents. He says it is always important to look for the good in people and recognize that parents want what they think is best for their children and that everyone—student, parent, and coach—has a valid perspective that must be heard and acknowledged. I can see that Mr. Egan is very earnest and really tries his best to resolve conflict and be supportive of everyone. I can imagine that he is able to calm down heated conflicts and remind everyone that they all enjoy the love of the game and sports is as much about camaraderie as competition. I was very grateful for my time with Mr. Egan and tried to be a sponge when it came to the information he told me. I think parent and coach confrontation is the least favorite part of his job but he always seemed to have a good attitude about it and try to stay positive. I think this job at the high school level specifically requires a love for teenagers and wanting to see them succeed. He really is a great guy and has every athletes best interest in mind when making decisions.

Mrs. Struchtemeyer also had me read The High School Athletic Director’s Book, a handbook of legal forms and advice for an aspiring athletic director. This helped me to ask thoughtful questions. Talking with these athletic directors has been incredible for me because of all the knowledge I have gained. I have realized I have to put myself out there and get working in the area. Being an athletic director is all about networking with coaches, players, parents, and other stakeholders such as sponsors. As the saying goes, the early bird gets the worm. Mr. Sterk said he liked how I had the chutzpah to contact him and ask for a meeting, and that’s why he opened his office to me. He told me I carried myself well and was offered me an interview for an internship with the Tiger Scholarship Fund. I got in the program and plan to work this summer in the MU Athletic Department. I’d advise anyone looking to get into this field to make connections as soon as possible and don’t be afraid of rejection. This internship was such a positive experience and helped solidify my curiosity of wanting to enter the athletic administration field.

“ONE KEY TAKEAWAY FROM WORKING WITH
Mr. Sterk is that if you want to be successful in this field you must treat everyone with the utmost respect and do things the right way. He prides himself on his integrity, and I believe that is what has made him so successful. It is critical to his job because it is all about dealing with people and trying to keep them happy.”
This past semester I interned at Tiger Pediatrics with Dr. Laura Weidt. I first learned of the EEE Internship program my junior year at Rock Bridge. I was so excited to have the opportunity to shadow and experience my dream career. I have always been surrounded by medicine. When I was growing up, my mother and I took care of my grandmother when she was very ill for over ten years. I have always pictured myself going into the medical field, in particular as a physician in either pediatrics or obstetrics. This past semester has been the most exciting and enlightening experience that I have had in high school while learning. Interning with Dr. Weidt not only showed me the perks of being a pediatrician, but also the struggles she faces every day.

I began shadowing in early September. My first day I was whisked away by the office manager to take a HIPAA test for me to be able to observe, look at patient charts and be briefed on patients medical history. Our day started with discussing the number of patients we were going to see that day and a briefing on the first patient’s reason for the appointment. When we would go into the exam room, Dr. Weidt would greet each patient and family. This part of the exam showed how involved she is with her patients, which shows how much she cares for them. She then would begin with a physical exam. Exams differed depending on the age of the patient. Her patients ranged in age from newborn babies to teenagers. She would check ears and eyes to see if most patients, she would check ears; in early adolescents, ear infections are very common, she would check for inflamed ears and cloudy fluid. Eyes; at early adolescents many kids don’t realize that they have impaired vision, this exam can assess formations in the eyes and ability to follow the light. Dr. Weidt would then examine the mouth. In early childhood many children have trouble remembering to brush their teeth, this exam can show signs of tooth plaque, infection and she would also examine the throat and to see if it was inflamed. She then would move on to listening to their heart and breath sounds. This can detect heart murmurs and if the child is having breathing problems, can help identify the certain sound that depicts a certain infection. She would then examine knee and ankle reflexes and joint movement. Lastly, she would examine the abdomen to double check that the child is passing bowel movements and is not becoming obstructed, and the pelvic region for fluid buildup or inflammation.

During this time she would be engaging with the patient and parents or guardians, asking how school and normal activities are, this again involves the kid and allows Dr. Weidt to monitor social skills, academics and health activities. Dr. Weidt always makes time for her patients and their questions.

This semester almost every child that we examined had an illness. Earlier this season, ragweed was very high, which affected a lot of asthma-prone kids and induced a lot of sinus infections. Over the past few months inneral virus and paraflu, which can have symptoms ranging from respiratory to gi were seen in many children. Dr. Weidt is a big believer in vaccinations. She believes that they’re not only safe for children but that they also stop the spread of disease. Vaccinations are a controversial topic that Dr. Weidt has to deal with on an everyday basis. Dr. Weidt always makes a point to answer all of the questions parents have and puts their minds at ease.

Dr. Weidt works in her own practice with other associate doctors. This difference allows Dr. Weidt to grow a relationship with each of her patients. In contrast to working at a hospital, where you usually never see a patient more than once. Dr. Weidt’s bedside manner is second to none. She has only kind and encouraging words to all patients. I never realized the difference working in your own practice makes, not only do you grow relationships with your patients and families, but you gain their trust, and you get to see them grow up.\n
"Dr. Weidt works in her own practice with other associate doctors. This difference allows Dr. Weidt to grow a relationship with each of her patients. In contrast to working at a hospital, where you usually never see a patient more than once. Dr. Weidt’s bedside manner is second to none. She has only kind and encouraging words to all patients. I never realized the difference working in your own practice makes, not only do you grow relationships with your patients and families, but you gain their trust, and you get to see them grow up.\"
ing a Pediatrician is the ability to watch the child grow up and go out into the world.

Aside from interning with Dr. Weidt at her practice every week, I got to go to the Boone hospital birthplace for morning rounds. This is when Dr. Weidt is assigned a baby that was just delivered that morning or the night before and performs their first checkup. Dr. Weidt examined the baby for any warning signs, jaundice, a yellowish tinge to the skin, or if any birthmarks or rashes had produced since birth. Then she would complete a regular examine on the baby. Watching Dr. Weidt examine a nine-hour old baby just warmed my heart and gave me that feeling of this is what I’m meant to do. After that, Dr. Weidt would then talk to the mother, congratulating her on a healthy baby. As I walked out of the hospital, I was filled with a rush of excitement that lasted the whole week. This whole experience has furthered my passion for pediatrics.

During my time with Dr. Weidt, I finally realized what went on in a day of a Pediatrician. Every morning I interned with Dr. Weidt I jumped out of bed and was ready to learn. I thought I was passionate about pediatrics before this internship, but now I know that this is what I am meant to do. I have never been so excited to learn. This experience has opened my eyes to how unique and beautiful every single child is and how the good of medicine plays such a powerful part in their life.

Looking back on this endeavor I loved being able to ask questions and observe my future career. This was a phenomenal semester filled with learning and incredibly memorable moments. I would definitely recommend any Juniors and Seniors to take advantage of this great opportunity. There is nothing better than first-hand experience of a career that you are interested in pursuing. This EEE Internship is one of the best things Rock Bridge has to offer.
For my second semester internship, I chose to investigate law and politics. I began by going to a stump speech and hearing seven politicians speak. From this event I met Michela Skelton, and arranged a meeting with her a week later. She talked about the areas where law and politics integrate. There are three main groups when it comes to running for office. Michela said these groups are field, communications, and finance. In field, people knock on doors and make phone calls to potential voters. In finance, one learns ways of getting donations and then sending out thank you notes. With communications, we make a social media page and email potential voters. I learned that campaigning is its own full-time job.

Next, I met with Julia Bonham, who started out as a public defender, but is now a criminal defense lawyer. In our first meeting, she talked about the competitive nature of law school. This made me wonder if the atmosphere of law school might be too competitive for me. I continued to meet with Mrs. Bonham throughout the semester, going to the Boone County courthouse. Before those courthouse meetings, though, I met with two other lawyers: Helen Tatum and Anna Lingo. Mrs. Tatum is an immigration lawyer. This interview was especially enriching. She took me through how recent laws and events have affected immigration law and her clients. She ends up working very closely with family lawyers as well. It was interesting to hear the increase in cases since President Trump became elected, and how new regulations have affected her practice.

Anna Lingo is a family lawyer who works with juvenile cases. She described her work as emotionally demanding because young people get into cycles of arrests that compound their likelihood of spending time in jail. She spoke a lot about the school-to-prison pipeline and how she and juvenile courts do their best to give young people second chances until a major offense. After meeting with these two lawyers I began going to the courthouse with Mrs. Bonham. She gave me a tour of the courthouse including trial
rooms. Then we began going to sit on doctrines, which are setting up trial meetings. Here, I saw what it was like to get a trial time, or for someone to plead guilty and not have to go to trial at all. That day I witnessed two people plead guilty to their crimes. This was interesting because I got to hear the wording used by the judges to complete the plea. Apparently over 95% of cases are end in plead deals rather than trials. All of the visits I went on were helpful for me to see the possibilities within the field of law.

After a few of these courthouse visits, I decided to see what it would be like if I were a corporate lawyer. I met with Kent Lowry, whose practice in Jefferson City involves defending corporations. Mr. Lowry described his typical day and some of the cases he was currently working on. He also let me sit in on a phone call between him and his client, and that was very interesting to hear. After this interview with Mr. Lowry I completed a “Know Your Rights Training.” This training taught me the rights that are given to me and to immigrants, and how I can help inform someone become aware of their rights if they need them. This was also eye-opening to see the issues immigrants face. While all of these experiences were going on, I was also reading a few books. The books were Don’t go to Law School Unless by Paul Campos, Family Law by Mary S. Furlong and Edward T. McMahon, and One L by Scott Turow. One L was my favorite out of the three. It was written by a Harvard Law student about his first year in school. He touches on the competitive feelings in students, and the need to find their success in grades and summer associate positions. This book is definitely one I recommend to anyone wanting to go to law or business school, and I can see myself rereading it again my senior year.

Toward the end of the school year, I also got to attend the Sophomore Pilgrimage. This event is a tour of both the Missouri Capitol and Supreme Court buildings sponsored by the Women’s Clubs of Missouri. The tours took us through the library at the Supreme Court, and through the halls of the Capitol, led by an informative guide who told us of the political positions and what they entail. I also got to hear from four speakers, Mike Parson, the Missouri Lieutenant Governor, Patricia Breckenridge, one of the Supreme Court judges, Jay Ashcroft, the secretary of state, and Nicole Galloway, the state auditor. Each of these speakers talked about what their job was like, and the need to be persistent when creating justice for all citizens.

After the Sophomore Pilgrimage, I followed Martha Stevens on a photoshoot to see what it’s like to campaign for reelection. Currently I am working on a case with Mrs. Bonham. I am getting to see communication between prosecution and defense, and between attorney and client. I am also learning how to look up files on CaseNet, and seeing the different appearances that occur in a case before the trial.

Overall my internship really helped open my eyes up to the struggles of going into law and politics, as well as the positives that can come out of community service work.
I had the opportunity to work with Dr. Ilboudo, a pediatric infectious disease physician at University of Missouri Healthcare’s Women’s and Children’s Hospital. An infectious disease physician works to ensure proper disease prevention, diagnosis, treatment, and recovery. They deal with diseases that affect the immune system. The body’s immune system is the network of organs and tissues that work together to defend the body from foreign pathogens. When the immune system is compromised, infection can occur and this is where the doctor comes in.

Dr. Ilboudo primarily sees inpatients who are checked into the hospital. Here the focus is to figure out what disease is infecting the patient. There was one patient who had recently come back from vacation outside the United States. The patient showed symptoms of Dengue Fever. Dengue Fever is a viral mosquito-borne illness that occurs in tropical areas. Symptoms include fever, headaches, fatigue, vomiting, skin rash, and pain behind the eyes. In order to diagnose the patient, a blood test was ordered to identify the pathogen in the body by looking for antibodies. Antibodies are proteins that can fight pathogens; each is specific to a certain pathogen. Once the disease is identified, Dr. Ilboudo is able to create a treatment plan for recovery. She also sees less acute patients such as those who have gotten an infection to a feeding tube or after surgery. One example was a baby who has just gotten out of neurosurgery and acquired an infection. During neurosurgery, the skull is removed then reapplied afterwards. The dura is then cut to expose the brain, dura is replaced by duraguard when closing up. This patient had an infection on the duraguard between their brain and skull. Due to the nature of the infection the skull had to be removed and the infection was cleared from it in lab.

Dr. Ilboudo also sees some patients in-clinic. In-clinic patients typically have chronic infectious diseases. One example was a patient with Sjogren’s syndrome. Sjogren’s syndrome is a disorder to the immune system that primarily causes dry mouth and dry eyes. It is an autoimmune disorder, meaning the body attacks its own healthy cells. It is caused by a deletion of the twenty-second chromosome on the Q side. The disease begins by attacking the mouth and eyes but can progress to attack important organs. The role of an infectious disease physician is to monitor the progression of the disease and attempt to slow it.

Another one of the tasks infectious disease physicians are given is antibiotic stewardship. Antibiotic resistance is a significant worldwide medical problem. Antibiotic resistance occurs when bacteria mutate to make it so antibiotic drugs which previously killed them no longer work. When antibiotics are not taken as prescribed antibiotic resistance can occur. Also, antibiotics are overused in agriculture adding to the worldwide epidemic. As an infectious disease physician, Dr. Ilboudo is tasked with ensuring proper hospital policy is maintained in regards of antibiotic use. Monitoring the prescription of antibiotics by physicians makes it so physicians are more cautious towards the effects of over-prescribing the drug.

Over the course of my internship I was able to learn about diseases first hand through medical cases. I was able to get a better understanding about the medical field and the tasks of being a physician in the 21st century. I am thankful to Dr. Ilboudo for providing me with this opportunity.
I’ve wanted to be a doctor my entire life. However, you really can’t get a sense of the job until you actually see what happens on a real day. This semester I had the opportunity to work with the Pediatric Neurology Department at University of Missouri Healthcare’s Women’s and Children’s Hospital. Pediatric Neurology looks at children with nervous system problems. I worked with Robin Riggins, an advanced practice nurse, and Dr. Anilkumar, a pediatric neurologist.

Mrs. Riggins’s day begins bright and early with answering phone calls, refilling prescriptions, scheduling appointments, referring patients to the right specialty. In clinic, she sees a variety of patients, ranging from headaches to Cerebral Palsy to Neurofibromatosis. She begins the appointment with simple questions: What’s your teacher’s name? What did you eat for breakfast? What’s the capital of Missouri? These small questions are actually part of the neurological exam she conducts with every patient, testing memory and speaking skills. The neuro exam involves a variety of small tests to ensure the coronal nerves are all functioning properly. Afterwards, she will speak to the patient and understand why they’ve come in and what she can do to treat the problem.

An advanced practice nurse tends to see patients with more stable conditions. They typically will see return patients and not those with Epilepsy. A very common problem with patients is headaches. Every patient is different, and every headache is different. Each patient will explain to her their symptoms and signs. She will then decide the best drug and proper dosage as a treatment plan. Another common condition I got to see was Tourette’s Syndrome. Tourette’s Syndrome typically goes undiagnosed, but it’s a type of tic disorder in which the patient has two or more motor tics and at least one vocal tic. A motor tic is an involuntary movement, and a vocal tic is when a person involuntarily creates a sound. Most patients don’t partake in any treatment unless the tics make them unable to perform normal daily tasks.

As a neurologist, Dr. Anilkumar sees patients who have less stable conditions. I was able to witness a patient with Triploidy: a rare genetic condition in which a child has an extra chromosome. The severity of the condition depends on how many of the 23 chromosomes the patient has multiplied. Having three copies of chromosome 21 results in intellectual and developmental disorders such as Down’s Syndrome.

However, this patient had multiple chromosomes with three copies. Triploidy is so rare that there are currently only 45 cases reported alive in the world as most don’t survive past infancy. The patient had surpassed the odds and was here for a check-up on his neurological development. He had epilepsy due to his triploidy which had progressed. Epilepsy is a disorder of nerve cells in the brain which causes seizures. It can be treated by medication.

Typically, a neurologist prescribes anticonvulsant medication to reduce the patient’s seizures. The goal is stop seizures because irreversible brain damage can happen. Thus, doctor changed the dose of his anticonvulsant medication. He also conducted a neurological exam and asked questions to ensure there were no new changes or problems. Throughout my internship I was able to witness a variety of medical cases that reassured my passion for medicine. I was able to view a different career and a specialty of medicine I never considered before. I’m thankful for Mrs. Riggins and Dr. Anilkumar for giving me this opportunity.
Throughout my semester of internship at Gentry Middle School (GMS), I have already learned more from the students and teachers that I am working with than I have learned from being a band student at RBHS for four years. During my free time within the school day, I drive over to GMS and enter the band room. From there, I observe Ms. Quest as she gets the seventh grade brass students warmed up and ready to play. Observation has definitely been a large part of my work with the middle schoolers. While watching an experienced teacher work, I was able to see very clearly how the students reacted to her direction and how they responded to different situations. That experience has taught me a lot about how to take control of a class, how to tell when students need something repeated or explained a different way, and when it is time to take a few seconds and just laugh. While observing the class was very helpful to me, I was lucky enough that Ms. Quest allowed me to “learn by doing” and lead groups of students in sectional work.

The experience of standing in front of a herd of seventh graders and attempting to help them make music has been humbling, entertaining, and terrifying. My situation as a high schooler is essentially that I am one lesson ahead of these students and I have to find a way to help them succeed even when I have no idea what I am doing. Sometimes, I am able to help them improve and we have a productive rehearsal, but other times the class derails and I am struggling to decide if I am capable of getting 25 wild trumpet players back on task or if I need help from their “real teacher.” I have already gotten to know the personalities and musicianship of many of these kids; they are all hardworking, caring, and most of them are fairly entertaining as well. In the beginning, I was somewhat unsure about working with middle school music students because I was worried that I would be “bad” at teaching and that the students would dislike and ignore me. This has not all been the case so far. All of the students I have worked with have at least attempted to listen to me and try my suggestions to help them improve, and while I can’t tell if they’re actually impressed by my puns, some of them laugh anyway.

The Gentry band directors have an extremely student-oriented approach to teaching. After almost every repetition of the music, they ask the students questions that allow them to think through their mistakes and how they can make the next repetition more effective. These questions are usually qualitative and can have a variety of different answers, such as “How can we make this sound more musical?” “What do you hear us doing well?”, or occasionally a mildly exasperated “What happened there?” I believe that this method of allowing students to give feedback and to think through the process of teaching themselves and their classmates allows for a deeper understanding of musical concepts and helps the students form articulate ideas and achievable goals for improvement. I hope to someday learn the patience and gentle correction that these teachers displayed continually while I was observing them.

I have loved my time working at Gentry, and I truly believe that this internship was able to solidify my decision to pursue music education next year in college. Working with middle schoolers has proved to be an extremely rewarding experience, and I can’t wait to continue being in the classroom helping students learn. I’d like to thank Ms. Amber Quest, Mr. Zach Nenaber, and their incredible student teacher, Ms. Elizabeth Ferguson for allowing me to be a part of the Gentry band family for a few hours a week and share in the joy of teaching. Most of all, I learned that great teachers don’t get nearly enough credit for the amount of time and effort they expend and the amount of love they have for the students and their profession as a whole. So, please remember to thank your teachers; the ones I observed go “above and beyond” every single day.
I have always loved learning languages and when I was informed of the opportunity to further my French language skills at La Petite École (the French immersion school in Columbia), I was thrilled. My enjoyment of learning French and spending time with kids was combined into the perfect experience for me.

I worked as an intern in the kindergarten class at La Petite École for two hours every other day. Each day the kids came in and silently read for a couple minutes after which they would draw a picture in their journals. The other teacher aids and I would ask the students what they drew and what they could write about. The students then wrote a few sentences describing their picture. It was amazing to see the development of such young minds as they became more familiar with the French language. Even though the kids were at all different learning levels (depending on whether they’d attended preschool at La Petite École or not), they all showed extraordinary growth.

Sometimes, I didn’t know how to answer a student’s question; luckily for me, I got to work with Joelle Quoirin and multiple student teachers who would help correct my French. Often it seemed I was learning more French than the students! After journal time we transitioned to circle time. Squeezing in with the eight kindergarteners and singing along with them on the circle rug was my favorite part. We always began by asking where each student was: in front of someone, next to another student, or at school. Then each student answered how they were doing, all in French of course! Answering these questions every other day at my internship helped me solidify basic conversational language. Afterwards, the children would fill out phonetic or spelling sheets. At each step I had the opportunity to work with the kids one on one.

Speaking this much French every other day helped me develop phonetic understanding which had not been focused on as much in my high school French class. When the class would pronounce different letters/sounds I was able to quietly join in using every opportunity to enhance my learning experience.

This internship helped me progress in my French conversational skills and also allowed me to work with kindergarteners trying to learn French. It was not only rewarding when I was able to help a student, but it was also filled with unexpected delights of youthful exuberance. I was asked if I was married a couple times and given lots of warm hugs. The students were so friendly and intelligent even when they probably didn’t completely understand what I was saying. They always had me on my toes to keep up my French language, and yet always kept me laughing. I went to La Petite École hoping I could help the students there with my limited French, but instead they ended up helping me. The faculty and students all had a profound impact on me as a French speaker and as an individual and I thank them all for this wonderful opportunity.
Y*AAL Progress started in Snapchat. From a conversation that spanned the thousands of miles between New York City and Columbia, Missouri, the Young Asian American, Pacific Islander (AAPI) and Arab, Middle Eastern, Muslim, and South Asian (AMEMSA) Leaders for Progress Summit knit together a chosen family of mobilized peers. I worked with my sister, her partner, Rajiv, and a local politics researcher, Sheela, through the last couple months of my junior year into July to organize and host our political action summit. With an eye on the 2018 and 2020 elections, we created a foundation of political education for high school students to engage in local movements as well as a broader progressive network of policy and political actors. The summit included introductions to policy issues, campaign tactics, political identity formation, democratic institutions, and coalition-building.

In the months leading up to Y*AAL Progress’ inaugural weekend summit, four of us worked via google docs, brainstorming and reaching out to speakers and organizations to bring our vision to fruition. Y*AAL Progress had a host of guest speakers and simulations over the two days of the summit, from local representatives to organizers we skyped in from national organizations like 18 Million Rising. With these guest speakers, we held legislative and campaign simulations to explore local politics and the ways to navigate issues we found to be important for ourselves and our identities.

Additionally, we reached out to the University of Missouri Honors College, who provided us with a location where we were able to host Y*AAL Progress. In the spirit of empowerment and activism, we also felt it was important to remove economic hurdles by making Y*AAL Progress free, and set up a YouCaring crowdfunding page, where we raised $1050 of our $1000 goal to put towards programming supplies, food for participants, and website maintenance fees.

Interestingly enough, food ended up being a big part of my experience as a participant-organizer of Y*AAL Progress. Our first meal together as a cohort was with local politicians, Rep. Martha Stevens, Rep. Kip Kendrick, and Missouri Democratic Party Chair Steven Webber. Over falafel from International Cafe, our cohort asked questions about local politics and ways to get involved, opening our discussion from a presentation earlier that morning about race, to a discussion of how, from our position, we can get involved in politics and exercise our power as members of this community. One of the most impactful experiences of the weekend was sharing homemade gochuchanna (Chickpea curry with Korean gochujang spices), daal (spiced Indian lentils) and rice while telling food stories.

Our experiences as API in a predominantly white culture reach to every area of our lives, particularly our experiences with food. On a topic that is literally as close as our mothers’ home cooking, otherization, and unapologetic pride all come to an intersection, making for some stories that invoked collective sympathy as well as laughter.

Moments like those were comparable to experiences I had earlier that summer interning with an organizer with the National Asian Pacific Women’s Forum (NAPAWF) in New York City who looked to mobilize Asian American Pacific Islander women, trans, and gender nonconforming folks. What I learned from that experience was something that I tried to foster at Y*AAL Progress— a feeling of community and solidarity that built power. When we speak about issues amid shared personal experiences, we are more than data. Our experiences and our struggles are personal, emotional, and they call for a sort of community that I hadn’t experienced until I spent time in New York City.

However, organizations like NAPAWF and 18 Million Rising are strong in large metropolitan areas on the coasts, but lack in communities like Mid-Missouri. In the places most dominated by a culture of whiteness that isolate API/AMEMSA folk, that large community with structure and resources just doesn’t exist. This is why we created Y*AAL Progress, particularly for young people who were looking for ways to express and explore that part of their identities. Their motto is “Y*AAL Progress is where young leaders bring the movement home.”

Living in Mid-Missouri, any support for understanding my politicized identity as an Asian-American is sparse, at the most. In a time where these politicized identities are so pronounced, I found it important to build power and community with AAPI/AMEMSA peers through political education. Columbia has double the population of Asians than our state, but it is still is a lonely place to be a person of color. The coalition that the Y*AAL’s summit created still exists today, sharing political opportunities, action alerts, and memes. In this seemingly isolated world and increasingly hostile political atmosphere, Y*AAL Progress is a circle of solidarity.

To learn more, visit yaalprogress.org
After taking Financial Accounting at Rock Bridge my junior year, my heart was set on pursuing a degree in accounting. I am surrounded by many accountants in my family, and have heard only good things about this career. The beauty of accounting is the number of paths you can take, specializing in numerous areas such as taxes, auditing, forensics, financial, managerial, etc. Within the next eight years, employment of this field is projected to increase by 10%, which is faster than any other occupation.

To further my interest and experience in this field, I completed an internship with Hawthorn Recovery Services (HRS), and directly worked with the President, Bonnie Baker.

HRS is a debt collection agency that receives uncollectable accounts from medical service providers. HRS is given the task of getting a hold of each account holder, and determining if they are willing or capable of paying off their account. If HRS is able to recover a balance, it goes back to the client, who in turn gives HRS a percent of what they collected. Collection agencies are an extremely important component that helps keep other companies in business (particularly hospitals) while also solving an individual’s debt and keeping his or her credit score as good as possible.

During my time at HRS, although I did not directly call can collect debt, I did learn and perform important tasks related to accounting. I was frequently assigned writing checks, bills, entering deposits, conducting bank reconciliations, running University Hospital reports, and doing mail return and skip tracing. Bonnie uses Quicken, a program that works as an online check register.

I was trained and used Quicken to write checks to clients, write bills to companies for services and dues, enter deposits that come from paying debtors or attorneys who collected balances, as well as bank reconciliations where I matched balances between the bank statements and the company’s check registers.

When running University Hospital reports, I made a spreadsheet of all the debtors at the University Hospital for the past year and organized the accounts by status of active, cancelled, closed by the agency, paid in full or settled in full. I also totaled the amounts remaining or paid from each account which Bonnie would use later when sending the University Hospital a monthly report of their current debtors. Skip tracing was not something I did often, but I found it very interesting.

At HRS, the contact information they have for debtors is not always updated or correct. In order to get the newest information possible, they do skip tracing. Through using TransUnion, I was able to type in debtors Social Security numbers, and find recent addresses, phone numbers, and age. HRS then uses these updated phone numbers to try to contact the debtor, or send mail notices to the address to make the debtor aware of their balance.

Since starting my internship at Hawthorn Recovery Services, I have learned so much about not only accounting, but also debt collection and what it is like running a business. This internship has widened my knowledge about accounting giving me more reason to pursue this career.

“Since starting my internship at Hawthorn Recovery Services, I have learned so much about not only accounting, but also debt collection and what it is like running a business. This internship has widened my knowledge about accounting giving me more reason to pursue this career.”
I clocked 120 hours between June and August making a 3D computer model of an Alligator Trigeminal Nerve under the instruction of Dr. Casey Holliday. The first 50 hours (spread out over 10 days) were spent using Aviso 9.0.0 to color a rough model of an alligator's trigeminal nerve. Aviso is a program which visualizes CT scan data, and can use gray scales to show a computer's hypothesis of what the object scanned (in this case an alligator head) looks like. I colored voxels one frame at a time in all three planes (x/y, x/z, y/z), creating a model. I spent another 10 hours working on cleaning the model in GeoMagic, a program for smoothing and cleaning models, cropping out mistake areas and filling holes in the model. After I got the model smoothed, I began making background and reference images in MediBang Paint Pro, an art program I frequently use at home. To make the background and the final model, I aligned my model with the 2012 model, which had a lower scan resolution of 85 microns, compared to the data I was working with, which had a scan resolution of 23 microns.

Dr. Holliday had been a bit skeptical if the Ophthalmic division I had found in Aviso was correct, so Kaleb and I did a partial dissection of a larger alligator head to see if we could find the Ophthalmic division and confirm if what I had found was correct. Just prior, I spent a day working in Aviso to see if there was a different nerve branch I hadn't picked up in the same area as the Ophthalmic division. I ended up finding a small nerve branch going into the eye, and both the main division I had found and the smaller branch were confirmed through the dissection.

After the dissection, I worked on attaching the small branch to the main model, then correcting the background and reference images. I got the model uploaded, but not published, to Sketchfab, where I applied annotations and a matcap (dictates the color and shading of the model as you look at it) to the model. We still weren't sure about certain details of my model, specifically how I had the Maxillary division going to the premaxilla (the front sets of teeth, similar in position to human incisors), which were supposed to be innervated by the Ophthalmic division. Another dissection revealed that I had accidentally switched over to a blood vessel were the Maxillary division ended. I corrected the model and background, and finished up my annotations and model description. Dr. Holliday checked and edited the text on Sketchfab (and made the diction more scientific), then published the model on August 17th, 2017. The finished model can be found at https://sketchfab.com/models/cb12e656fa584d3ba9ce5bb55873283c, or by going to sketchfab.com and searching “alligator trigeminal nerve.”

Seven months later, I learned that Dr. Holliday will be presenting these models at The Society of Vertebrate Paleontology (SVP) meeting in Albuquerque, NM in October 2018. I will be attending the South Dakota School of Mines with a major in paleontology and am invited to present alongside Dr. Holliday who is including my name with his published research. I am grateful for his mentorship and expertise.
This school year, I was offered a position as an intern in the civil engineering department of MU with Dr. Henry Brown. Having always been fascinated by technology, I jumped at the opportunity, and have since been working alongside college student Zhu Qing on improving road safety with construction vehicles. The idea was to develop new light patterns on the backs of slow-moving construction vehicles to make them more noticeable and prevent crashes. It was quite the unique experience.

Before I became an intern, Zhu and the other workers had created a short simulation to test the effectiveness of the different colored light patterns on willing subjects. It involved the subject climbing into a disassembled car body and driving down a virtual road, with periodic construction vehicles along the way, each with a different light pattern.

My first assignment was to collect data on a subject. Simply put, I had to tell the subject how the controls worked and make sure that the data collection program was running. Nonetheless, I believe it was a good experience, actually running a real test on a real person.

My second assignment was to record the information entered in a survey completed by the subjects about their experience. The survey asked questions about which light pattern the participant preferred, which ones they didn't, and the like. I copied that information onto an Excel file for easy management. My third assignment was to calculate velocity of cars passing construction vehicles on a highway.

This real-world information was crucial for comparison to the simulation. I used the marks on the road and a timer to calculate the velocities of cars as they passed the construction vehicle.

My fourth assignment was where things really started to pick up. Up to this point, everything that I had been doing was rather straightforward and simple, as Zhu pointed out to me. Wanting me to come away with not just a new experience, but new knowledge, I was assigned the role of statistical analysis. As a sophomore in high school, I knew absolutely nothing about statistics at the time, so I got a book on behavioral statistics and taught myself the basics.

While I was educating myself, Zhu gathered information on the distance where people began to slow down when they saw the flashing lights in the simulation and gave it to me. I then performed t-tests on the average distance for each light pattern and submitted it to Zhu for revision. It was an amazing experience, and I began to truly feel fulfilled with my internship.

My fifth and final assignment was the most interesting one. My internship was ongoing, but there was little more to be done on the project at hand. Finding nothing better for me to do, Zhu decided to teach me how the simulation was made. He directed me to a wonderful website called Coursera where I learned all about using the Unity engine, which was used to make the simulation. It was quite interesting and entertaining, and I truly appreciated Zhu's kindness in taking my interests into account.

Most of my work in this internship involved data reduction or collection. However, that didn't stop it from being an amazing experience. I learned much about what it meant to work in this field, and the support of my employers helped push me to do things I wouldn't have otherwise done. I intend on continuing my internship at MU if possible, as it has only been a positive experience for me.
As I was driving to school my junior year of high school, the snow came down softly and even in my car, I was still freezing. As I pulled up to a stop sign, I glanced over to see eight elementary school children waiting for their bus. They had no coats, no gloves; they had nothing to keep them warm. My heart sank watching them shiver. This same sight confronted me day after day, and I became more distraught each time I passed. Knowing I had to act, I researched winter apparel programs in Columbia and found a major hole in available services. I described this experience to my Internship Advisor at the Crossing Church, who had dealt with a similar situation at Jefferson Middle School.

With this, I pitched the idea to start my own nonprofit, Koats4Kids, to collect and purchase winter coats and apparel for elementary and middle school students. Although Koats4Kids’ main objective is to provide needed clothing for these students, the deeper mission is to remove a barrier to learning for these students: I believe that by meeting these students’ basic needs for clothing, I would contribute to their feelings of self-worth and confidence, and confident students are better learners.

Mr. Alphin, my advisor, loved the idea and allowed me to use my internship hours to work independently and learn the skills needed to run an organization, first hand.

My first step was to contact every school principal to announce Koats4Kids mission and to invite them to send me a list of current student needs in their schools. The response was incredible, but I realized quickly that many students needed everyday clothing, as well, so I transitioned from delivering coats to delivering other essential items to help these students thrive.

To start Koats4Kids, I relied on my personal savings of $1,000 to begin purchasing needed items. Within a week, community donors helped bring my financial total to $2,000, but this amount was simply not enough to match the schools’ requests. Still in need of donations, I emailed local families to explain my organization and ask for their support. I received over 500 pieces of clothing to be delivered to partner schools and an additional $2,000 in financial donations. My excitement about donations ramped up when Veterans United Foundation contacted me and pledged $2,000 to support Koats4Kids’ ongoing efforts.

To organize my donated items, I recruited my mother to help me build a closet in my family’s basement, complete with labeled shelves and hanging space. The clothes are organized into categories: type of item, gender, and size. This system allows me to reach out to schools to offer items that I have in excess, for example, gloves to Beulah Ralph Elementary.

When I receive an order, I immediately print the list and add it to the “To Be Filled” section of my Koats4Kids binder. After filling and delivering, the paper copy is moved to the “Filled” section. When organizing items to be delivered, I use plastic bags and tags to avoid mixing up schools’ and students’ orders.

In regards to financial organization, I use my checking account that started with the initial $1,000. This account has a debit card and checkbook that I use when purchasing items that I do not have in my closet. In my orders binder, I added a zipper pouch to keep my card, checks, and cash together and staple all receipts to the top of the order page. When doing anything for Koats4Kids, I use the binder to stay organized.

To date, Koats4Kids has helped over 120 students. Over 15 pairs of shoes, 50 coats and sweatshirts, nine full wardrobes, and countless pants and shirts have been delivered to students in need. Items delivered from the Koats4Kids closet have been washed and screened to make sure that items are in top condition. As a high school student with younger siblings, I understand current styles and trends that attract most students. I piece together outfits that feel fresh and new, giving students a sense that they fit in, a major psychological need for children and teens.

Because I am legally not allowed to meet the students that Koats4Kids supports, I will take into account specific style requests, and I also give my school contacts the op-
portunity to send back items that the student does not like. Giving students clothes and shoes that fit their desired style allows that student to feel confident. It is my hope that their outward confidence will boost their motivation in school and achieving success in life.

My favorite order consisted of a middle school boy who wanted to dress like Justin Bieber, a specific style characterized by combinations of ripped skinny jeans and oversized tops. Because I had nothing in my closet that resembled the signature look, I reached out to a friend whose style is like Justin's and asked him for hand-me-downs that were this boy's size. With my friend's generosity and my eagerness to find the perfect items, the middle school boy received multiple items that may be more like Justin Bieber than Justin Bieber himself.

This Christmas, Koats4Kids sponsored over 20 students with gifts from Santa. I offered this service to my school contacts, asking for a list of two to four items that the students would like and their favorite candy and stocking stuffer items. Koats4Kids is proud to have completely filled each request, spending $50-$75 per student. Drones, perfume, Axe products, slippers, Nike sweatshirts, dress up clothes, and video games were among the items donated. Each student also received a large bag of candy, and extra surprises to make their holiday even more special.

As Koats4Kids’ founder and lead volunteer, I reach out to classmates and family members to help balance my nonprofit and other obligations. Each week, I spend between five and fifteen hours responding to emails, organizing orders, collecting donations, shopping, and delivering items. Total hours worked is around 130 hours since starting in September. My next goal is to apply for nonprofit status for Koats4Kids through the state of Missouri.

With my acceptance to Washington University in St. Louis, I will no longer live in Columbia to coordinate and grow Koats4Kids. However, my nonprofit has made too significant of an impact in just eight months to consider it a one-time-only project. I will leave this organization to my mom and younger sister Lily, who will be an 8th grader. She has loved helping me with Koats4Kids and is very passionate about continuing its success.

On December 14, 2017, I was invited by Mr. Alphin, who was thrilled with my progress, to the bi-monthly Columbia Public Schools Outreach Counselor meeting. The counselors that had previously worked with Koats4Kids were so grateful for the work I had done, some even in tears when describing the joyful reactions of students when receiving their new items. The high school counselors, who I planned to reach out to in January after completing my elementary and middle school orders, practically begged for Koats4Kids’ support for their students. The opportunity to meet with the counselors who have dedicated their lives to serving kids was inspiring and humbling. The stories they shared demonstrate that the Koats4Kids’ mission matters to our community and the impact has made life a little easier for many deserving students.

This experience has taught me more than I anticipated. My eyes were opened to the needs of my community and in reaching out to others, they, too, saw the need. I realized that the orders were not just sizes and items; rather, these orders represented real students who were in need of basic necessities, the types of everyday items we too often take for granted.

The joy of giving them what they desperately needed motivated my eagerness to lead Koats4Kids. Time and time again, I was informed that often, students stopped coming to school because they had outgrown their clothes. Providing them with clothing gave them the chance to continue their education and keep them on track for academic success. I am blessed with so much support from the community and am honored to help students in Columbia. Koats4Kids has made me a more empathetic, grateful person.

On top of Koats4Kids, I assisted in running Crossing Middle School events and helped Mr. Alphin coach the Gentry Middle School track and field team. At both events, I practiced the skills to work with young teens and help them grow as people through faith and athletics, which are two areas of life that are very important to me.
Web Design for Pro Lawn in Columbia and Miner Company in Kirksville

Hamza El-Darrat

Everyday I’m at my internship I learn how to solve a problem on the website. At CACC, teacher Patrick Sasser is frequently asked to provide student intern help to create, modify, and update websites. I am interested in website development, but haven’t had enough experience. I was tasked to update the websites for two companies: Pro Lawn, a lawncare company in Columbia, MO, and Miner Company, which makes calliope whistles. A calliope is an air instrument that was created in the 1900s and is used in player pianos, carrousels, ice cream trucks, and rides throughout amusement parks across the country and the world. It was fascinating to learn that a major company that makes these music makers is located in Kirksville, MO! Pro Lawn has an existing website that needs updating: http://www.pro-lawn.net/ The Miner Company has multiple websites that have been created over the years by different web designers. They wanted them combined into one easy-to-find website: http://minercompany.com/ I have learned that there is a much more difficult, yet interesting, process than just copy and paste. I’m using WordPress to do this. Pro Lawn is fairly straightforward to update their website with a fresh look. The Miner Company is a much more difficult process, because I could not find a good theme to fit the website type, and it is a bigger website with more information. I have found it difficult to organize more information without making the website seem bland and overloaded. Depending on the theme that is used, it can come with a built-in page builder or not. If it does not then I have to install a plugin from a third party that allows me to move and insert different things using columns and rows. The plugin I am using is very easy to use. It has a drag and drop system and gives a variety of options to customize, such as how many rows are in one column. Some of the options that are given include allowing me to put a picture in a module, a box that allows information and photos to be put in it, or even text. The page builder I am currently using has a very modern feel to it and is very user friendly. Using a page builder lets me be creative in my placement of information or pictures. This can really make the difference between a good and a not so good website. Also, this placement makes it user friendly such as the placement of a menu or different tabs.

Another skill that I have learned is to take the initiative and solve a problem on my own before asking a teacher. Using web design services online, I’ve found that nine times out of ten I have been able to solve the problem on my own. For example, I had to use Adobe Illustrator to remake a logo for my first client. I have never used Adobe Illustrator before, but instead of asking I went to YouTube, and although I am not an expert in this program, I now know the basics of it because I took the initiative to teach myself. Another important aspect for creating a website is something called Search Engine Optimization (SEO). SEO helps websites be the first or on the top pages of an online search. For example, if I were to search Facebook on Google, the first option that would come up would be the Facebook page because of how strong their SEO is. Of course, this is a plug-in that you have to install and activate on your website. WordPress is the host that I am using to create my websites and they make it very easy to create. I have noticed that it doesn’t take very long to recreate a website when you have all the information to reference. Although you have to be creative and change the look, you

“These types of skills benefit me in the long run and even now. I am not just learning about creating websites but am also gaining valuable life skills that I can use in my future in IT and web design.”
still have all the information to put on the site. I feel that if I had to create a website from scratch where I had to put the information of my company on the website, this would be a much more time-consuming task. These types of skills benefit me in the long run and even now. I am not just learning about creating websites but am also gaining valuable life skills that I can use in my future in IT and web design.

Http://www.pro-lawn.net/
Http://minercompany.com/
From the Jetson’s robot maid, Rosie, to Honda’s Asimo, to Boston Dynamics’ Atlas, I have always been astonished by robots. Throughout middle school, I dreamt of being a creator of a famous robot. So much so, my parents decided to invest in a LEGO Mindstorms EV3, a robotics kit that I would obsess over for the next year because of its ultrasonic sensor resembling eyes and ability to create arms and legs to make it resemble a mini humanoid. When I got to high school, I joined the Army Ants Robotics Team which I would become my favorite activity.

Last April, I came across Dr. Guilherme DeSouza, a professor of Electrical and Computer Engineering with research interests in Robotic Phenotyping, Robotic Assistive Technology, 3D Modeling, and Object Recognition. Dr. DeSouza runs the Vision-Guided and Intelligent Robotics Laboratory (ViGIR), first established at the University of Western Australia in 2003 and moved to the University of Missouri in 2005.

After speaking with Dr. DeSouza regarding internship opportunities, he introduced me to one of his PhD Candidates, Ali Shafiekhani. Since he joined the ViGIR Lab, he has been working on developing a robotics platforms for plant phenotyping in agricultural fields. It was really intriguing seeing how two completely different departments could work together to help one another further their research in a useful way.

The first project I was put on was his Vinobot. This was both an autonomous and remote controlled ground vehicle that allowed for the phenotyping of plants on an individual basis. The prototype of this that Ali had used a JACO2 Robotic Arm on a linear slide that would hold a camera capable of creating a 3D model with a thermal map over it to monitor specific plants. At the time the camera had a hand made wooden handle that the robotic arm would hold. This was holding them back as it was not stable or consistent in the way the arm held the camera. Additionally, the user had to bring the robot back to themselves to switch out the camera with other tools which was incredibly inefficient. I was asked to come up with a solution to this as everyone in that lab were not very proficient in Computer Aided Design (CAD) and were not as good at mechanical things as they were all majoring in Electrical Engineering. Having been on the Army Ants Robotics CAD and Mechanical team for several years really came in handy for this. After researching and finding CAD models of the robot arm, camera, and t-slotted structural system on the Vinobot, I was ready to create a camera holder that would be able to interface more effectively with the arm. While I was relatively proficient in CAD assembly, I definitely learned a lot about creating non-geometric shapes to mold to other objects.

My plan was to create a handle with a shape that matched the cross section of the hand when it was closed for a good grip. In order to keep the handle steady and consistently in the same place I decided to create an extrusion that would fit inside the carved out cross in the grippy part of the hand. However, this would need to be scaled down in order to allow for an easier fit. This caused me the most trouble as the rubber grip was a free form shape. This required me to derive the shape from the grip itself and scale it down. This process was essentially creating a negative mold out of a cube, presenting the issue of cutting down the excess after creating the mold. This took hours upon hours of work just to isolate the small cross section without destroying its shape.

Following this I created a part that would fit right over the t-slotted structural system and have a peg shape that would fit on the inside of the handle. This would allow the arm to set the camera down onto the holder in order to switch tools without human interaction.
The second part to this study was the Vinoculer, a telescoping, rotating platform that had two cameras on either end and a thermal camera in the center. This would rotate above a corn field creating a 3D image with a thermal map overlay to help monitor the growth and health of the crops. The Vinoculer had already been completed by the time I had begun my internship, however, I did get the opportunity to help put it together in the field and get it working.

The next project Ali had me work on was the automation of the classification of wrinkles on soy beans. He was working on a learning AI (artificial intelligence) that would automatically rate the wrinkles to help the Plant Sciences department with their research. The end result would be to place a group of seeds in front of a camera, and a computer would output a wrinkle rating. While I do not have much experience in this level of programming, I got to see the backend of the code which was really interesting. The main way I helped with this project was inputting data for the AI to learn from. We were essentially given sample photos with predetermined ratings by the Plant Sciences department. Then we would select the area the seed was in which would help the AI detect where seeds were. After this, we would give each of them a rating for the system to learn how to rate the wrinkles based on shadows, highlights, hue, and contrast in that area.

Shortly after, Parth Upadhyay, a PhD student joined the ViGIR Lab. Following Ali recommending me to him, Parth asked me to help him create a device that could hold an Xbox Kinect sensor to a piece of t-slotted framing and have the ability to rotate freely and then lock in place.

Once again, I took my CAD skills to create a printable model. I figured out a way to make a three-piece holder that would be attached in two steps. One piece would attach to the bottom stand through the hole and would be the attachment point to the t-slotted framing. It would have two slots following the curve of a circle to allow for rotation. Then two pieces would attach the sides of the main part of the sensor to lock it all into place.

One thing I learned from this project was how important it is to have a clear design specification from the start to avoid unnecessary rework of designs. I had to go through several redesigns as Parth did not come with a clear understanding of what Dr. DeSouza desired in the final product. This really taught me how to communicate more effectively and how to ask for more information to create a successful product.

While I was expecting to be given lots of busy work and maybe learn a thing or two throughout this internship, I was given quite a bit of freedom on some of the projects and just trusted to do them. While I did not get a chance to learn much in Electrical Engineering, my background in mechanical design from robotics made me an asset to the lab and helped me practice and improve my CAD and overall design skills.

The exposure to this intradepartmental research has also really opened up my mind to the vast number of applications of Electrical Engineering and Computer Science as well as every other engineering area.
I have always known I wanted to work in a STEM field. My sophomore year, my Honors Biology class assigned me to write a paper on an aspect of biotechnology and I found my interest in prosthetics. Mid-MO O&P was founded in 2000 by Certified Prosthetist Tracy Ell and Certified Orthotist Shawn Bright to serve the needs of people with limb loss and amputations and those needing orthotic bracing and supports. Both doctors were kind enough to open their doors to me so I could explore whether this is a good career choice. When I worked with them I got to not only meet the patients they serve, but to analyze the journey a prosthetic takes to get from nuts and bolts to the end user. I was able to get to know patients and help with solutions to problems occurring with their devices.

Most amputees don't come from trauma. The majority are birth defects or limb loss to infection from addiction, diabetes, or cancer. Most people are unilateral amputees meaning they only have one limb missing. Most amputees say their goal is to get back to their “normal” lives. One patient left a lasting mark on me and my outlook on the prosthetics field. She is a 9-year-old trilateral amputee. She is a bilateral above the elbow and a below the knee. She only uses a prosthetic for her leg and has trained herself to do everything with her residual limbs on her arms. This little girl was so strong and remarkable. She completes in the Disabled Athlete Sports Association (DASA) track team.

For every patient I saw, I would ask them to tell me what they wished to see in the prosthetics industry going to the future. This girl’s mom said something that really struck me, “I want the kids to be able to get the cool moving stuff. She always wants the functioning ones.” There are a lot of children with amputations that do not have access to the proper tools they need let alone things that adults are able to use. Because of this, I have decided to have a focus on pediatric prosthetics because they need new technology too.

When I started my internship, I didn't think I was going to be able to do a lot of hands on work considering that many of the prosthetics cost $1000-$100,000. I was wrong. My first day, I was allowed to put together a patient's new prosthetic. My second day, I helped to try and fix a woman’s fully functional elbow and hand, costing upwards $100,000. The various ways Dr. Ell got me involved with the work he did is the reason I loved this internship so much. When amputees go to Dr. Ell for a prosthetic, there is a process to go through. It includes measurements, casting, socket testing, and prosthetic adjustments. While I was not allowed to make sockets because it was such a complex task, I did get to cast someone. Similar to what the doctors do when you break a bone, casting must be done to get the precise shape of the patient’s residual limb in order to make the socket fit better. I have never broken a bone so I didn’t know what to expect. It was not only challenging, but rewarding after I successfully casted a patient. In every way imaginable, my internship has aided me in my future with life skills in general.

I would like to thank everyone at the Mid-MO O&P office for making this a possibility for me. Tracey, Shawn, and Drew I could not have asked for better practitioners to work with and learn from. Everyone in the office who helped and answered my endless questions making me more knowledgeable and assured of my future career interest: I’ve decided to pursue biomedical engineering and build fully functioning prosthetics—specifically for children.
Over the course of this semester and continuing into next semester, I have had the opportunity to shadow Dr. Karen Edison in the Department of Dermatology at the University of Missouri. During my internship, I have observed numerous different aspects of Dermatology. I have shadowed clinics, patient consultations, and hospital rounds. I have also learned about and observed Mohs surgery. Mohs micrographic surgery is considered the most effective technique for treating many basal cell carcinomas (BCCs) and squamous cell carcinomas (SCCs), the two most common types of skin cancer. During Mohs surgery, thin layers of cancer-containing skin are progressively removed and examined until only cancer-free tissue remains. The procedure is done in stages, including lab work, while the patient waits. I have also learned in the dermatology lab how samples from patients are proceed and read to determined diagnoses.

Not only have I had the chance to observe, I have also had the chance to play a role in telehealth ECHO meetings, a Skype-like service where medical professionals can communicate with in rural areas. I also attended a nutrition and obesity conference, and various other meetings with doctors specialized in dermatology and ethics. I have learned an incredible amount about the science behind dermatology. I have also learned what it takes for doctors to have a successful and professional relationship with their patients.

Another thing I have learned, that I was not expecting, was how much doctors depend on one another. While I was in clinic, doctors would constantly communicate, text, or even look up questions, concerns, and best practices on the Internet. They frequently double checked their diagnoses with other doctors. Their ability to work collectively and be confident they had the best treatment plan for patients was inspiring. I was honored to be a part of this process. Based on my internship I feel that the only way to truly learn about these process and dynamics between science, patient care, and doctor’s methods is to have an opportunity to observe it in action directly. I have taken many science courses in high school, but this experience has been by far the most educational. I was incredibly fortunate to intern Dr. Edison who is completely driven to intern Dr. Edison who is completely driven to make this experience focused on exactly what I wanted to accomplish and learn. Our regular meetings have helped me reflect on my experience and move forward with new ideas for opportunities based on my interest.

Next semester I am looking forward to participating in more meetings as well as case studies. Case studies are meetings that happens every Thursday between a group of doctors at the university that want to share and discuss cases they need input on or want to use as learning devices for other doctors. I am also excited to shadow a cosmetic dermatologist in clinic as this is one of my main interests in dermatology.

I am so thankful I did this internship; it has reassured me in my career interests as well as set me up with useful connections that set me apart and I can use going forward in my educational journey.

“While I was in clinic, doctors would constantly communicate, text, or even look up questions, concerns, and best practices on the Internet. They frequently double checked their diagnoses with other doctors. Their ability to work collectively and be confident they had the best treatment plan for patients was inspiring.”
My internship was set up around a program I was already interested in coming into the school year. Last fall my family and I were having dinner with some of our friends, one of whom is a firefighter for the Columbia Fire Department (CFD). He asked me if I might be interested in firefighting. He told me about Columbia Fire Department’s Explorer program, which is run by a group of firefighters for kids age 14 to 21. We meet once a month for most of a day, which totaled up to match the hours I needed for the internship. We have access to the CFD training facility so we have the opportunity to do all kinds of cool things that the firefighters help set up and organize.

It's designed to push students out of their comfort zone, mostly through exercises and training. If you aren't used to heights, your heart might just beat a little faster when you clip the carabiner into your harness and lower yourself out of a fifth story window, which you see me doing in the picture. We've done trainings designed to familiarize ourselves with confined spaces by suiting up in full bunker gear, and putting on a blindfold and an SCBA, (self-contained breathing apparatus, just like SCUBA but not designed to be used Underwater). Then we crawled through pipes in the dark building.

In the Explorer program, I've operated a ladder truck both from the ground and in the bucket which can reach up to eight building stories. I've practiced forced entry into a burning building, tracked the suit of a simulated downed fireman, and went in to rescue. I've learned the procedure for water rescue on lakes and rivers, set up mechanical advantage lift systems for high angle rescue, and tied commonly used knots. Each training that I've gone to has taught me more about being a firefighter and at the end of each training I've been more interested than I was before.

After my first couple trainings, it was time to pick classes for my senior year, so I enrolled in the Emergency Medical Technician (EMT) course at the Columbia Area Career Center to train me for my National Registry test. I've already begun my Clinical ride nights for that test, and been able to interact with several different patients which has given me insight into the medical portion of this field. Right now I’m set up to work as a firefighter and already have my EMT license. Medical skills are just as important for firefighters as actual firefighting, because 60% of the calls the CFD runs are medical, not fire. This internship and the EMT program are setting me up to be successful as a firefighter applicant.
For two semesters during the school year of 2017-2018, I was granted the opportunity to work with Mrs. Ben-Ayed and Mrs. Donna Hoffman and in aiding and mentoring English Language Learners (ELL) at Rock Bridge High School. Every fourth block on A days, I meet with about ten students. Several are from Mexico, two are from China, and the rest are from Korea, Vietnam, and Africa. I speak several languages including Farsi, French, and English.

I have always had an interest in education, as my family had emphasized its importance long before I even began school. I have been inspired by many teachers and staff who have taught me to be kind, understanding, patient, and flexible, all while continuing to be assertive. I believe that teachers and peers at school have major impacts on the behavioral and educational outcomes of every student; it is important that students are surrounded by individuals that will influence them in a way that prepares them to face the realities and responsibilities of becoming an adult.

I also wanted to help reach out to the English Language Learning students at Rock Bridge, as I know how it feels to be exposed to a completely different world with an unfamiliar language. Despite being born in Missouri, I was raised in Iran for eight years, where Farsi became my first language. When we moved back to America, I was worried that I would fail to learn the English language. With the assistance and support of my fifth grade teacher, I managed to learn fluent English in two years.

During this period, I absorbed many teaching and learning techniques that had personally helped me learn a completely new language. I felt that through this internship, I could help spread these tips and tricks, and help others become fluent in English also.

While working with Mrs. Ben-Ayed, I realized that adaption and preparation was a keystone to being a helpful tutor. I had to be prepared for any potential questions, which made it a fun challenge at the end of the day. I helped students understand assignments, work on homework, and practice presentations. I became known as the “Math Expert” as I frequently helped students complete math and physics assignments. Those subjects have always been a personal favorite of mine, which made it a very enjoyable experience when trying to encourage students to appreciate math and science the way I do. I would often recognize learning patterns between different students, and adapt my teaching style in a way that would benefit them. For some students, I would use analogies to explain a mathematical concept, which made it difficult to forget. Other times, I would use imagery to help them analyze problems with visualization.

I also helped them complete their Civics assignments, which were still fresh in my mind from taking that class last year. I remembered what teachers were looking for in terms of thesis, evidence, analysis, and general writing style. In between this I would give small lessons on history either from my own experience, or from what I was learning in AP World History. There were several occasions where I realized I was significantly helping students to understand and complete assignments. I would teach students different writing tips and tricks that I learned when trying to gain some inferences about the English language.

Despite helping the students academically, I learned to use our cultural differences as a way to connect. The students would often teach me different words in their first languages, where I would use those words to communicate for a better sense of connection and understanding. Mrs. Ben-Ayed taught me this way of connecting, as she knows multiple languages and uses this to comfort students who are new to this country. “Muy Bien!” “Very good!”

During my internship, I got firsthand experience when working with students who taught me how to better explain different subjects, improved my social skills, gave insight on the field of education, and even taught me how to better connect with students. I’m grateful to Mrs. Ben-Ayed and her assistant, Mrs. Donna Hoffman for allowing me to work with their students.
Much of what interests me about the field of journalism is the fact that it is ever changing. The media is constantly growing as it tries to work with the internet, and, as a result, this has led to some very interesting new companies online. One of these websites is newsy.com, a news website based originally out of Columbia that is known for taking larger stories and compressing them into quick, entertaining videos. They are quickly changing how news is being digested which is why I was extremely excited to intern for them over the summer of 2017.

I shadowed Digital Content Producer Tori Partridge who edits videos and creates animations for Newsy. Just watching her work was incredible because I had never seen a professional editor create content before. I had been editing videos for bearingnews.org for three years, but I was completely blown away at the speed at which it took her to create a video. This really opened me up to new ideas about how I should handle workflow. I quickly began to realize all of the mistakes I had been making, but thanks to Tori and her team’s great support, I quickly got an understanding of how video producing works at the professional level.

On Mondays through Thursdays I would go in for two to three hours to work with Tori and be given new tasks. At first, this included things like editing a short news clip in with a title screen or making sure photos had proper attributions, but as I got a better understanding of how their software (Final Cut Pro) worked, I was soon given larger tasks. This included editing together entire rough drafts for online content and also working with their website template so that I could learn about and help cover breaking news from around the globe.

Maybe my favorite part of this entire process was the animation stage. For the second half of the summer, Tori and members of her team helped teach me the basics of Apple Motion, an animation software that Newsy uses to create graphics and recreations of scenes. This was incredibly daunting to me at first as I had never animated before and felt rather confused by the program. Thankfully, Tori took time to explain the intricacies of the software which helped me to create really cool animations explaining things such as robots working as journalists. For me, learning new programs like Motion would be totally impossible (or at the least extremely slow) without someone to help me as I dived in for the first time. I deeply appreciate the time Tori took and invested in me to actually make me into a video producer.

Of course Tori wasn’t the only person that I worked with. The entire team at Newsy helped me in multiple ways by helping to teach me new tricks in Final Cut or even just coming up and commenting on what they liked or would tweak to improve my work. It was a very organic community that was very easygoing and comfortable, which helped my learning even more. Most of the employees at Newsy are newly graduated from college, so they’re within five years of my age. This made it easy to have conversations outside of just video editing. For example, Tori and I spent a lot of time talking about our favorite Marvel movies which eventually lead to her helping me edit an entire video feature on box office sales for superhero movies. It was this kind of free spirit attitude that allowed my time there to be more than just an internship; I looked forward to going to work their each day.

The entire experience has paid off in more ways than I can count, but it has been especially helpful for the school’s news website www.bearingnews.org. Our online content has gotten much better this year as I have been able to take what I learned about video editing at Newsy and apply it to all of our videos. Working at Newsy in particular also opened up a door that I could have never expected. At the end of my internship hours, I was asked to continue working with them as a paid video editing assistant. Being able to continue learning and working at the highest levels of my favorite field is a dream come true that I never thought possible.
This past year I was delighted to intern with the doctors and associates of Cherry Hill Dental and attend their program of dental assisting. With dental careers common in my family, I’ve spent my entire life immersed in the ins and outs of how to give patients a healthy smile they can be confident showing off. However, hearing and doing aren’t the same. I quickly realized how much I needed to learn. Compared to the medical field, dentistry is so new because humans are just recently starting to outlast their teeth. That has left dentists with the job of helping patients keep their natural smile through preventive care and treating with restorative when wear and tear or neglect has done its damage.

Preventive dentistry occurs in a “hygiene room.” I learned how to complete visits for new and returning patients. I gained experience for addressing the health and cosmetic goals of patients with the doctors to find the optimal treatment plan, making notes, charting, taking radiographs, making impressions with alginate, polishing, applying fluoride varnish and sealants. Sealants are non-invasive fillings of grooves in the biting surface of teeth to avoid decay.

The mark of a “restorative room” is that it has a more surgical set up. It is more difficult to learn; depending on the appointment, there are a multitude of things to have set out and a long order of operations to follow. Nothing we can put in the mouth is as good as what was there before, so everything needs to be executed to perfection to make restorations last as long as possible. A simple but large piece of this is keeping everything dry. A dry tooth surface ensures a stronger bond. It can be achieved through proper methods like the insertion of triangular pieces that block salivary glands, cotton rolls, the blocking of the tongue, proper use of a high volume suction, and placing of a dental dam.

I also trained in the sterilization center and laboratory. Sterilization starts when instruments are brought to the red zone and finishes in the blue zone. The process starts by sorting the instruments by infection level. They are then put through an ultrasonic shaker to remove debris, packaged into sets and placed into the autoclave before being moved back into the sterile cabinet. Rooms must be disinfected using tuberculocidal cleaners after all trash and debris has been removed.

In the lab I learned how to complete tasks like making bleach trays, retainers, and milling crowns. To make bleach trays, I made a cast from impressions. Once hardened, it was ground to have a flat base so it could rest evenly. I then placed it into a machine that uses high pressure to push plastic down over it. Once I removed the stone from the shaped plastic I cut the tray and packaged it to go for the patient. To mill crowns, I placed a block of material into a Cerec milling unit and paired it with the computer the doctor used to design it. Once made, I cleaned it with a high power steamer to start preparing it for cementing in the treatment room.

It was great learning experience in each section, but in all of them I took away one constant.

At Cherry Hill Dental nothing is more important than caring for each patient and treating them like you would your own family.
From broken arms to sprained ankles, I’ve been hurt many times playing sports. Muscle pulls and dia-phragm spasms have often left me wondering how the body heals. I’m planning a career in medicine, and Scott Graham at PEAK Performance and Spine gave me just what I so happened to be looking for: a way to grow my knowledge of human anatomy, learn how to help others heal their injuries, and to thoughtfully prevent my own.

I started my internship learning the basics of how the body operates, and this would usually lead me to spend hours doing research on common ailments that physical therapy patients have. I began to learn that the job of a Physical Therapist would be to make the healing process go better after a surgery or a major injury, and not when they get hurt. They operate as the middleman while at the same time providing a great deal of palliative care in the process.

Making patients feel comfortable is paramount. I would even go as far to recommend anyone that has a thought of doing anything to do with people care to go shadow a physical therapist to develop these people skills. An example is making sure the patients have comfortable pillows to their liking at their station. Typically at a moment of discomfort they make sure that they guide the patient in a way to cause as little pain as possible. I learned a great deal from this myself when it comes to taking care of my own siblings to make sure they ice and foam roll their joints after athletic events.

While working there I also learned how to operate many of the machines that they have, including Electric Stimulation devices that help repair muscles faster via electrical impulses that are delivered to the injured site. In addition, I also learned how to operate a muscular strength calculator, which is used to help find a starting point in the therapy regiment. In this, the patient exerts a certain amount of force at certain positions set up by the machine to test muscular strength after certain procedures like ligament reformation, or spinal surgeries. The device helps a lot when the physical therapist doesn’t quite know how the patient will heal after the surgery.

Along with the heavy machine operating like the Electric Stimulation devices and the Muscular Strength Calculators, the simple things like main-
have spent the past several months of my life deeply involved in the local music scene here in Columbia, Missouri. I play regularly with two different groups: a psychedelic alt-rock group of my own creation called Crooked Fix, and a neo-soul hip-hop group named after its lead singer, Sifa. Between these two bands I sing and play two different instruments, as well as regularly performing, recording, and writing original music for a huge variety of people and groups. On February 9, Sifa played an early-morning set for the kids at New Haven Elementary School, only to turn around that next month and play before documentaries at Columbia’s own True/False Film Festival, where we had been asked to entertain audiences between movies.

These are just several of a multitude of performances: we have performed at Cafe Berlin, the Rocheport General Store and the Mission in Jeff City and have plans to continue performing on a weekly basis for the next couple months. We are also in the process of planning a Midwest summer tour, in which we plan to play in St. Louis, Kansas City, Chicago, Nashville, Minneapolis, and countless other cities across the country. Sifa has been playing together for a couple years, but I just recently joined, and have been learning a lot in the past couple months about booking shows, organizing tours, interacting with different musicians and people, and playing different genres of music. Sifa is in the process of writing new material and plans to release new music in the near future: I have spent countless hours locked in a basement with a computer, microphone, and guitar, writing and recording original tracks with bandmates.

This has not only led to a deeper understanding of how computers and recording software works and how the songwriting process occurs, but it also has improved my playing dramatically by forcing me to listen to what I’ve created and correct my mistakes.

Sifa is not the only musical endeavor I am part of that is attempting to create original music. My personal project, Crooked Fix, is also in the process of recording an EP, an album, and organizing a summer tour of our own. Crooked Fix has also given me huge insight into the creation of music, both digitally and sonically. My friend and bandmate Mickey Jamieson, who also did an EEE Internship his senior year in music, now studies music at Berklee College of Music in Boston and is gaining vast quantities knowledge that he brings back with him when he visits Columbia to play with us: through him, I’ve acquired valuable insight into the process of recording, mixing, writing, and performing.

CONTINUED ON PAGE 34
I am definitely interested in medicine, but am unsure of what kind or whether clinical or research, or both. First semester I completed almost twenty hours of shadowing at the Missouri Orthopedic Institute (MOI) and University Hospital. I spent ten hours of that time with Dr. Hoernschemeyer and his team at MOI. I observed him and his residents meeting with patients and checking their injuries and conditions. He also showed and explained X-rays of patients, what is wrong with them, and what he will do to fix their issues. The remaining ten hours were spent in the Nuclear Medicine department at University Hospital. There, I spent that time observing and learning about the tests they conduct and how they help the patients. I helped them prepare the waiting rooms and conference rooms for patients before they arrived. My shadowing experiences were very beneficial because I was exposed to both the outpatient clinic setting and inpatient hospital setting of multiple careers. I am very interested in Nuclear Medicine as a major and career path because of this experience.

At the end of October, I was welcomed as an intern with the Baker Chemistry Research Group at the University of Missouri, led by Professor Gary Baker Ph.D. Professor Baker focuses his research on “green” chemistry. The research group also conducts other research that could be beneficial to the health industry. Both focal points of the research made me very excited to join them and assist with the great work they are doing. Professor Baker set me up to work with one of his graduate students, Laxmi. I quickly got to work on a research project that she was just beginning. We were tasked to repeat an experiment in which aminoclays were used to stabilize and suspend Cu2+ in a solution. Being able to do this would have important implications for medicine, especially with respect to cancer detection and treatment. This is because Cu2+ has great photoacoustic properties and is also used by cancer cells at a higher rate than other cells. In other words, by giving
a patient medicine that has this stabilized Cu²⁺, the medicine will concentrate inside tumors. The tumors can then be detected by specialized medical equipment that picks up faint sounds that are emitted by the Cu²⁺ when it is hit by low-frequency light waves. This will allow very early detection of tumors and discovery of tumors that are hard to find with other detection methods. We attempted the experiment dozens of times, but we could never replicate the results of the paper that was our example. We tried to alter the experiment slightly but that failed as well. After many failed tests of the results of the experiment, we concluded that we could not replicate the experiment with the materials that we had. Even though the experiment was a failure, it was very enjoyable to be able to work in the lab and conduct experiments that could have a real impact on the world.

Laxmi and I moved on to working on another project which used the speed of sound traveling through various liquids could estimate how much contamination is in the liquid. To do this we placed liquids like gasoline, milk, diesel, and olive oil into a small basin which has a microphone on one side and a gold plate on the other. The gold side is hit with a laser which creates a faint sound wave that travels through the liquid to the microphone which interprets the sound and displays it on the monitor. We did countless trials and tracked the differences between different brands of gasoline and milk that claimed to have the same ingredients. Instead, we noticed minor differences which indicate that something was different between the brands of gasoline. We could also detect how much water was added to a given sample of milk by using pure milk as a control and comparing it to milk from a company.

The last project I worked on involved the stabilization of silver nanoparticles in a solution. Silver nanoparticles are known to be highly toxic to bacteria. While silver nanoparticles have already been made and stabilized, we attempted different ways to make and stabilize silver nanoparticles that are less expensive than current methods. We just recently completed the experiment successfully by mixing silver deep eutectic solvent and oleylamine to cap the silver nanoparticles that form when the solution is heated. The results of this experiment were very promising and I hope this will help lead to a cost-effective and easy way to stabilize these nanoparticles to be approved and used as a medicine.

It was an amazing experience to be able to work in a real lab with chemicals galore. I did more “chemistry” in one session with Laxmi than I did all year in chemistry class. I enjoyed talking to the other members of the research group and working as a team with them. I gained a lot of lab experience and it has peaked my interest into doing research in the future. I have learned firsthand that research is like a whole mine of failure with only few gems of success. The silver nanoparticles project was my first real success while I was there with Laxmi. It was rewarding to work through the failure and persisting until we found something that worked. I’m grateful to all of my hosts for this amazing experience. I have a lot to think about when I attend UMKC Six-Year Medical Program in the fall.

“I HAVE LEARNED FIRSTHAND THAT RESEARCH IS LIKE A WHOLE MINE OF FAILURE WITH ONLY FEW GEMS OF SUCCESS.”
In the summer before my senior year I had the privilege of shadowing Dr. Daniel Hoernschemeyer, a pediatric orthopedic surgeon at the University of Missouri. I have always had an interest in pursuing a career in medicine, specifically surgery, but I was unsure of which specialty. Dr. H. splits his clinical time between a small clinic on Keene Street by The Women’s and Children’s Hospital and the Missouri Orthopedic Institute by the University Hospital. Dr. H. treats a variety of orthopedic conditions including fractures, as well as genetic conditions such as hip dysplasia, scoliosis, kyphosis, and dwarfism. Dr. H. is in clinic on Mondays and Thursdays and operates Tuesday, Wednesday, and Friday as necessary. Working for the university, Dr. H is accompanied by his nurse practitioner Nicole Buckler and several residents.

Clinical days are very busy for Dr. H, seeing up to 30 patients between 8 a.m. and 5 p.m. I learned quickly on my first day that there is always something going on behind the scenes. When a patient is sitting in an exam room waiting to be seen by the primary physician, it may seem as though the doctors are just standing around.

In reality, Dr. H. was always speaking with a patient or examining an X-ray/CT/MRI. We were always on the move between exam rooms and the X-Ray monitors. Each patient
had a unique conversation with Dr. H. regarding their
particular case. Some discussions would be a short chat and
check-up, while others would be significantly more in-depth
if, for example, a surgery was in the near future. Dr. Ryan
Schell, a resident of Dr. H. mentioned that a unique aspect
of pediatrics is the need to connect with both the patient,
who is typically very young, and the parents, who must be
informed and reassured. Dr. H. is remarkable at creating
discussion that caters to both the parents and their children,
putting complex information into terminology that both
parties can understand.

Dr. Hoernschemeyer’s practice covers a significantly wide
breadth of conditions. He treats fractures throughout the
body, removes malignant and benign bone tumors, treats
scoliosis and kyphosis, corrects clubfoot, hip dysplasia, and
leg length discrepancies, and many other conditions. As a
result, his clinic’s record keeping is strenuous and
detailed. Dr. H. or one of his residents creates a
dictation of every single patient every time they’re
seen in the clinic. Dr. H. says that these dictations
help him to see the bigger picture. Bone development
is a slow process, so keeping track of progress in condi-
tions like scoliosis or hip dysplasia over several years
requires detailed records. With modern day comput-
ers, retrieving past x-rays is
a snap, and physical x-ray
copies are a thing of the past.

Interestingly, one pa-
tient from a rural hospital
brought physical x-ray
copies to the clinic for their
first appointment with Dr.
H. We had to hold the cop-
ies to the ceiling lights because the light boards had been re-
moved from the walls years ago when they became obsolete.

Another clerical responsibility of Dr. H. is to aid patients in
making insurance claims. Dr. H. is part of a small group of
surgeons around the USA and a select few other countries
helping to pioneer new treatments for pediatric scoliosis
through a procedure known as Vertebral Body Tethering,
or VBT for short. VBT is a new surgery, currently in stage
III of FDA trials, so it has not achieved FDA approval yet.

While the surgery has demonstrated itself to be safe and
extremely effective, Dr. H. often finds himself corroborat-
ing the procedure to agencies who would otherwise deny a
claim for the surgery. He says that this hesitance in approval
stems from the youth of the surgery recipients and the fact
that the procedure is still in FDA trials. Insurance compa-
nies are much more likely to approve an older more estab-
lished procedure over a newer one, even if it is not the most
effective treatment. With procedure cost reaching several
hundred thousand dollars, insurance approval is an absolute
must.

Treating so many complications requires an incredible
amount of knowledge and treatment plans. Yet despite the
constant advancement in medical technology, Dr. H. says
that the most powerful treatment he can hope for is patient
compliance. Often times, Dr. H may prescribe a non-surgi-
cal treatment like a brace for
conditions such as scoliosis.
Many studies have shown the
effectiveness of bracing in
the management of scoliosis,
but he says that, oftentimes,
given that it is uncomfortable,
patients don’t actually wear
the brace half as much as they
need to.

Similarly, Dr. H. regularly
writes for physical therapy to
help a patient regain mobility
after a procedure, but some-
times the patient never attends
the therapy or stretches the
muscles that need to be relaxed
after an invasive operation. He
commented that it is frustr-
tating when a patient is not
willing to do what is necessary
to help themselves, and they
often set back their own prog-
ress by weeks if not months; in
cases like scoliosis, a patient’s
noncompliance may lead to
surgery or permanent disfigurement.

My shadowing experience with Dr. Hoernschemeyer
made for an unforgettable summer. This opportunity not
only confirmed my existing love for medicine, but also
introduced me to new parts of health care that I was unfa-
familiar with. I enjoyed the valuable patient interactions I got
to be a part of, as well as the detective work in X-ray eval-
uation. It was fascinating to get a behind-the-scenes look at
such a busy clinic with an incredible team of physicians.
O

ver the past few years, I’ve witnessed my mother, a

family physician at the University of Missouri, travel-

e the world setting up medical support clinics in
countries lacking medical structure. Upon returning from
every trip, I’d watch as my mother recalled tales of help,
love and fulfillment. After finishing my junior year at RBHS
I was presented the opportunity to travel with my mother
and a group of five other doctors, nurses and other medical
professionals.

Less than five days after school ended, my mother and
I departed from Lambert International airport upon a 35-
hour journey to Addis Ababa, Ethiopia with four suitcases
filled to the brim with toys, medication and clothes (each
weighing 50 lbs.). I found myself contemplating the reality
of this developing country. What will cities be like? People?
Medicine? Government, police, stores, etc. My curiosity ran
wild as I attempted to speculate the actuality of the concept
of culture shock.

When we finally arrived in Addis Ababa, a guide met us
and took us to a van to a hotel downtown. The journey from
the airport to the hotel can be cited, without a doubt, as
the most harrowing experience I’d ever been through. The
definition of culture shock pales upon the actuality of the
experience. I witnessed poverty, overpopulation, and pollu-
tion unlike anything I’d ever seen. Houses of deconstructed
tin and barbed wire littered the city with incomplete and
exposed infrastructure everywhere. People openly begged
in the streets searching for scraps to eat. This experience
would haunt me for months to come.

The following morning my mother and I met with the
rest of the group, originating from Billings, Montana, upon
where we embarked on a five hour “bus” ride to a smaller
city in the Ethiopian countryside named Ambo. In this
equally rundown city, we were driven directly into a gat-
ed and barbed wire lined hotel in which we were strictly
instructed to not leave. With our malaria medication and
our bottled water, we would stay here for the next week and
a half.

Each morning our group met in the lobby, had a com-
munal breakfast and travelled an additional 30 minutes to
a small village named Gouder at which there was a small
orphanage that would be the focus of our visit. We were
greeted by approximately 30 young and older orphans with
such love and appreciation that many individuals from
our group were moved to tears. Here, we would meet and
befriend kids from 3 years old to 18. These children were
among the sweetest and most affectionate young individuals
I ever had the pleasure of encountering. Medical attention
for these young kids was scarce and routine checkups where
nonexistent. Furthermore, there were no medical files for
these kids.

The first few days the group worked towards organizing

a makeshift clinic of which we would chart age, height,
weight, blood pressure, heart rate and any known preexist-
ing conditions. Given my scarce medical knowledge, I was
tasked with menial but meaningful activities. The first of
which was organization.

One memorable physician I became acquainted with
the brilliant, loving, and knowledgeable Neurologist, Dr.
Arturo Echeverri. As one of the founders of the charity that
sponsors this orphanage I learned an incredible amount of
philanthropy and modesty from him . Although I interned
closely under my own mother, I found myself gravitating
towards the knowledge and confidence of this particular
doctor.

For the first days, I was tasked with getting to know and
teaching the kids English. Through books, games and other
various activities I quickly befriends the majority of the
kids and attempted to show them basic hygienic functions,
such as proper hand washing and teeth brushing, as well as
some basic communicative forms of English.

On the fourth or fifth day, the clinic was as complete as
possible and our evaluations began. From then on, I assisted
my mother in taking height and weight. Here, I began feel-
ing the importance of what we were doing as trivial person-
al procedures such as height and weight were unknown to
these kids.

The following day, my mother instructed me through
taking blood pressure by measuring and listening for heart
rate and systolic over diastolic pressure blood pressure.
There I sat taking blood pressure, learning proper “patient
care” (as proper as patient care in a school yard could be)
and other various medical terms. Upon measuring every
attendants BP and height and weight, our group moved on
to organizing medicine and treating existing conditions.

On approximately the sixth day, my mother and I sepa-
arated in tasks as she focused treatment on a 14-year-old
boy with late staged HIV, named Obasa. He had received
no medication and had Kaposi’s Sarcoma sores all over
his body. I washed his arms, legs, and chest (with obvious
safety precautions) with sterilizing ointment as fungal infec-
tions grew rampant upon his skin. After helping the basic
wrapping and cleaning, I found myself in a serious discus-
sion of how to help this poor young man has his disease
progressed.

The remainder of my time in Gouder was spent organiz-
ing and playing with the younger kids. Through games and limited English, I formed connections with these kids like nothing I had ever experienced. I learned their names, life stories, and relationships to other children in the orphanage. Aside from general first aid, I was taught some of the most important lessons of my life. I saw young kids who had lost their families to poverty, war, or disease take daily joy from the smallest things such as making a gift out of leaves. I felt the love the children showed one another and the gratitude they showed to the medical workers. These kids, who made do with so little, showed me the value of modesty and human connection over material want. Not a day goes by that I don’t think of them.
INTERNING WITH JAN LEE AT COLUMBIA PERFORMING ARTS CENTRE
CHLOE GREENE

As a kid, I spent many hours each week practicing and performing at Columbia Performing Arts Center (CPAC). http://cpac-dance.com/ In 2012, I decided to leave the studio that year and, until recently, I hadn't been back. This internship gave me the opportunity to reach out to a former teacher who had shown me love, kindness, and a passion for her work.

I am incredibly grateful to Jen Lee for letting one of her former dance students return to take a behind-the-scenes look at competition dance. Over the period of several weeks I ran behind her, attempting to keep up. Jen has taught me that being a Competitive Dance Director is more than the fun and games of picking costumes and dancing to the beat.

During my first night with Jen, we worked with approximately five different competitive teams. We would spend 45 minutes to an hour with them rehearsing and fixing their counts. We began each session in one of the studios and then later moved onto the stage for a few quick run-throughs of the dance. The first competitive group was the largest, from there the groups continually slimmed down until we reached the end of the night, during which we were working with a single competitive dancer on her solo. My job throughout these nights was to take notes and write down suggestions for where things needed to be cleaned up a bit more. It was a constant pace from studio to stage for competition rehearsals from the moment we arrived until we left for the night. As we came closer to performances our time at the stage altered. We were no longer on stage for the sole benefit of rehearsing, but instead Jen and I were now recording the dances and discussing lighting and backdrops on video for the technical team.

While most of my time with Jen was spent working relentlessly on performance pieces, there were several nights in which we spent packing the Dancers for the upcoming weekend competitions or completing the necessary paperwork for them. Before a weekend's Nationals performance, Jen and I came into the office to prep for two CPAC dancers who had won Nationals earlier in the year. That night I had to download their music to a hard drive and assure it was packed away safely where they could find it. Without the files on hand during the performance, they would have been unable to perform. This has happened before and is awful.

Jen frequently said that we had to anticipate any and all possible problems and make sure they didn't occur. After the music was secured, we stuffed two suitcases full of first aid necessities, tights, hair ties, socks, stereos, and the like. Once we had everything they could possibly need to be packed, the rest of the evening was spent completing paperwork and responding to emails about upcoming performances, costumes, and rehearsal schedules.

In the last few days during my time with Jen, I had the opportunity to have some hands-on experience with the choreography process. While most pieces are put together earlier in the semester and performed throughout the rest of
the year, there was one specific piece that was withheld until right before winter break. Andrew Winghart, an esteemed local choreographer, had been gone for several months prior, choreographing for artist Lorde’s tour. When he returned, he came to CPAC where he spent seven hours straight choreographing for us. After 30 minutes, Winghart had made cuts, allowing 30 of the dancers to remain. Immediately after, the group began learning the choreography he had planned. They started off learning the routine the whole way through, watching and repeating Winghart as he walked them through step by step.

After they had learned the moves, Winghart walked them through each formation and transition. This is the part in which the piece finally begins to come together as the dance moves are put to a count and one can begin to see how the dancers will interact throughout the piece. At approximately 6 o’clock, the group was allowed their first and only 15-minute break. During this time, Winghart, Jen, and I met with the costume shop designers to discuss what the costumes for the piece were going to look like. This encompassed what the dimensions, color, and style were going to be. Winghart’s piece was choreographed to the song Ultralight Beam by Kanye West and falls into the ‘Specialty’ genre. This means the performance piece does not directly fall into any specific genre alone but rather encompasses every genre. The group’s age ranged from 13 up to 18, with an average age of 15, which lands them in the teen category for competitions.

The group was also co-ed, with 5 boys and 25 girls, and fell into the larger group categories with their size of 30. This piece will be performed every other weekend beginning on the last weekend of January until May.

As Winghart worked with the dancers, Jen and I worked to take notes on his piece, record the choreography process, and begin the registering process for competitions. This would come in handy the following day when Winghart had left and the group came in for a brief practice before the break. That following day we worked on cleaning the first half of the piece with the performers. Making sure that the counts were as agreed upon and that everyone was on the same page for both counts and movements. After the break, the group will have three weeks to practice and clean up their dance before their first performance.

Overall, I’m excited to see where this piece goes. While I’m unable to travel with the group to competitions, I hope I am able to return next semester to see them through their final practices and Spring Showcase. When I was younger, I was never a part of the competition process. I had only attended classes that were followed by an end-of-the-year performance. So being a part of the competition world this semester has been an amazing opportunity.

“While I’m unable to travel with the group to competitions, I hope I am able to return next semester to see them through their final practices and Spring Showcase. When I was younger, I was never a part of the competition process. I had only attended classes that were followed by an end-of-the-year performance. So being a part of the competition world this semester has been an amazing opportunity.”

This experience has motivated me to look beyond what I’ve always thought my future should be and focus more on what it could be. Dance has always been a passion of mine and I now regret ever straying from it. I plan to spend more time in the studio next semester and see what dance has in store for me.
Throughout high school, I have always thought I would go into business. Whether it was management, advertising, or public relations, I knew I was going to pick a career under the umbrella of business. I liked the way I was challenged and the variety of markets out there. It wasn’t until my internship that I found the true reason for my love of business, and perhaps even my career path. I was lucky enough to intern and eventually land a job at The Crossing Church here in Columbia. Make no mistake, a church is a business: it has to pay staff, keep up the building, actively seek membership, and give and serve the community. Tim Worstell, my host, is a family who I reached out to and for mentorship. Tim does it all – sales, marketing, merchandising, event planning, pretty much everything one would do in a small business. But with almost 3,500 attendees every Sunday, The Crossing can hardly be called small.

Starting out I was assigned odd jobs here and there. I organized a music closet, put up massive TV stands, and assembled lighting structures. My first big project was the Magic Tree over the holidays. I wrapped lights around this 85-foot sycamore tree for hours until it was time for professionals with huge cherry pickers to finish the rest.

We ended up with over 200,000 lights (38 miles of lights!) when we were finished. Each light was supposed to represent someone in Boone County. I hauled sandbags and huge signs and set them up next to the church in preparation for the grand opening of the tree. I talked to Tim about our use of radio ads, social media, and signs.

I ended up using everything that I had learned in two years of marketing classes to make this attraction successful. One night I get a call from Tim saying, “Hey, the tree is all set up, want to dress up as Frosty and run around the tree for a few hours?” Next thing you know I was slipping on mittens with the Grinch. As soon as I put on Frosty’s head I thought to myself, “Why am I doing this? All I do is carry stuff around and put on costumes!” But the second I walked outside in front of hundreds of people gazing with wonder at the Magic Tree—families and children of all ages—I got the answer to my question. Everyone was delighted to see me: kids were laughing and taking pictures with me, parents hugging each other listening to the holiday music. What I thought was a tree with some lights on it had brought the whole community together.

My heart was filled with joy and I realized the reward: serving others and spreading happiness. Horace Mann said it the best when he said “Doing nothing for others
is the undoing of ourselves.”

After Frosty, I graduated to working at the front desk in the office of The Crossing. My job was to set up for events, take people to the correct locations for appointments, and lock the church up at night. I loved working the front desk because of all the people I met and formed relationships with. I found that I truly love serving others and showing hospitality. There are few things that feel so good as feeling welcome.

The Crossing is light in the community, with or without the Magic Tree. Every day I came into work, no matter how my day was going, I felt happiness rush through me. I learned that the power of community and working together towards a good cause.

The Crossing is a very busy church and holds services and programs every day—not just on Sunday. I was allowed to participate and plan events and contribute to marking and raising awareness of opportunities for workshop. We used graphic design, advertising, public relations, direct mail and much more.

During my time at The Crossing, I was reminded how important it is for businesses to stay up to trend. Social media is bigger than ever and The Crossing does an excellent job of utilizing it. I was able to take in different ways they used their platforms to reach the members of the church. The Crossing uses a variety of media, from pictures and videos to live feeds and online sign-ups and seminars. They stay up to trend stay efficient and to allow them to attract all different walks of life.

The Crossing functions like many businesses, but what it produces is far greater than any product on the market: Joy, love, faith, knowledge, and fellowship. It was through me showing the light to other people, that I could feel it shining inside of me.
always been captivated by architecture. Designing a functional building that is aesthetically pleasing with spaces that inspire is very appealing. By my sophomore year, I had completed the two architecture courses offered at the Columbia Area Career Center, and I was looking to continue my learning in a professional setting. After asking my architecture teacher, Mr. Thompson, about what other classes I could take to advance my skills, he recommended that I meet an actual architect in Columbia. But I had no idea how to contact an architect, since my family and I didn't know any. Thankfully I got the opportunity to meet architect Robbie Price of SOA at the end of my sophomore year through the EEE program. I continued to meet up with Robbie and draft throughout my junior year as well.

We started at one of Simon Oswald's projects, a retail space in the 4200 Merchant St. building in The Village of Cherry Hill. It is a two-story, 15,000 square feet mixed commercial and loft apartment complex. One of the stores in the building, Focus on Health Chiropractic, hired SOA to remodel their outlet and conjoin it with the adjacent outlet so they can have more business space.

The day I saw the outlet, it was in the middle of work so it was perfect time to see a mix of planning and execution of a project. Robbie and I primarily talked about how an architect manages a project. He said the architect is the problem solver who must find a solution for every change a client desires. In the Merchant St. project there was a wall separating the two retail outlets and SOA needed to find the load bearing walls and the sections of the wall that could be removed as the client wanted them completely connected.

I was also able to see the entire project plan which detailed the several aspects of the final project. There was a ventilation schematic, demolition plan, electrical plan, and many others. He told me that an architect must be up to code on every detail because the architect takes responsibility for the safety of the people inside the building after it is constructed. We walked around the building and Robbie told me that an architect should always be mindful of the proportions of a room. A room must make the person inside it feel comfortable, and secure.

In the building there were several small offices in the back, and Robbie said that his goal was to make each office comfortable instead of sacrificing quality for higher number
of offices. The Merchant Street project opened my eyes to a more meticulous and detailed view of architecture. I continued to return there to see how the renovation continued. The final space was attractive and functional and the owners and employees at Focus on Health were very pleased.

Another time I met with Robbie we about architecture as a career. Before I did this internship, I was pretty sure I wanted to be an architect, but I wanted confidence that it is a good career choice. SOA is a successful architecture firm that has designed several local buildings including the Clary-Sky Urban Architectural Park in Columbia, and the renovation of Missouri Hall and the North Quad at Columbia College. An enormous project from a few years ago was the design of Battle High School, a 70-million-dollar venture designed to educate as many as 2000 students. They’ve also enhanced buildings at the Missouri Botanical Garden in St. Louis.

These designs can be seen here: https://soa-inc.com/category/case-studies/ Luckily, my hopes were confirmed. Robbie said that it is very likely to get a job after college, and that it is even possible to find job while you’re still in college. He told me the best way to ensure that I have path after college is to network. Oftentimes there will be architecture career fairs at architecture colleges, and it is good to network and look for career paths at those. Another way to improve my likelihood of getting a job is to intern while I’m still in college. Architecture schools have lots of connections and it is good to get internship. This will not only give me real world experience it will contribute to becoming a registered architect because I’ll need a certain number of hours working under a licensed architect to become one myself.

I also asked Robbie if there are any other classes I should still take in high school that would contribute to my architecture skills. He stressed taking drawing classes because an architect needs to be able visualize their plans without a computer. He also recommended calculus as it is a cornerstone of most math involved in architecture.

SOA is a Leadership in Energy and Environmental Design (LEED) building. Robbie gave me a tour while also describing the energy saving principles of the building. SOA has a rain water collector for toilet flushing and landscape irrigation; the building also has double-insulated walls so there is less heat. Robbie introduced me to two employees who have very critical roles in the success of the firm.

The first employee I met was Julie Whitsitt, the interior designer for SOA. She was a graduate from K-State which is the college I’m considering going to study architecture. Julie said that the program at K-State is very good. She said they allow you to explore different types of architecture such as landscape, interior, and engineering.

The second person I met was Kegan Thompson, who also graduated from K-State and is the most recent employee at SOA. He echoed the positives of K-State that Julie did, but he talked about how involved with firms K-State was. He said they have great career connections for networking. Meeting two K-State graduates was great for me because it confirmed for me that going to K-State is a good decision.

This internship was very insightful for me. It helped me grasp what it is like to be an architect. The Merchant Street project allowed for me to see how an architect must solve every problem that relates to the client’s specifications. Seeing the office environment of an actual architecture firm showed me that being an architect is also being a part of team. I also completed several drawings, one for an enclosed patio for my mom and a design for the Pantheon. This internship gave me the confidence that becoming an architect is the career path for me, and I can’t wait to live it.
ADAPTING MODIFICATIONS FOR SPECIAL NEEDS CHILDREN
JACY HIGHBARGER

I interned at a Behavioral Psycho-Educational Clinic, where I volunteered at an adaptive ballet class, and cared for children with disabilities. With all of these experiences combined, I’ve been able to use my interests and skills in varied environments. The BPE Clinic is run through the Mizzou Psychology Behavioral Program allowed me to examine real behaviors alongside graduate and doctorate students. I observed the parent interviews, actual evaluation of children through a monitor, data collection and data analysis and participated in the discussion of the results and how to proceed. The following are specific cases I observed:

Pica is a psychological disorder in which a person eats non-food items. In this case, I was not able to observe the interview, so I reviewed the information collected prior to the evaluation. This case involved a young girl who started exhibiting pica behaviors before diagnosed with Celiac’s Disease (gluten intolerance), but continued to exhibit the pica behaviors years after her diagnosis and dietary changes. This six-year old girl mostly struggled with eating tissue and licking things, usually when bored or anxious. For the evaluation she was first observed and had data collected in a scenario in which she'd be bored (alone in a room without toys) and then again when she wouldn't be bored (playing games with mom). After data collecting and observation, it was obvious that she did indeed engage in behaviors more when she was alone and likely bored or anxious. The suggested treatment was behavior replacement therapy. This type of therapy would essentially 1) train her to become aware of her behaviors and 2) give her some sort of healthier and more constructive replacement—a fidget spinner, for example.

I also observed an interview for Traumatic Brain Injury (TBI). The mother asked the child a set of questions that had been written by the doctors associated with the child’s behavioral issues, in school and at home. This specific child was around six years old, with aggression and non-compliance behaviors resulting from a traumatic brain injury and temporary left side paralysis from a stroke. Through the clinic, we were able to observe his major stressors: writing and homework. For this client, the evaluators chose to implement a system of breaks at school during writing and work so as to avoid frustration. The doctors will follow up with the school.

DanceAbility is an adaptive ballet program for children and adults with special needs. Through my entire experience with this program, including this semester, I have had the experience of working with children with Autism, ADHD, Cerebral Palsy, hearing impairments, visual impairments, Down Syndrome, and mitochondrial disorders. The variety of diagnosis and differences in children has allowed me to observe how different strategies work with different kids. I think this variety has provided me with a more well-rounded approach, as I have had to deal with more variables than just one child.

I pick up R (8 years old) and take him home from DanceAbility. Through this, I practice assisting someone with a handicap, (cerebral palsy) helping him in and out of my car, of his house, and of the dance studio. I have also been so happy to engage in conversation, indulging his curiosities and learning his interests, his quirks, his likes and dislikes. For instance, I play music for R sometimes, and am teaching him about BB King and Childish Gambino. With his impeccable memory, he often asks me to “play ‘Riding with the King!” or other songs I have shown him. We also discuss routes and the roads I use to take places, as well as the buildings on them. The first time I drove him anywhere, we drove past the smoke stacks and he asked me what carbon dioxide was. R is not one to be underestimated.

I have known W for two years (now 5 years old). Though I had an interest in psychology prior to knowing W, my interest in Autism Spectrum Disorder and specifically ABA/ VB therapy was sparked by him. The mind and life of a child, or really any person, with Autism is fascinating. In order to support a child with ASD, you must always be on your toes, always be making changes. With W, we developed one strategy to help him do his job, only to have him outgrow the strategy three weeks later. While I see how this could sound frustrating, I found it more interesting than frustrating. I really enjoy watching W’s progress and trying out new strategies, especially when I see a strategy that works. This semester, W’s ever-changing behavior was in full force. SPIO’s (sensory compression vest), headphones (muting sensory input to make him more comfortable), and snow days, were all factors in his behavior, outside of his own experiences and thoughts that might impact how he acts. For a solid amount of classes this season, W struggled
significantly with everything. He struggled with stretches, with waiting in line, with going across the floor, with having a safe body, and with following dance instructions. We tried all sorts of strategies with him. Counting backwards, leaving him be, SPIO, no SPIO, headphones, no headphones, talking to him, not talking to him- the list goes on and on. Our expectations for him were constantly changing, and the variables we could control were also constantly changing. After weeks of seemingly no improvement, some tactics started to work. We learned that, at least for now, W does best with as few verbal commands as possible. We also learned that often, for him to stand in one place, standing behind him, in order for him to lean on you and receive sensory input, worked wonders. Most impactful of all, my mother (DanceAbility founder and pediatric physical therapist who worked with W in preschool), Karla (CPS Para with lots of experience with W and creating social stories) and I created a social story for W. Social stories are a concept created by Carol Gray in 1991 that help to teach appropriate social behaviors.

All sorts of children use these, but they’re especially useful for modeling appropriate and inappropriate social behaviors for children with Autism. For W, we created a story using his favorite Snoopy characters. The first page used three pictures, under which were “too fast”, “too slow”, and “just right”, which worked really well to help explain to W how he is behaving (very often, the problem is being too fast). The second page is a follow up for too fast that explains, “when I am too fast, I can ask for a hug, take a deep breath, or take a break.” This also works very well for him, because we give him choices that he can ask for to solve his own problems. Now, for example, he will often ask to “take a break” rather than running around the room or lying on the floor.

I have had the absolute pleasure of spending time with H, (9 year) with Autism. Once a week, I pick him up from school and we go do some sort of activity. It’s been an amazing experience to observe a child with such high functioning abilities, which are created mostly through his family’s approach towards ASD. Their strict attitudes have, I think, pushed him in an amazing way to overcome a lot of the hardships that come with Autism. Through simple verbal commands, he is able to stop certain compulsory physical movements, engage in conversation, and follow directions. He is great at voicing his opinion, asking questions when he’s confused, and even asking for choices in situations that he doesn’t understand. It’s been a cool and challenging experience to plan excursions for us, to take into account things like how loud or crowded a place might be. Henry and I have gone to Rock Bridge State Park, Flat Branch Park, Sparky’s, Main Squeeze, Schnucks, and even visited my neighbor’s farm. We’ve explore nature and local spots, observing sights, sounds, and playing lots of I Spy. We navigate grocery stores, creating lists and reading aisle signs. We read maps at parks, choosing trails and consulting the legend for unknown symbols. Mainly, we discuss High School Musical, his favorite movie. We talk about the setting, always applying it to our current location. We talk about the songs and the characters, specifically Sharpay more than anything. His biggest goal, undoubtedly, is for me to drive him to East High, though I have to constantly remind him that driving 17 hours is a lot longer than he thinks.
At the beginning of the school year I was unclear about what I wanted to do as a career and how I could use my internship block in a productive way to figure out my future. I knew that I have always had a desire to work with kids, but it was not until high school that I discovered that I wanted to work within special education. During the first semester of my senior year I dabbled in the SPED department at Rock Bridge, and I realized I didn't want to work in a high school environment. I did realize that I'm interested in working with children.

When second semester started I began looking for a place that I could shadow a Pediatric Occupational Therapist or someone in the profession that could give me a good insight on what the job is really like. I found the Speech and Language Preschool which is owned by my host Sherri Germann. The preschool is offered to students from the ages of eighteen months to six years old who experience developmental delays, physical disabilities, or mental disabilities. They also offer individual therapy sessions for children of all ages through their staff. It seemed that after a simple google search I automatically knew that the Speech and Language Preschool was the place for me. The preschool is applied towards speech therapy, social skills, and behavioral support, but they also offer many different types of therapies such as individual speech therapy, occupational therapy, music therapy, group therapy, food therapy, reading intervention, and physical therapy.

I started going every other Tuesday and Thursday to shadow my hosts and to watch how the kids reacted to the learning environment. Right away I loved being there because of the interactions and experiences I enjoyed with the children and the staff, they welcomed me with open arms and shined a brighter light on something I knew was there, but was had been having a hard time finding.

After almost four months of shadowing I have built strong relationships with not only the staff, but the students as well. During this time I saw many extraordinary transformations: One eighteen-month-old girl I worked a lot with learned to walk; another boy who hadn't been talking started to engage me and others and learn new words. We had an afternoon music group and one student who had not yet spoken at five years began to sing along with everyone. When one of the children reaches a goal they have been working towards for a long time, it is the best feeling in the world. It is not just the joy I feel for being part of their therapy and realizing that hard work and patience eventually can create lasting improvement. It is also the happiness and after reaching and accomplishing this barrier that has been holding them back.

I cannot thank Sherri and her business partner, Chris, enough for letting me shadow them and learn from them. Watching them has helped me figure out my own ambitions and expectations for the future. I would also like to thank the rest of their staff for welcoming me and serving as such amazing role models for me. I would specifically like to thank their music therapist Abby Anderson for letting me join in on classes and inviting me to help with one of her afternoon classes every week. I have a new appreciation for music therapy as I saw children express themselves in this area more eagerly. To hear a five-year-old who doesn't talk, sing, is magical. I would like to thank Mrs. Struchtemeyer for being so patient and really letting me use my internship to explore different options for my future. Lastly I would like to thank the children at The Speech and Language Preschool for teaching me: I am certain that I am meant to work as a Pediatric Speech Therapist, and I will always carry their smiles and laughter with me. I'm excited to continue working there this summer.
Over the summer of 2017, I decided to take up an internship at an institution where I had been utilizing the services for years: the Columbia Academy of Music. I decided to pursue an internship at the music academy because I knew music was something I was passionate about, and I recognized how much I appreciated the organization for which I was working. The experience I had working on the other side of musical lessons was not only enjoyable and informative, it also served to demonstrate to me a possible avenue I could pursue in my life. The work I did at the Columbia Academy of Music was mostly centered around trying to create a structured ukulele program to teach beginning students. Before I began my internship, multiple people had contacted the academy about enrolling their kids or themselves in ukulele lessons. Since the music academy didn’t have any ukulele teachers, my guitar teacher, Greg Hausman, decided he would teach ukulele lessons instead of just turning these people down. To do so, Greg needed a structured program with which to teach beginners. He thought this would be a productive and helpful thing for me to create. We wanted to make a beginning curriculum similar to what Greg had given me when I started taking lessons from him—that is, a curriculum that would allow students to build a base of technique and a technical understanding of the instrument before turning to more personal and specific lessons. I started by finding a book that fulfilled the requirements we wanted. Lots of books and online resources provide rough approximations of how to play songs, providing only chords with no voicings, sheet music or lead sheets. I needed something that not only gave me those resources but structured the musical pieces as well, so we could help form a fully competent musician who wouldn’t struggle in any situation.

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Although this part of the internship may seem mundane, it taught me a lot. I had never worked in an environment like that before, with those types of responsibilities.

I also helped teach as part of my internship. Many times, I taught part or all of a lesson to Greg’s beginning students. Though this wasn’t intense information I was sharing, it nonetheless was a nerve-wracking experience for me. Ultimately, those lessons helped me gain confidence in my knowledge and the people skills needed to be a good teacher.

Along with a lot of information about how to play the ukulele and the inner workings of the Columbia Academy of Music, I genuinely gained a lot from this internship. Before my internship, teaching any musical instrument seemed like an extremely intimidating and mysterious task. But after experiencing teaching first-hand and helping piece the foundation of a course together, I felt a lot more confident in my abilities to teach and had a much better understanding of the lesson material and what teaching would be like and in practice. While it may seem simple, knowing that you don’t need to be an elite-level musician to teach was one of the most impactful and confidence-boosting things I took away from this experience. Sometimes when you progress to an extent in something, you forget how much you’ve learned. It becomes second nature. My internship required me to look back and focus on the basics of playing an instrument, reminding me that there are lots of people out there who could learn from knowledge I have acquired. While I myself still have a lot to learn musically, I think teaching music is a fun and exciting thing I want to pursue. This internship helped me realize that, and made me less intimidated by the idea of teaching. If only for that one thing, I’m happy and thankful to have had this opportunity.

The first weekend of March every year is an exciting time in Columbia, MO, as almost 50,000 people from all over the world gather to watch documentary films at the True/False Film Festival. It’s well known that every year the festival has hundreds of volunteers to help make the multiple theater and associated events run smoothly: from taking tickets to taking out the recycling. What is a little less well known is that there is a team of about a dozen people who connect the festival to a network of teachers, professors, and artists across the United States, and in some cases, the world. The three of us were lucky to get to work on the Education and Outreach Team, which is so imperative to the growth of True/False. To leaders of this team are Allison Coffelt and Kelly Famuliner.

Some of the work with the Education and Outreach Team began as early as July 2017, where as an intern one could provide a student voice during the Media Literacy Institute, a series of seminars for high school teachers to learn about how to better utilize modern media for the purpose of education. During these sessions we were informed of what thought goes into making lessons around media.
We learned how educators make lesson plans around not only documentary films, but other forms of media, including political ads, commercials, and even Instagram posts. We were also afforded the opportunity to speak on behalf of high school students on what types of lessons are more interesting and engaging. We were able to see how the True/False Education and Outreach team created a real impact on Columbia teachers, and as a result, their students.

We did some office work throughout the fall, shelving DVDs, addressing envelopes. It wasn’t until January that things really began to pick up. Our team’s weekly meetings began soon after the new year. Our first main task for the fest was Outreach. Essentially, there was a giant spreadsheet that contained people and organizations we needed to contact. At our weekly meetings, members of the group were assigned different contacts to reach out to for the subsequent week. These contacts were people who were potential fest-goers who could benefit from working with the Education and Outreach team. Another form of outreach was giving class talks. Teachers throughout Columbia would request a talk from our team and at the meetings we would coordinate who would give these talks. We went to classes at Rock Bridge and Hickman. These talks mainly consisted of explaining what True/False is, showing a short video about DIY day, and talking about our own personal experiences with the festival.

Another aspect of our internship was working with the True Life Fund, a charitable effort to raise money for the subjects of a specific film each year. This year, subjects were the young women in the film, Primas, an experimental documentary about two young Argentinian cousins going through their journey recovering from separate traumatic events. We watched the film in the True False office screening room. Soon after we began promoting the film at The Crossing church through newsletters and a True False booth. Since the True Life Fund is a cooperation between True False and The Crossing Church, we spent the three Sundays prior to the fest week in a booth outside the church, selling tickets and t-shirts for Primas. We found these Sunday mornings to be good work experience as we learned how to be quick on our feet when dealing with a mix of people asking questions and purchasing items.

As the festival grew nearer, we had two main jobs - creating art installations for Camp True/False and promoting the True Life Fund at the Crossing. Creating the art installations was an arduous task. One of the pieces involved using a saw to cut sizeable letters out of a piece of plywood. While the transportation of these letters was complicated, they ended up transforming the space very well. The other installation was interactive with the students, allowing them to attach notes which were written about things they learned and took away from being a part of the festival.

On the Friday of the festival, we helped direct the chaotic high school traffic in Jesse Hall, as every sophomore in CPS (and from a few other districts) was bussed downtown to watch the film on Mr. Rogers called Won’t You Be My Neighbor. After the film, we led the students to Rose Music Hall for lunch. After lunch, interactive DIY workshops were held for the students.

We were in charge of making sure everything ran smoothly for our respective workshops. Some of these workshops included a lesson from a master Moroccan guitarist, mural painting with a local artist, and filmmaking with a professional. It was really amazing to see these artists work firsthand. We finished up DIY day with the aptly named March March. Students joined locals and travelers alike to march in the lively parade that went through downtown Columbia. It was an exciting scene.

The rest of the weekend was spent doing mainly grunt work, i.e. delivering buckets to the locations of True Life Fund film showings and passing them out to collect money. In all, we were very grateful for this work experience. We met all sorts of colorful characters, viewed one-of-a-kind films, and learned the ins and outs of working at a wildly successful film festival.
At the beginning of this year, I was fortunate enough to secure an internship with Dr. John Howe, a professor of Finance, the Missouri Bankers Chair, and Chair of the Finance Department at the University of Missouri. Our first several months were spent searching for a suitable topic to research and report on.

I have always had an interest in a large variety of fields, including computer science, law, political science, economics, and psychology. So when I learned that Dr. Howe had recently written and published a novel entitled The Foolish Corner, which dealt with behavioral finance, I was inspired to study this area. I hoped to branch off of his former projects and conduct a research project about behavioral economics. I spent the next few weeks reading a wide variety of books about behavioral economics, including the infamous Thinking: Fast and Slow by Daniel Kahneman.

As I continued to read about behavioral economics, I also began the social psychology unit in Mrs. Matteson’s AP Psychology class. It just so happened that I had just begun reading an article from Harvard Business Review dealing with social networks and their influence on our economic decisions. This particular combination of psychology and economics seemed to be incredibly interesting, so I decided to conduct further research on it. After reading Robert Cialdini’s Influence, and conducting an extensive review of online literature, I began to realize that social networks are not a new or unexplored phenomenon. In fact, considerable research has already been conducted on the impact of social networks in daily life and in the business world. I voiced my concerns to Dr. Howe, who simply responded with, “Well, you’re interested in law. Why don’t you try to find a way to combine your study of social networks with the legal field?”

Of course! That was certainly the logical conclusion. Numerous studies had already been conducted on the impact of social networks and the business hierarchy, particularly the relationship between CEOs and their boards. Likewise, there were numerous hierarchies and fascinating relationships in the legal world that I could explore. The relationship between judges and their clerks, a potential connection between a defense attorney and prosecutor, relationships and friendships between the nine justices on the Supreme Court, the list goes on and on. Of all the relationships that came to mind, there was one that stood out: the potential for a social network to influence the probability of a higher court judge overturning a lower court’s decision. For, although judges are generally expected to deliver impartial and fair rulings, there is mounting evidence that minute social connections may play a role in influencing human behavior and decision-making.

I began to conduct background research on the topic and have spent the last several months developing a research proposal on this subject. The majority of my research focused on the question: what is a social network? What research has already been conducted, and what have they already found? And, more broadly, I also delved into the structure and nuances of the American court system, developing an understanding of the various courts that exist in the United States, and the hierarchy between them. I

“Up until the end of my junior year, I had always believed that my passion was in STEM. However, my membership on the debate team exposed me to numerous other disciplines, resulting in the development of my interest in economics, international relations, and law. Conducting research on the impact of social networks on the legal system has forced me to delve into economics, law, and psychology, and has proven that this is truly the field that I hope to spend my future in.”
decided to analyze a few social networks, which were as follows: attending the same undergraduate university, attending the same law school, attending the same high school, serving on the same branch of the military, and being a member of the Federal Judges Association.

Unfortunately, collecting data on this topic will be incredibly difficult, as there are millions of court cases each year, and hundreds of thousands of them will advance to a higher court. The process of data collection becomes even more difficult when one considers that, while there are biographies for many federal court judges, few include their location of undergraduate study, and even fewer include their high school. Furthermore, there is not such a database available for state judges, which means that data collection will require tens of thousands of hours searching through LinkedIn and Facebook biographies. Considering the time constraints of this year, I likely will not be able to complete the entirety of this research; however, I hope to continue my research into this summer and potentially even next year so that I can hopefully come to a conclusion.

Although I may not have found concrete results from my research this year, my internship with Dr. John Howe has definitely solidified my passion for the social sciences. Up until the end of my junior year, I had always believed that my passion was in STEM. However, my membership on the debate team exposed me to numerous other disciplines, resulting in the development of my interest in economics, international relations, and law. Conducting research on the impact of social networks on the legal system has forced me to delve into economics, law, and psychology, and has proven that this is truly the field that I hope to spend my future in.
This year I have participated in two internships. First semester I worked alongside Phil Threatt, the Athletic Trainer at Rock Bridge. I really liked the work and every day was different. Some days we would just have to fill up the waters for practice, and others we had seven ankles to tape, a bloody nose, and someone in need of treatment, all needing to be completed in the next five minutes. One of the most interesting things I saw was during a freshman game when a player from the other team was hit by another player in the game. He was pinned to the ground which snapped his femur. The femur is the hardest bone to break in the body, so you can first imagine how loud the sound of the crack was and the extent of the injury. I was standing on the sideline and Phil knew right away what had happened, so he told me to run and grab the splint bag, told another intern to call 911, and took off running onto the field. We set the player’s leg in place and waited for the ambulance to come. It amazed me how well Phil immediately knew what all of the injuries were. I learned a lot through this internship, but in the end realized athletic training is not the career for me. I am grateful for the chance to find this out.

This semester I have been volunteering at Danceability, a dance class designed for kids with disabilities. There are anywhere from 5-15 kids there each week and we are learning a dance routine for the end of the year showcase. The kids get really excited for this because they get to dress up in a dance costume and perform on stage in front of everyone. The children have a variety of challenges and severities, so I have learned how to adapt and deal with different abilities and emotional responses. I’ve worked with one child named Ashton a lot. He does a pretty good job on his own but likes to be reassured he is doing things correctly by being guided the first time through the movement and then watching someone for the rest. We’ve worked on stretching, coordination, and balance. Ashton’s biggest struggle is balance because he likes to swing his head from side to the side during movements. He has very little communication but responds well to high fives and fist bumps, along with a little bit of sign language. During this internship I have realized again, that I want to work with kids, but also that I am able to handle a variety of disabilities and differences while being in a teaching environment. I think during my course of internships this year that I belong as a teacher. The hours are family friendly, I love working with kids, and I can handle many types of adaptations while staying positive and having fun. I think I have certain qualities brought out by these internships that have made me realize I am fit to work in an atmosphere of hand painting, singing, dancing, and nap time. Attached are pictures of me and Ashton stretching and doing the ribbon song at the end of class and Phil teaching me how to tape wrists and assessing an elbow injury.
This year, I had the opportunity to shadow physical therapists at the Missouri Orthopedic Center. I have been able to see what they do with their patients and how they work to return normal ambulatory functioning. I decided to study physical therapy because I am interested in the medical field. I enjoy interacting and helping people. This career path has been suggested to me several times, so I wanted to learn more about it.

On a typical day, I would arrive at MOI and shadow one of the physical therapists in the clinic. I saw all sorts of people of different ages and situations with a variety of different injuries. I would watch the therapists teach and practice new exercises and revisit former exercises to assure mobility. Afterward I would help clean equipment and do small jobs in the clinic, like prepping kinesiology tape for arriving patients.

I also learned about Transcutaneous Electrical Nerve Stimulation (TENS). This is a machine that sends electrical impulses to nerves to promote healing. Patients would perform their exercises while hooked up to this machine, which strengthened the injured areas. Another machine called KAATSU was a form of blood flow or occlusion training. This is when the therapist temporarily restricts blood flow to build up lactic acid in the muscle. The lactic acid strengthens the muscle and improves endurance.

Structured exercise remains the primary form of therapy. I learned various exercises for patients with specific injuries, such as an injured shoulder or knee. The physical therapist I was shadowed that day would explain to me what injury the patient was suffering from and how the various exercises that they were teaching the patients were helping them get back to normal functioning again.

I also had the opportunity to shadow physical therapists as they visited patients before they had surgery. The physical therapist would explain certain exercises that the patients should be doing after the surgery and also (if needed) teach them how to use crutches.

One area I got the chance to observe is hand therapy. Hand therapists treat everything from accidents to carpal tunnel syndrome. Massage and guide them in exercises. Sometimes wrapping an injury isn't enough support and there are no available specific prosthetic supports for purchase. This is particularly true of hands, which are unique in size, shape, and mobility. I learned that with hand injuries, often the hand therapists will make prosthetics for patients using warm plasticine, which can be formed to fit the individual hand and dries to a hardened splint.

I learned a lot about the different muscles in the human body and how they work with each other during my time researching and reading about the muscles and while I was in the clinic. I also read a book put out by the American Physical Therapy Association about the muscles and different exercises that help people get back to normal after an injury to a specific part of the body. It was interesting to learn how the different exercises strengthen muscles. Researching and reading this book also helped me to understand more of what was going on while I was in the clinic.

Physical therapists are very important in the recovery of a patient. Not only do they teach patients exercises to get them back to normal mobility, but they also provide support and encouragement to people as they recover and get back to their normal lives again. I saw that the physical therapists got to know their patients individually over multiple visits ultimately forming friendships. This appeals to me because I would like to know the patients I treat rather than seeing them only once or twice. When speaking with the therapists, they often commented on this aspect of getting to know patients. They preferred working in an out-patient setting as opposed to a hospital setting where they only saw a patient once or twice and then never again. Thank you to all the staff at MOI who shared their time, knowledge, and perspective with me. I am very grateful to them as I am assured that I’m seeing the right career path.
CHRONICLING THE CITIZEN CATE EXPERIMENT
Lucinda Kegley

This summer, I participated in a research project on the total solar eclipse, studying the outer layer of our sun. Normally the bright photosphere, or solar surface, overpowers the Sun's faint, wispy outer atmosphere called the corona. We can only see the corona when the photosphere is covered up. The eclipse was a perfect opportunity to gather data on the inner corona, because it is only visible when the bright disc is blocked out by our moon.

Scientists create artificial eclipses using a coronagraph, an instrument that covers the Sun's bright disk allowing study of the outer atmosphere of the Sun. But because the artificial disk is close to the observer, the edge of the Sun becomes distorted making precise measurements and observations difficult. The 1,000 pictures taken at each site help scientists understand not only the intensity of the corona over a long period of time, but also the motions of prominences, coronal inflows, coronal mass ejections and other active regions. The Citizen CATE (Continental-America Telescopic Eclipse) Experiment was comprised of 68 teams, set up across the 2,500 mile path of the eclipse, ready to record the 90 minutes of totality.

I had an awesome experience and the time I spent with my team was both enjoyable and informative. I was one among four people at our site, two students from Battle and our host, a graduate student from the university. Our mission was to record the two and a half minutes of totality through a telescope. It took countless days of practice to get the timing and positioning just right, so the path of the sun could be accurately traced by the motor. The camera we used to record totality was very sensitive, so we had to ensure the lens was covered by film, similar to the film in the solar glasses. If we neglected to do this, the camera would have been fried and our data lost.

On the day of August 21st, we all gathered at A.L. Gustin Golf Course, and set up our equipment for the final time. We aligned the camera, and checked it often to ensure it was set on the right path. We took our flats and darks, necessary in solar photography, which affects the overall outcome of the images. We watched in awe as our moon slowly engulfed the sun, the surroundings grew quiet and the sky appeared as a panoramic sunset. Once totality begun, we began taking our data, and sat back and admired the natural phenomenon. Luckily, the cloud cover broke just in time for us to view the eclipse with our naked eye. It was everything it was described as and more. The sky glowed a pinkish blue as the moon blocked the sun, and the corona shown bright against the dark satellite. As quickly as it had begun it was over, and the clouds covered the sun once again. Our data was collected and was quickly loaded onto the database to be shared with the NSO.

My team celebrated our successful experiment and packed up for the last time. It was bittersweet to see all of our hard work come to an end, but to know that my data was to be used in a nationally recognized experiment was amazing. I cannot describe how thankful I am to have been a part of the Citizen CATE Experiment. I have always been interested in the field of astronomy, but to participate in this project confirmed my love for this field of work.
I interned at the Sager Braudis gallery in downtown Columbia under gallery director Hannah Reeves. With special First Friday opening receptions, Sager Braudis shows off their museum quality curation and presentation with rotating exhibits displaying national and international artists every month. Also, in 2018, the gallery is showcasing a collection from Cuba. The owners and staff of the gallery took a trip to Cuba to select and secure artwork from internationally recognized artists for an incredible exhibition.

Sager Braudis usually hosts a college interns, but there was none during the 2017 summer so they accepted my application. As an intern, I was charged with curating my own gallery show, an in-depth and amazing task. It was absolutely wonderful to be able to get a hands-on experience with the beautiful and diverse collection of acquired art that the gallery stores, presents, and sells. Their storage room is in a separate building and is completely filled with shelves of 2-D art and large crates holding 3-D art. Mrs. Reeves tasked me with organizing a gallery show at Sycamore with a unifying theme. I spent a lot of time sitting, squatting, reaching, and standing on my tip-toes to ogle at their enormous collection and thinking of themes to encompass the show at Sycamore. This time alone with the art and my favorite music playing in the background was a highlight of my summer. Encountering this much collected art in such an intimate and personal way was a major highlight.

As I began planning and organizing the gallery show at Sycamore, I visited the restaurant with Mrs. Reeves to get a feel for it and to go through what the Sycamore owners were looking for.

I then continued to sort through and examine each of the gallery’s pieces in inventory to find the 8-12 best fitting pieces for that space. Since Sycamore focuses on farm-to-table cuisine, I coordinated a collection of various artists to go with a natural, rustic atmosphere. This included oil paintings of barns, vegetables, and trucks all from one artist among landscapes from another, tree and roadscapes from the gallery co-owner, and finally, for a splash of color with large acrylic paintings from one of the restaurant’s waiters.

Once everything was all planned out, alongside Mrs. Reeves, I carted the artwork through the downtown sidewalks and streets to the restaurant during the post-lunch break to set up the show. Because she had taught me how to properly measure and calculate where to hammer in the nails to hang the artwork up, we finished rather quickly. It was extremely gratifying to be able to see the restaurant with the artwork creating such an inviting space and to be able to know that all of the work and thoughtfulness that went into planning and carrying out the show paid off so well.

Later on, once there was no more work for me to do on site, I worked on a Historiography of an upcoming show for Mrs. Reeves at home. Basically, I found different websites, books, or journals of each of the artists in the exhibition. This show was their yearly “Masters” exhibition. This year, they focused on female surrealists and abstractionists. Because these artists are deceased, Mrs. Reeves couldn’t interview them as she usually does. Rather, she had me compile some resources to do research.

In addition to drawing, painting and embroidery I’m also interested in graphic design. During second semester I worked alongside Mrs. Struchtemeyer to create this year’s Folio, a magazine that celebrates Rock Bridge students’ art, writing, and music. I visited with each of the art teachers and helped them take pictures of art including drawing, painting, sculpture, and pottery. Then I visited with students whose art we wanted to feature to obtain their permission to be in Folio. I was reminded what a strong art program we have at our school and how much great art there was to select from. While I was doing this, Mrs. Struchtemeyer was collecting music scores and writing selections. Then she and I worked together to match the art with the writing and music. Mrs. Stover helped me to set up the book in InDesign and then the three of us reviewed the final book to make it as visually appealing as possible.

This was an amazing experience that taught me how to put together a publication and is another creation for my artistic resume. I’m grateful to Mrs. Stover for her publication experience and Mrs. Struchtemeyer for making these internships possible.
Over the past year, I have completed 90 hours of job shadowing at the Missouri Orthopedic Institute (MOI) and the University Hospital. To say this experience has been eye-opening would be an understatement. Having the opportunity to walk side-by-side with real life professionals who were willing to share their knowledge, practices, and opinions has taught me so much more than I would get reading a textbook or sitting in class. I began my year set on going into nursing in college; however, through extensive observing and advice, I have narrowed my focus to Occupational Therapy thanks to the opportunities Gifted Internship opened up for me.

First semester I learned my way around MOI. Each day of my internship, I would check the calendar to see which doctor or nurse I would be shadowing for the day. I would then head to the designated work space and introduce or greet the professional I would be shadowing. Most times, the doctor or nurse would discuss with me the upcoming patient and this meant pulling up an x-ray or an MRI to see what the problem was (if it could be observed at a skeletal level). We would then head to the patient room to see the patient. Every time we entered a room, the doctor or nurse would introduce themselves and then ask the patient if they were comfortable with me shadowing to observe and I would greet them as well. Then we would listen to what was bothering or hurting the patient and the doctor would take notes on their chart. Many times, the health professional would pull up the x-ray to point out a problem or to look more closely with the patient present to help fill in the gaps of understanding. We would then test the patient by having them participate in multiple tests of movement such as bending the arms (flexion/extension) and so on. With patients that were a bit more impaired patients (those recently out of brain surgery) our main goal of the day would be to get them sitting on the side of the bed and to have them engage his or her arms and such. With patients that were a bit more advanced, we would focus on getting patients up and moving around and completing basic occupational tasks like putting on socks, pants, showering, and more.

Over the entire 90 hours of shadowing, I have seen very many different patients and different health practices. When I think back to the first month of school and the uncertainty I felt surrounding my college decision, I can't help but think I would be in a completely different place now without the Gifted Internship program. This internship allowed me to see the fields I want to study firsthand and to know with certainty what choosing a specific degree would mean for me. I would recommend this experience to anyone unsure about what their passion or uncertain as to what they want to study in college. Seeing fields of work firsthand truly is knowledge that compares to no other and allows for a better preview into what comes next. I am thankful to the doctors, nurses, and therapists at MOI and University Hospital, especially Lanette Garrison.
Last summer I interned in Environmental Engineering at MU. Dr. Maria Fidalgo took me and two other Rock Bridge students to her lab, where we would be helping Atri Ariapad and Shannon Kelly with their research. The project they were working on involved removing antibiotics from wastewater.

Veterinary antibiotics are widely used on farms to promote growth and prevent disease among livestock. As a result, antibiotics are found in manure. When the manure is used as fertilizer, the antibiotics enter the environment. Over time, they build up in the soil and are absorbed by farm crops such as corn, lettuce, or potatoes. Later, when humans consume these foods, they are also ingesting antibiotics.

This is a big problem, because antibiotics aren’t good for ecosystems. They pollute the soil and rivers, and contribute to antibiotic resistance. That’s why it is very important for farms to have a good wastewater treatment system and prevent antibiotics from leaking out into the environment.

The goal of our research was to test if the Fenton reaction could be helpful in getting antibiotics out of wastewater. In Fenton chemistry, hydrogen peroxide reacts with the ferrous ion (a molecule of iron with a charge of +2) and produces hydroxyl radicals, which are a very powerful oxidizing species. (The hydroxyl radicals then attack any pollutants and break them down.) However, since the Fenton reaction is more efficient under certain conditions, it has some drawbacks when used for water treatment. First of all, it requires a pH of 2.0 to 4.0, and is most efficient at 2.8-3.0. If the pH gets too high, the reaction will stop happening. And second, the number of iron ions decreases as the reaction goes on.

There are ways to get around these problems. A light source can make the reaction more efficient and speed up the process of generating hydroxyl radicals and recycling them. And once the reaction evolves into a heterogeneous Fenton reaction, or one where the catalyst is solid iron oxide instead of iron ions, the pH range grows wider and fewer iron ions can escape. Nanosized iron oxides are nontoxic and environmentally friendly, with better absorption and higher catalytic activity. They are the catalysts in certain types of heterogeneous Fenton reactions.

Atri and Shannon were trying to find a catalyst that would make the reaction fastest and most efficient. They asked us to use the equipment in the lab to create samples of water containing a specific concentration of antibiotic. (The two antibiotics in this experiment were sulfamethazine and oxytetracycline, which are commonly used on farms.) After this we set up a Fenton reaction by adding the catalyst (iron oxide) to the mixture, squirting in some hydrogen peroxide, and placing it under a UV light to speed up the degradation process. Every 20 minutes, we would take samples of the solution and place them in vials.

We repeated this procedure several times with different amounts of hydrogen peroxide. Our objective was to determine which amount was best for breaking down the antibiotic. The samples we took would be sent to a different lab, where they would be closely analyzed.

Overall, it was an interesting experience. Everyone I met was very nice, and it was fun to spend the summer in the lab at MU and participate in our hosts’ research. I learned that all small details in research are important. I like chemistry, but I think I would like my next internship to be in design. I learned that after the data we worked on was collected, other graduate students would design a tank where antibiotic degradation would take place on a farm. I hoping to go back this summer and participate in this kind of engineering design. I’m grateful to Dr. Fidalgo, Atri and Shannon for providing me this opportunity.

This is a picture of the inside of the lab. On the far left you can see the reaction in progress. The beaker with the solution is covered in aluminum foil to prevent outside light from getting in. Balanced on top of it is the UV lamp.
I consider there to be two general sides of medicine. There are those that are in the spotlight and those that work behind the scenes. Neither is inherently better than the other. There are pros and cons to both. If you work personally with your patients, you get to watch the difference you make in their lives, but if the difference is not the desired result, you will always be the face they remember at their worst moment. Developing personal relationships with patients means that you will also feel their hardships. Those behind the curtain don't get to see the end result of treatment or establish that personal relationship, but they also don't feel the pain when something goes wrong. Each person has their own preferences, one side may fit someone perfectly and be completely wrong for another. As for me, I set out to determine which side of the divide was right for me. I know medicine is where I belong; I do not, however, know where exactly I fit.

I set out to intern in radiology, a behind the scenes type of field. I job shadowed Dr. Faler, a radiologist at Advanced Radiology for a day. He described the field to me as a giant game of “Where’s Waldo?” Most physicians, he informed me, know how to find what they took the scan for, a radiologist’s job is to find what they aren’t looking for. I was excited and enthralled by the idea of spending my life with a human logic puzzle, knowing the body so well that I spend my life looking for the problem others haven’t yet found. That fit me rather well.

I was impressed by the speed at which Dr. Faler could read scans and dictate all he found to a hand-held recorder, then flipping to the next patient. When the list was small, he would take the time to explain to me what he was seeing and what that meant. In a meeting with Dr. Altes, a radiologist at MU Hospital, she told me that if she had watched a radiologist before becoming one, she wouldn’t be where she is because watching someone read scans is incredibly boring. I did not find this true. I loved sitting in the dark watching pictures of real people’s bodies flash up on screen, and hearing what may be ailing them. Sometimes I could catch on to a diagnosis with my limited knowledge of human anatomy, sometimes Dr. Faler had to explain it to me. Either way, I found the job fascinating. What kept flashing through my mind while watching the man next to me find potentially life-altering anomalies in a matter of seconds, was that I could see myself doing just that for the rest of my life.

My largest worry about radiology was that I would be sitting back and watching for my whole life, never getting out there and making a difference. My day with Dr. Faler helped put this to rest as well. Breaking up our extended time in the darkroom in front of large screens, Patient came in with pain. Dr. Faler, being a musculoskeletal radiologist, also performed small procedures to help with joint pain. I stood, weighed down by a lead suit, watching while Dr. Faler, utilizing radiological technology called fluoroscope, guided a needle into the smallest crevice between two bones of a joint to relieve the patients pain. I watched him talk and laugh with each patient that came in the room, each time listening to their story and making a connection with each of them. This exposed me to the other side of radiology. There is more than simply diagnostic, this was a small taste of interventional radiology, where the doctor performs procedures with the aid of advanced radiological technologies. Upon further research and some YouTube videos of actual procedures being done, I explored this whole other side of radiology. One with the patient connection I wanted and the field that most interested me. Now I had something new to think about.

What I had not planned, was the part of my internship in emergency medicine. By second semester I found myself in the back of an ambulance, lights blaring, speeding to my first call, stomach a flutter with nerves. At first, I sat back and watched the paramedics get to work. They knew exactly how to talk to people in their times of stress and crisis. My nerves died down as my training kicked in and took vital signs on patient after patient, learning myself how to speak to people based on the situation. As I went on more calls and spent more time in the EMS world, I found that this side rather fit me as well. Meeting patients, and learning about their lives while doing hands-on medicine in a fast-paced environment got my heart pumping. I loved it. Not only was there face-to-face contact to patients, but there was an aspect of reaching...
out to the community. We were on the truck to provide medical aide, but also to do what we could for the people in their homes. There was something so personal about not only being with someone in potentially one of the worst moments in their lives, but being in their home and inserting yourself in their lives.

Spending 16 hour shifts with EMTs and paramedics showed me a family. I saw a group of people who had each other's backs no matter what. While we were going out into the community, we were also putting ourselves at risk, for any number of things, whether it be disease or physical harm.

No one quite understood that feeling like the people working beside you. I was exposed to a myriad of situations that can only be seen in the pre-hospital setting. I spiked an IV bag for a woman who would never again leave the hospital once we dropped her off. I laughed at the jokes of a sweet old man being transported to hospice care. I saw a man get tackled by a pair of police officers and get arrested after running from my paramedic partners on the way to the ambulance. My worldview grew. I had to learn ways to cope with things I never imagined, all with the knowledge that there was much more I hadn't begun to comprehend, and wouldn't until I encountered it. Through all these eye-opening experiences, I knew the people I had met just hours before were there for me. They understood, and they knew what to say because they had been there, and they would be again. I knew after that, that this was a family of people I wanted to be a part of.

I still don't know for certain where I belong. High school is a time of growth, I still don't know exactly who I am yet, so how can I say which side of medicine is the right one for me? As for what my future will hold, I still don't know. This internship was meant to figure things out, yet I seem to have more questions, but now I know how to pursue them. I would believe you if you told me I will end up on either side of the line, but I know I will strive to include aspects of the other whenever I can, and that was the most important lesson I could have learned.

Over this past year I have asked many medical professionals how they ended up where they are now, and almost all of them told me that they never expected to do what they do, but some action they took at the beginning of their medical journey paved their path for them. I cannot be a radiologist tomorrow, I can however work as an EMT throughout college. This step may have no effect on where I go in my future, and it may change my path forever. Figuring out the first step is half the fight, and through this year's events I have done that. All that is left to do is jump in and follow the current.
Even as a high school freshman, EEE Gifted Internship offered me the opportunity to earn credit by exploring work that interests me. PLTW Intro to Biomedical Sciences course has taught me the importance of biological sciences and research in the medical world. EEE Internship helped me put these theories into practice. Over the summer I began working with Dr. Jussuf Kaifi, a cardiothoracic surgeon and cancer researcher at the University of Missouri. My internship with Dr. Kaifi has been intellectually stimulating and awakened potential abilities not yet known to me. Dr. Kaifi has research expertise in liquid biopsies and the use of circulating cancer biomarkers. The concept of a liquid biopsy is exciting as it would allow for cancer diagnosis with a single blood sample. In collaboration with Dr. Kaifi is his post doctorate student, Dr. Yariswa Manjunath. We conducted research on how phenotypic characteristics of circulating tumor cells may serve as early diagnostic markers of lung cancer.

Our research used a filtration system that allowed us to view circulating tumor cells, or CTCs. Using this system, CTCs were captured on filters, stained, and viewed with a fluorescence under a microscope. Over the 150 hours of my internship, I conducted these experiments and collected data with the Yariswa Manjunath. Through CTC images and data, phenotypic characteristics of circulating tumor cells could be analyzed and give the stage of cancer in patient samples. This method could even give specific characteristics that the cancer had, such as its aggressiveness in progression of stages, or likeliness to advance and spread to another parts of the body. Our analyses could then be used to diagnose cancer with specific characteristics so that future treatments on a patient could be done by targeting these specific traits. These findings are currently still in progress, however my mentors and I are planning to publish our research very soon. I have taken this research to participate in Science Olympiad as well.

This internship has given me crucial insight to the world of medicine and biology. The research that I conducted and the experiences I had in the laboratory were a fulfilling, immersing me in the discovery process. From learning how to operate laboratory equipment, to analyzing microscope images and diagnosing cancer, I have grown intellectually and solidified my interest in biomedical research. I will be continuing this lab work over the summer, and I am excited to learn more about circulating tumor cells and cancer. I am very grateful for this opportunity of researching at a major institution, and thank Dr. Kaifi and Dr. Manjunath for their mentorship.
I have always been interested in the medical field but
never knew exactly what I wanted to do for a career.
My sophomore year of high school I injured my Lateral
Collateral Ligament (LCL) during soccer practice and had
to use crutches and wear a brace on my knee for a couple
months. I did not get the rehabilitation I needed for my knee, and
I lost much of my strength in my right leg. Some days I will still have
problems with it and it will hurt after a practice or workout. After
my injury I became very interested in physical therapy.

My sophomore year I talked to the athletic trainer for Rock Bridge
and sports medicine teacher Greg Nagel about joining his class and
interning for him. That year I requested to have sports medicine as
one of my junior year classes. Returning in the fall, I learned
Greg had gone to Peak Performance and Dawn Threatt had
replaced him at Rock Bridge. Lucky for me, she was also receptive to
mentoring me. I was also taking her Sports Medicine class,
which was ideal as I got to see the real application of what we
were studying.

Days in the training room were always interesting as I
was learning about but when
more people became injured
I was able to watch many
different types of rehabilita-
tion. In the beginning I mainly
viewed the Threatts treating
the athletes but I soon could
help more.

I started to set people up
with ice and heat pads and the
Stim machine which sends
stimulating electric pulses
across the skin and to nerve
strands, these pulses help pre-
vent pain signals from reach-
ing the brain so you won’t feel

By watching and helping I learned so much from the
Threatts and the college students that were conducting clinici-
s in the training room.

The second semester I finished out my internship at
PEAK Sport and Spine. I worked with Dawn and other physical ther-
apists, PTAs, and athletic trainers
in the clinic with a wide variety of
patients. I saw all types of injuries
from head to toe (literally).

For the first few times I went
to the clinic I just observed but
quickly after that I began to help
the patients by demonstrating their
exercise, helping them go through
and finish their exercises, or giving
them ice/heat and hooking them
up to the Stim machine.

One day I gave a patient ultra-
sound therapy on their neck which
was really exciting for me.

I developed many relationships
with the patients knowing their
names and joking around with
them when they came for their
appointments. Having such a
hands-on experience really solid-
ified for me that I do want to go
into physical therapy.

Working with such a wide
variety of injuries and people was
exciting for me because I acquired
a lot of knowledge and good
social skills which you need to be
successful in this field. Without
Dawn being such an amazing
teacher and friend, I don’t know
if I would have continued in this
path. She helped me learn new
things every day and quizzed me
in the clinic with anatomy and
injuries.

I would like to thank Dawn
and Phil Threatt and PEAK Sport
and Spine for giving me such an
amazing opportunity.
I have been fortunate to participate as an intern in the research laboratory of Dr. Tzyh-Chang Hwang at Dalton Cardiovascular Research Center, University of Missouri. Last summer I spent most days at the lab working on electrophysiological recordings of the CFTR (Cystic Fibrosis Transmembrane Conductance Regulator) chloride channel. With the guidance of Dr. Hwang and my mentor, Dr. Yingchun Yu, I was able to gain a deeper understanding of the CFTR channel and how defects in the channel can lead to cystic fibrosis. I was able to start my own project and produce my own results. What made my internship so invaluable to me, however, was what I learned about the research process.

Cystic fibrosis is the most common lethal genetic disease in the United States with nearly 30,000 people currently suffering from it. It is caused by an autosomal recessive genetic mutation that results in buildup of dehydrated mucus in the respiratory and digestive tracts. The CFTR chloride channel is a transmembrane channel protein that regulates the flow of chloride ions through epithelial cells that line our airways and respiratory tracts. In order for the channel to open, it must first be phosphorylated by the cAMP-dependent enzyme protein kinase A (PKA), an enzyme that transfers the phosphate group in ATP to its protein target. Only after this can ATP molecules bind to the channel, open CFTR's gate, and let chloride ions pass through. Depending on the types of mutations in the CFTR gene, the mutated proteins could be defective in biogenesis (i.e., a reduced amount of CFTR proteins synthesized) and/or in gating (i.e., difficulty in opening or staying open).

The research group at Dr. Hwang's lab works with a variety of reagents and mutants to better understand how normal CFTR channels operate, how mutations perturb the normal function of CFTR, and how drugs or drug candidates ameliorate CFTR dysfunction. They hope to use this knowledge to develop drugs to lengthen the lives of those struggling with cystic fibrosis. For my project, I focused on the effects of 2'-deoxy-ATP on channel function. ATP analog 2'-deoxy-ATP, or more simply, dATP, has a structure remarkably similar to that of ATP. The only difference is that dATP is missing a hydroxyl group at 2'-position of the ribose ring; yet, dATP can generate more CFTR activity than ATP. Most interestingly, dATP can generate relatively large amounts of CFTR currents even before channels are exposed to PKA, challenging the idea that CFTR must be phosphorylated before it can open. Why does dATP, which is so structurally similar to ATP, work better? I based my project off this simple yet intriguing question.

Before I could collect any data, I had to learn how to master the patch-clamp technique, the state-of-the-art methodology used to directly monitor CFTR channel openings by measuring ionic current conducted across a small patch of the cell membrane at a given voltage. This technique was developed by Erwin Neher and Bert Sakmann late 1970s and early 1980s, who later won the Nobel prize for their contribution. To carry out patch-clamp experiments, I used a micromanipulator to move a glass pipette towards the cell I wanted to record under a fluorescent microscope. The glass pipette would contain electrolyte solution and a recording electrode connected to an amplifier. I would maneuver the pipette until it touched the cell. A negative pressure inside the pipette would then be applied to facilitate formation of a tight connection between the cell membrane and the glass electrode. This mechanically stable “seal” would allow a portion of membrane to be excised when the pipette was lifted from the cell membrane. This “patch” of membrane would contain functional CFTR channels. The patch would then be soaked in different solutions containing reagents like ATP, dATP, and PKA, depending on the experiment. The effect of these reagents on channel opening would be recorded by the amplifier in real time and saved for later analysis.

While this process seems fairly straightforward, operating the delicate patch-clamp machinery under a microscope requires a lot of technical skill; it took me weeks of practicing with the micromanipulator to carry out just one experiment. I had to learn via trial and error the exact pressure to apply to a cell membrane to get a seal, and the exact speed at which to excise the patch without damaging it. I also had to make my own solutions and glass pipettes, applying the lab skills I have developed through my science classes at Rock Bridge and the Career Center. If any steps were performed incorrectly, I could lose the patch in the middle of a recording and had to start over. I learned the importance of rigorous lab technique and carrying out experiments accurately and precisely. I learned that research requires not only dedicated persistence, but also an open mind to improvement. Instead of avoiding mistakes or smoothing over them, one must actively seek them out and correct them, even if it means starting all over. Revising your lab technique and experimental design over and over again is essential for getting accurate results. Above all, I learned that research takes time and dedication; you can’t expect results overnight.

By the end of the summer, I was able to come to a few conclusions regarding my work with dATP. I saw that dATP elicits more CFTR current than ATP both before and after
Comparison of effect of dATP on WT- and 10SA-CFTR. A. Recording of WT-CFTR current in the presence of 2 mM ATP, 2 mM dATP, 2 mM ATP with PKA, then 2 mM dATP again. B. Recording of 10SA-CFTR current in the presence of 2 mM dATP, 2 mM ATP, potentiator GLPG1A37 and then 2 mM ATP. 10SA is a mutant-CFTR which had its ten serine PKA binding sites in the R-domain removed and replaced with adenines, thus PKA-phosphorylation decreases significantly.

PKA-phosphorylation. However, it works on channels very gradually and doesn't open them to their full extent. dATP appears to work better on mutant CFTR that are unable to be phosphorylated by PKA, which indicates that dATP's mechanism is different from PKA's. These results are interesting, but there are still many questions that need to be answered. For example, why does dATP open channels so gradually as opposed to all at once? I plan to continue my internship this summer to study dATP in greater depth and come to more definitive conclusions about it.

While the technical skills I developed and biochemical knowledge I gained will prove extremely useful to me as I pursue my future career, what made my experience truly invaluable was the insight I got into the world of research. Before my internship, I had never been asked a question that couldn't be found in a textbook or done lab work without knowing the desired results beforehand. In my classes I simply learned what facts were presented to me; my education required little initiative on my part. I quickly learned that conducting research is an entirely different story. During my first week or two, I transitioned from being overwhelmed with information about the CFTR channel to being surprised by how much is still unknown. As I learned more in depth about the channel and its mechanism, it did not take me long to start asking questions I couldn't find the answers to. Dr. Hwang and other lab members always encouraged these questions, saying that it is curiosity that drives the research process. A question leads to an experiment, which often leads to new questions and new experiments. It was curiosity about how dATP works on the CFTR channel that led me to start my project, and I hope to continue to draw inspiration from the unknown as I continue my research.
From the Capitol to the campaign trail, I’ve had an exciting year of internships. First semester, I spent two to three days a week working in the Missouri Attorney General’s Office in Jefferson City. I closed cases, attended mediations and depositions, sent case settlement memos to the Treasurer’s Office, and learned a significant amount about legal processes in discussing them with the top public lawyers in the state. I was in the Labor Department for three months; they didn’t have many people and lent me a small office overlooking a beautiful view of the Missouri River. Around October, I transitioned to the Public Safety Department, a much smaller group that handles many issues of habeas corpus law. The two offices offered very different perspectives and niches of law that both contributed to my understanding of the profession and what I want to do within it.

Second semester, I interned with Attorney General Josh Hawley’s U.S. Senate campaign, transitioning from the legal side to the political side, representing my two main professional areas of interest. I’ve traveled across the state of Missouri on the campaign trail meeting influential leaders and thinkers, and spending plenty of hours in the office planning events, organizing spreadsheets, and communicating with campaign officials. I spent about 25 hours per week working as a volunteer intern from January until March, when all of my hard work paid off (literally) as I became the youngest paid staffer in the office. Since then, I have continued going to many events and coordinating with field experts. This has been an amazing journey. Everyone at the office is kind and accommodating, and it’s been a wonderful place to grow and learn. One of my favorite experiences has been going to Lincoln Day fundraising events leading up to the August primary. These are programs put on by each Missouri county’s Republican Party chairs and host anywhere from one hundred to a thousand party members and leaders. Attendees discuss policies, campaigns, and elections. Candidates speak and engage with the voters and supporters. We eat lots of food and always have a great time. I’ve gone to events like this from Sedalia to Cape Girardeau and I’ve met dozens of state and local officials, talked with many inspirational active citizens. I even got to speak on Josh Hawley’s behalf a few times.

“\n\n from JeffersoN CIty CApItol to CAmpAIgN trAIl: INterNINg wIth Josh hAwley
Dalton Nunamaker

The lessons and experiences of the past few months will never leave me, and I encourage everyone reading this to get involved in any way they can. Vote, march, petition, discuss, sign up, speak up, stand up, and contribute to our Republic. You’ll be forever grateful that you did.”

Beyond the personal growth, it’s been wonderful to participate in such a lively and engaged atmosphere. Witnessing the craziness of a campaign has only solidified my belief that this exciting arena is where I want to spend my life: No day is ever the same, they are challenging and exciting, forcing me to learn something new, and I’ve gotten to meet interesting people who are dedicated to active democracy. Watching our democratic process unfold has been a profound experience for me.

I’m still continuing as a paid staffer and have many things left to do before college starts in August and the November general election for this campaign. Now I’m deciding whether to attend Washington University in Missouri (closer to the campaign) or Georgetown University in Washington, D.C. (closer to Josh if he wins). Regardless of the result, this has been an extremely formative period in my life: I’ve gotten a front seat to what likely will be one of the most watched and studied senatorial elections of all time. The lessons and experiences of the past few months will never leave me and I encourage everyone reading this to get involved in any way they can. Vote, march, petition, discuss, sign up, speak up, stand up, and contribute to our Republic. You’ll be forever grateful that you did.
Exploring Various Areas Within Performance Music, Teaching, and Music Therapy

I
n August, I began work with Pack Matthews, a local business owner of a piano tuning company and founder of SoulSeat. He asked me to sing for an upcoming local performance. Pack specializes in jazz piano and performs in Columbia at the Daniel Boone Public Library on Sundays, and multiple music venues including restaurants such as Murray’s. We rehearsed songs such as “Autumn Hymn,” “Don’t You Worry ’Bout a Thing,” and “Angel Eyes.” Then we performed these at the Library on Sunday. In September, he invited me to a vocal jazz summit at the United Universalist Church where I observed the singers who frequented the event every Thursday night of each month. Pack was the primary pianist for the church and the event, backed by a band that volunteered their time. I sang one song that night and the rest of the time, wrote down the techniques each singer would present and how I observed experienced and new performers’ confidence on stage compared to my own confidence on a stage. The biggest thing that I learned in this experience is how “to perform like I know what I’m doing” even if I don’t. It’s okay to make things up when it comes to jazz music, as long as you are within your tonal boundaries. I’ve learned that it’s also okay to express your abilities and stretch them as well; go beyond your limits. I am thankful for my time with Pack Matthews, and hope to continue collaborating in the future.

“I wasn’t sure what to expect in my first job with children with disabilities, when they feel they have no other option but to scream and cry to get the help of an adult. The next job was to visit with each of the nurses on the floor. Upon meeting with each nurse, Emily was given the details of how the patient slept through the night, what their day would look like that day and how they were doing psychologically (if there were any signs of sadness, depression, hyperactivity, etc. as result of surgery or adaption to hospital life). The kids with the highest rates of these symptoms would get Emily’s attention first for the day, which would be repeated at about noon to reassure there were no changes. She met with three patients who had just entered the hospital, one of which who had just gone through surgery, and offered her services to the parent and the child by talking them about what her job was and leaving her number on the board for them to call. It was also important in this moment to get to know the child. She wrote down what the age of the child, how many times they had been in the hospital for their condition, what kind of music they listened to and whether or not they would be interested in her services.

Continued on page 68
After collecting this information, we entered the Newborn Intensive Care Unit, where we met with three babies. This job is slightly different from her other jobs in the PICU because newborns will respond differently to the sound of music in that they will have no verbal communication, so the only way to see if they are engaging with you is eye contact, facial expression, and motor movement. Newborns in the NICU have more trouble displaying these actions than other newborn babies. Emily would begin by singing a “Hello, [name]” song, followed by lullabies while dangling a toy above the baby. Their ability to grab or hold on to the toy while still making eye contact with Emily shows progress. Another job Emily has, is a medical device called the PAL which Emily herself developed and created specifically for working with newborns. The device works by connecting a pacifier to the device with plays music every time the baby sucks on the pacifier. This is made to encourage sucking, which many newborns in the NICU have trouble doing. After all of her rounds were completed in the NICU, Emily took a break in her office to write down her patients for the afternoon. She also spoke to me about various degrees and colleges to consider as I go down this path. Her advice to me was to find what environment fits best for me. A major difference between her and other music therapists is that she is based in a hospital environment, whereas many other music therapists work for themselves in a privately-owned business. To do this sort of job in music therapy, I would be considered a private business owner and have to establish myself with various other hospitals, whereas Emily is already established with hospital. Another difference is that Emily never knows what songs she needs to play or what games she needs to do until she gets to the hospital and is briefed by the staff, and she’s often subject to “go-with-the-flow” of the day. A music therapist in her own business would be called upon due to the intensity of the patient.

In August I began meeting with William Rosen’s Community Skills classes during my internship hour. This experience made me a better teacher, and a better person. I have learned how to work with students with various challenges and respond to the many reactions that may occur in the classroom. Mr. Rosen often used my YouTube singing videos to calm students, or as a reward for good work and behavior. One job I had in the classroom was to observe and work with the students on their math work. All of first semester the class had practiced working with money, counting money and identifying coins. They were given fake paper money that they had to carry in a wallet at all times. They had the opportunity to purchase foods and drinks in the classroom each day for practice. This practice was kept up through the remainder of the school year. Towards the end of the semester they were given mock debit cards and began working with debit and credit. It was amazing how far many of the students had come at the end of the year and it was inspiring knowing that I got to help them through it. Every day I entered the classroom, I would help the students with their warm-up worksheets in which they were given a number (738, for example) and they had to describe the number in word form, number blocks, and real-world math problems using that number. Often times, they would have to come up with math problem to try to “stump” Mr. Rosen or me. They would be given a lesson that day, led by Mr. Rosen and assisted by myself and the occasional student teacher. The class would have “Music Days,” “Art Days,” “Food Days” and whatever other type of “day” they could come up with on Fridays. On many of the occasions, we played my performances off of YouTube and on one day, I gave a classroom lesson on music. It was called “Connecting Music to Feeling” and demonstrated how music is in everything we do and that it can be used as a learning tool inside the classroom and out.

In my second semester of assisted teaching Special Education, I focused my learning on seeing how these students interacted with me once they knew me better. At this point, I had spent a full semester with them and knew all of them very well, as they knew me very well too. Once we made that connection, it was much easier for me to get them to do their work or listen when I was speaking. I since learned that trust goes a long way.
Once these students knew that I could be trusted with their learning disabilities, they were more likely to interact with me, ask questions, or be vulnerable around me. Beginning around Spring Break of second semester, I created a research project that I would conduct with the class. The project is called, “Project Musical Behavior” and researches the various behaviors in which were elicited in the classroom when connected with a certain song. I concluded that a heightened sense of behavior can be affected by music of a genre matching the expression. Details of this experiment are shown in the Parent Permission Slip and Information Sheet at the bottom of this internship write up.

Working with these students in the past year has enhanced my ability to work with students of all types and I am so thankful for the experience. I have formed a relationship with every student in Community Skills, which I believe is the most important part of the experience. This reminds me that the best teachers seek to form relationships with their students; if students know teachers care, they are more receptive to learning. This was a great field experience for me and I am thankful for Mr. Rosen’s trust to allow me to help in his classroom.

I also alternated my EEE Internship working with preschoolers aged three to five in Title One Preschool located in the basement of Rock Bridge High School. During my time there I would read to them, read with them, worked with them on spelling, the alphabet, and identifying objects. A typical day for me in the classroom starts by greeting the children right when I enter the classroom. As instructed by Ms. Chika and Ms. Linda, this communication is very important to the kids because they need time to figure out they can trust me. As they enter activity time either Ms. Chika or Ms. Linda guides the class in an activity where they get to touch and move around building blocks, demonstrate how things float, and paint. After their activity time they practice spelling their first and last names and upon completion of this task they are to list out the games and/or toys they intend to play with during work time to either me or Ms. Chika. I have had the pleasure of seeing kids get better at this with time, with tremendous work ethic. Work time lasts for about 30 minutes and then the kids must debrief to the teachers and tell them what they did during work time. This practice, I have learned, reinforces memory and describing what they’re doing. They earn a snack time and reading time following this debrief and then they go outside to the playsets.

Working with these kids has, like the Special Education Internship, increased my teaching abilities and ability to accommodate children’s differences. No kid is the same and especially with preschoolers, they all want you to be somewhere different at once but in learning how to balance this I have been able to say “I’ll be there in a minute” and deal with the repercussions of this afterward, just like any other teacher. After a full year working with these children, I am excited to see where this newfound knowledge takes me in life. Children are spectacular, as well as complicated, but either way they are the future and it warms my heart to know that I was a part of their growth. To me, behavior develops strongly in the classroom and it matters who you are around when you are younger. Ms. Chika and Ms. Linda are phenomenal influences on children and have taught me how to be so as well!

Here is a YouTube link to me singing “Angel Eyes.”
https://youtu.be/fTPzJJss5YQ

Here is a YouTube link to me singing “Make You Feel My Love” https://www.youtube.com/watch?v=aYWD1YDOb7k
geNetIC dIsseCtIoN of the role of glIA Cells
to better uNderstANd NeurologICAl dIsorders

DHARTI PATEL

This past summer, I started an internship with Carlos Rive-ra, a graduate student, and Dr. Bing Zhang at Tucker Hall at the University of Missouri, Division of Biological Sciences. At my first meeting with Dr. Zhang, I was intrigued with his research interests in neurogenetics as well as his devoted investment in his students. Going into this project, I had high hopes on learning more about genetics and neurobiology. This experience has been remarkable; I have not only learned more about an interesting subject, but I have also made great connections and attained valuable skills and lab experience.

When I started, I was told that I would be working with glial cells. I kept wondering whether research related to glial cells would capture my interest since I had only learned about neurons in depth at school. However, as I began learning more and more about the features and roles of glial cells, I became further interested in the research behind applying it to neurological disorders and identifying therapeutic targets.

Up to recently, neurons have been the focus of research with glial cells in the background. Many scientists see them as just a helping hand in the nervous system when in fact, glia are a gold mine. Recent studies show that glia are essential to the development and function of the nervous system, as well as to the health of neurons. For our research, we overexpressed TRPA1, an ion channel, in glial cells to determine its consequences on the learning abilities of Drosophila melanogaster, common fruit flies. Through our study, we found that this indeed does have an impact as the learning capabilities of flies were diminished when TRPA1 was overexpressed through a heat shock. This might be because the synapses were stretched, correlated with the excessive and abnormal firing of neurons, and could not form any more connections, leading to diminished learning capacity.

We mated UAS TRPA1 flies with REPO GAL4 flies to express TRPA1 in glial cells (TRPA1-UAS/Repo-GAL4). By looking at the Proboscis Extension Reflex (PER) assay, we can determine if glia play a role in this learning behavior. We further expressed UAS TRPA1 in to neuronal cells by crossing to C155 GAL4 flies (TRPA1-UAS/c155-GAL4). The PER assay is used to teach the flies to learn and test their memory through their sugar preference and quinine, a negative stimulus. By administering heat shocks, we will test the flies on their ability to learn, potentially revealing glia-neuron connections are required for learning.

The purpose of this research is to determine the role
of glia in learning and memory. The basic functions of glia-neuron communication have yet to be fully understood. Through exploring learning and memory behaviors in D. melanogaster, we hope to gain a basic understanding of how glia can modulate the learning and memory process. The research that we conducted shows that 1.) We can train flies to avoid sugar water. 2.) TRPA1 overexpression and activation with heat shock in glial cells caused a decrease in performance in Drosophila. 3.) TRPA1 overexpression and activation with heat shock in neurons did not cause a decrease in performance. This suggests that activating glia or neurons affects memory consolidation differently. This unique behavior was only observed when activating glial cells. We are unclear if this means heat shocking in glial expression of TRPA1 can change the flies’ preference to sugar, increase lethargy, or undergoes a different learning pathway. The TRPA1/C155 flies demonstrate that neurons may have anesthesia-resistant memory as they learned well through the PER assay despite becoming incapacitated due to the heat shocks. Flies with glial expression and activation of TRPA1 learned, however, they may have a new mode of learning as becoming incapacitated decreased their learning performance.

Overall, this internship has allowed me grow throughout high school, providing a great learning experience. I have not only acquired a vast amount of knowledge about glia cells and lab procedures, but I’ve also formed friendships with the graduate students in the lab. This internship made me realize the immense potential of neurogenetics and just research in general to change the world for the better. I am indebted to everyone in this lab who have allowed me to enjoy this rich experience.
I spent summer 2017 in Environmental Engineering lab of Dr. Maria Fidalgo. While environmental engineering interests me, computational modeling interests me even more. Thankfully Dr. Fidalgo tailored my experience to my interests and allowed me to create computational models of engineered nanoparticles, especially titanium dioxide. Titanium Dioxide is (TiO2) is a naturally occurring mineral, appearing like a matte white power. It dioxide is widely known for its excellent photocatalytic abilities, and has a great ability to absorb UV light. Thus, it is a key ingredient in sunscreens, paint, coatings, self-cleaning glass, and ceramics. It might be surprising to learn that Titanium Dioxide is safe to eat, but breathing it is not good and has been linked to lung cancer. I was tasked with learning the SimpleBox 4.0 and calculating how much Titanium Dioxide is found in air, earth, and water.

Engineered nanoparticles are created to have special functions with their shape, size, and surface properties such as: catalytic properties, improved strength, enhanced thermal and electrical conductivity, and controlled release of host molecules. These enhancements allow engineered nanoparticles to be used in many applications, and with their widespread use across the globe, it ultimately leads them to have a profound impact on the environment. Computational modeling is the use of computers to simulate and study the behavior of complex systems using mathematics, physics, and computer science. Computational modeling allows the user to input numerous variables and adjust those variables to observe outcomes in the model. Observing the model can help make predictions of the real system (the environment).

SimpleBox 4.0-nano was the computational model we used to study the effects of engineered nanoparticles on the environment. This computational model runs on Microsoft Excel and simulates environmental effects of particles as mass flows between a series of well-mixed boxes of air, water, sediment, and soil on regional, continental, and global scales. It has around 300 inputs that allow the user to plug in specific details for their nanoparticle, as well as emission rates and landscape factors. The significant amount of input variables make the model more accurate and custom based on the user’s knowledge and needs. I was responsible for researching these inputs for titanium dioxide and making my best predictions for inputs that didn't have any pre-existing research.

At the end of my research, I delivered a 20 page paper of my inputs and findings to Dr. Fidalgo and Mrs. Struchtemeyer. I also used this paper for a Science Olympiad project. In summary, the good news was that the computational model showed that only 5% of the air contains Titanium Dioxide (likely from white paints), which also lends that painters should be wearing protection for their lungs. The bad news was the same model predicted Titanium Dioxide could be present in 20% of fresh water (likely from swimmers using sunscreen). Furthermore, it is present around 10% in natural soil and up to 30% in agricultural soil (likely from water runoff). It is not yet known how these levels of Titanium Dioxide might affect ecosystems and humans.

In this internship I learned many new things about computer science and the mathematics behind computer modeling. This experience taught me not only about computational modeling, but also how extremely small things such as nanoparticles can have a big impact on the environment and its health.
I’ve always been interested in business, and was thrilled when I got the opportunity to intern with Erik Morse in Human Resources at Veterans United in Columbia Missouri. Founded in 2002, and headquartered in Columbia, Veterans United is a full-service mortgage lender guaranteed by the Department of Veterans Affairs that primarily supplies loans to military veterans and their families. VU is the fourth-largest employer in Boone County with over 1,800 employees. They have 26 nationwide locations—seventeen of which are in Columbia, Missouri.

Erik set up our first meeting at a local coffee shop in Columbia to begin my internship, and the fact that this meeting took place outside of the office building made me feel that at ease and valued. At this first meeting, we discussed what I wanted to learn about VU, my interests, and what questions I had about how the year would progress. One goal I had in mind in doing this internship was to figure out what path within the business field I may want to pursue. While I took many classes at the Career Center related to business, I wanted first-hand experience on what makes a successful business and how the various departments work together to support its overall success.

Veterans United is not limited to one building, I had the opportunity to work at each location. Each location is defined or named, using the military alphabet; for example, Alpha, Bravo, Charlie, Delta and so on. Each location is unique, but all have the same purpose. That purpose is to provide excellent service to their consumers as well as provide a working environment that engages and respects their employees. I experienced first-hand, how the Human Resource department greets their new employees. I was invited to participate in an orientation that every new employee at Veterans United experiences. It didn’t consist of sitting in a meeting, or watching a PowerPoint on how to be a good employee. Instead, we were shuttled off to downtown Columbia to design our own t-shirt at Fast Yeti, create a work of art at Canvas on Broadway, and enjoy lunch at Sophia’s. For me, that experience set the tone for how this business treats its employees, which is the importance of individual ideas coupled with the value of teamwork. Their buildings have murals on the walls like “Be Passionate” and “Enhance Lives.”

Over time, I was introduced to the various departments within Veterans United including production, marketing, human resources, sales, and media. Within each of these departments, I learned that the relationship between the various departments was vital to the success of the business. Because I worked closely with Erik in Human Resources, my experience was primarily focused on hiring good people. Within this department, I worked on projects that were aimed at how to get to know employees, and what makes employees enjoy what they do. One project I worked on was titled “Map Your Path,” which involved the Human Resources department drafting questions and ideas for employees that revolved around personality type, interests and strengths. Those responses will later help develop company-wide activities that cater to the various interests of the group. These activities are part of what helps to drive the unique culture at VU.

Veterans United is also a business that gives back to the community, particularly in Boone County. During my time there, I witnessed VU giving back to numerous organizations including Big Brothers, Big Sisters, The Food Bank, and Welcome Home. On one occasion I traveled with other employees to the Veteran’s Hospital and helped to facilitate games and various activities for current patients. This type of engagement is what drives the VU culture of helping others, whether it is helping with significant decisions like financial security, or casual conversations with someone in need.

My internship at Veterans United was an amazing experience. Through it, I not only observed and learned the strategies of a well-developed business, but I experienced the many facets that drive and empower those that work there to help others. Employee investment, innovation, and community involvement drives a positive workplace. I’ve learned how important it is to listen to the needs of others and to know that creativity and innovation relies on the voices of many. I’m grateful to Erik and the rest of the VU team for opening their work world to me, and, as I am attending MU, I plan to keep in touch as I would like to work for VU someday.
I went through the classic I-want-to-be-a-teacher phase in elementary school. In first grade, I wanted to be a first grade teacher, in second grade, I wanted to teach second grade, and so on until about sixth grade when I started experimenting some other career ideas. After considering other fields, including psychology, meteorology, and physics, the idea of teaching came back to me. There wasn’t one spontaneous moment where teaching made its return into my life; rather, it was a culmination of many of my peers and teachers telling me I should consider teaching. When I heard about the internship program at RBHS, I decided this would be the perfect chance to test out teaching once again, but this time in a real way, aside from just the dreams of what I would possibly be one day.

Luckily, I was still in contact with one of my favorite teachers from elementary school, my fifth grade teacher Mrs. Allie Pennington. She and I had always felt a special student-teacher bond when I was younger, likely because we shared similar personalities and were both “Allie Ps.” I sent her an email asking if she would be interested in hosting me for the semester at Beulah Ralph Elementary School, and even six years after being her student, I could still imagine her facial expression through her words in the response. She was ecstatic about having me in her classroom, which made me equally excited about starting this experience.

On the first day of my internship, I was introduced to the school and got a first-look behind the scenes of an elementary school. During recess, I walked with Mrs. Pennington to the office where she picked up her mail and spoke with the school nurse about having a vision test done on one of her newer students. This student, she said, was entering public school for the first time after many years of homeschooling, so she was curious to see where he was in terms of his education, and she wanted to make sure everything was fine with his eyes before she started testing his reading ability. We walked down the hallway to the school counseling office, where Mrs. Pennington updated the counselor on the behaviors of students they had been observing over the last couple of weeks. I remember how in awe I was after the first day to see all of the twists and turns that go into making an elementary school run so efficiently and effectively for the students. I reflected on my days as an elementary student and realized how oblivious I was to everything going on around me to ensure I had a positive, enriching experience. From that day on, I was so excited to learn how to recreate that experience for my future students.

I go to my Beulah Ralph every “A” day during second hour. While it’s nice to have a set time to go each day, it’s frustrating sometimes because of the schooling schedule. In other internships, the student may get to experience their host’s many diverse responsibilities that happen to fall during the hour their intern is there, but in an elementary school, the students follow the same schedule every day. Therefore, I’m at Beulah with the students during their writing time every single day. While I like teaching writing and I’m interested in how to teach students how to be better writers, I wish I could be there during different times throughout the day to see how the kids learn other subjects, such as math, science, or reading. I’ve been trying to find other times throughout the day to go to my internship, such as my fourth hour on “B” days that I otherwise use for studying. The problem with going so late in the day, however, is that elementary schools dismiss earlier than high schools, so I don’t get very much time with the students at the end of the day. I’m planning on taking this class again next year, so hopefully then I will get to spend some time in the classroom where the students are engaging in other subjects.

Daily life in my internship begins with talking with Mrs. Pennington about what the writing time entails that...
day, and she catches me up on any behavioral or home-life concerns that I need to be aware of when working with the students. For example, there was a student who was having troubles with her parents at home. Mrs. Pennington told me to let her go see the school counselor whenever she asked, as she wasn't just using the question as a way to get out of class. Having those conversations with Mrs. Pennington allows me to see the reality of students' lives and give them the school experience they need to feel successful and comfortable in school, which is a huge part of what makes for a good teacher. Additionally, on some days, Mrs. Pennington would tell me who she wanted me to work with students one-on-one, and then she would explain to me how they learned the best. Those explanations were important to my growth in becoming an educator because it has helped me start to adjust to students' learning styles. Creativity is one very important aspect of being a good teacher because all students process content differently, and it will be my job as their educator to cater to those abilities and show them how to learn using their unique skills. After I speak with Mrs. Pennington each day, she explains to the fourth graders what their responsibilities are for that day in writing, and then they’re sent back to their desks and begin working, and I usually wander around asking the students’ questions.

Lately, the class has been studying various formats of essay writing, and I’ve been there to help them break down argumentative and editorial essays. They learn how to write the essay through a planning sheet that divides up each part of the essay for them, and they simply have to take the information given to them in verbal or written notes and transfer it to an essay outline. Once they’re comfortable with the flow of their outline, they write out their essay with the outline as a guide. As an AP student and journalist who spends countless hours putting thoughts together in essays formats, the hardest part of teaching writing has been resisting the urge to just tell the struggling students what they should write down. While the primary purpose of the outlining process is to teach the styles of writing, they must learn how to formulate their own thoughts in ideas in order to truly learn how to craft an essay. Sometimes it feels like it would be easier to just tell the student word-for-word the arguments they should make in each section, but it’s my role as their teacher to let them think their way through, while only guiding their ability to figure it out, rather than giving them my entire thought process and personal ideas. I have found that it’s so satisfying to watch a student’s mind finally click with the idea that works to convey their argument, and seeing their ability to have those “aha!” moments has helped me remember that they are capability of doing their own thinking, and I just have to be there to make sure they know the power of their own brains.

My favorite part of my internship thus far has been the days where I work with students one-on-one. Mrs. Pennington often sends me out into the hallway or to the back table with students who are struggling to grasp the day’s writing concept. I worried, initially, that I wouldn’t be able to answer their questions or that they wouldn’t feel comfortable with me enough to speak out about what their confused about. I was happily proven wrong. I was able to use my own skills in writing to teach them how I think through problems and form ideas, and I finally saw the natural skills I possess in helping those around me that my peers and teachers had told me so many times before. Seeing the kids—my students—put their pencil to paper with the skills that came from my mind brought my gift to reality, and it still brings me so much joy every time one of them says “ohhhh, now I get it” or “okay, that makes sense.” It makes me feel as if I made an impact on their lives, even if it’s something as simple as crafting a concluding paragraph to a fourth grade essay.

In high school, there seems to be such a lack of desire to explore academic capacity. The kids I spend time with every other day have such a passion for learning, even if they don’t consciously know it. They strive to be better at what they do and they push me to want to give them as many of my skills as possible. They aren’t closed off to me as I thought they’d be; rather, they vulnerably bring their questions and weaknesses to me and make it obvious they want my help more than anything. They want my help not because they don’t want to do the work themselves, but that they want so badly to understand how to complete every task with their best quality of work. Their passion for anything is the light in a dark time we live in of seemingly hopelessness and dying enthusiasm. Working with these students this semester has given me a new sense of hope in the world’s future, because every young life is a new start, a new perspective, I hope to change the world for these young people who will change our world.

At one of my internship sessions, I noticed many students being rewarding for their good behavior by adding a sticker to an index card with their name on it. After each index card has a certain number of stickers, the student levels up and gets a new index card with their name written in a different color. The excitement I saw in the kids’ eyes as they put stickers on their cards led me to believe there was some sort of incentive for leveling up, so I asked Mrs. Pennington what the prize was at the top level. Her reply was simple. There is no top level, and there is no prize for whoever is the highest at the end of the year. The kids just want to see how far they can go.
Starting last June, I volunteered as an intern for the OB/GYN Research Department at the University of Missouri. There, I worked under Dr. Susan Nagel, and Lab Technician Jennifer Cornelius in contribution to their study measuring the effect of hydraulic fracking chemicals on endocrine disrupting activity.

Endocrine disruptors are chemicals that can interfere with endocrine (or hormone) systems at certain doses. These disruptions can cause cancerous tumors, birth defects, and other developmental disorders. Any system in the body controlled by hormones can be derailed by hormone disruptors. Endocrine disruptors may be associated with the development of learning disabilities, severe attention deficit disorder, cognitive and brain development problems; deformations of the body (including limbs); breast cancer, prostate cancer, thyroid and other cancers; sexual development problems such as feminizing of males or masculinizing effects on females, etc.

In recent years, big energy companies have increased their dependence on domestic natural gas. By mixing millions of gallons of water with chemicals that are injected deep underground, these gases and oils can be released and mined. More than 1,000 chemicals are used throughout the industry, and more than 100 have been identified as Endocrine Disrupting Chemicals (EDCs). EDCs act on estrogen receptors that result in enzymatic degradation, alteration of hormonal concentrations, and changes in coactivator and corepressor genes.

In 2015, samples of groundwater were taken from 21 different locations in relation to surface water flow and spud concentration (drilling locations) in the Pinedale, Wyoming region to be analyzed by the University lab.

After identifying respective chemical concentrations in the sample collection, the samples were diluted in a tissue culture medium of mammalian gene assays with ERα peptides acting as a carrier, allowing the EDCs to bind with the assays in order to elicit a response through the expression of glowing luciferase—the brighter the glow, the higher the endocrine disrupting activity.

In order to better understand how locations of well spuds affected the chemical analysis, I was assigned the task to log every oil, gas, and disposal well within a 4 kilometer radius of each site. Using the online Wyoming Reservoir Information Tool, I compiled dozens of spreadsheets in Microsoft Excel to manually count and record spuds from sites through a strict system of instructions. Collectively, I analyzed over 10,000 wells based on their age, classification, and activity. To keep track of my work, I wrote notes and tracked changes of evolving method in a lab notebook. If I ever had a question about confusing data, I was able to set up meetings with Cornelius, when we discussed issues and changes to avoid errors. Sometimes, I had to restart weeks of work if Dr. Nagel or Cornelius discovered a more efficient or meaningful collection process that would make their experiment more accurate.

Over the months, I have acquired new skills through geospatial analysis, large volumes of data, and the pace of lab worked coupled with intricate detail. I could not have completed my work without the guidance, patience, and hospitality of my supervisors and their students at the lab. Working with the OB/GYN lab has been an enlightening experience, further proving to me that research has the power to uncover the truth of harmful practices within the fracking industry, affecting the health of those that depend on potentially contaminated groundwater. Because of this special opportunity, I am inspired to continue to understand the negative impacts of human consumption on interactions between the geological and biological systems.
During fall semester I interned with Mark Koch at the Missouri Prosecuting Attorney’s Office. There I learned that he is a Victim Advocate who focuses on helping victims of domestic violence. Since I want to major in Psychology and then go to Law School, this seemed a good fit. Mr. Koch explained that Victim Advocates focus on ensuring that no one operates in a vacuum. This is especially important within government institutions, like law, where things can get bogged down in paperwork rather than the individuals involved. For example, all are guaranteed a day in court, but what if they cannot get transportation there? What if after domestic violence the victim feels that she cannot go back to work due to fear? Victim Advocates in the Justice System help ensure that victims not only get a hearing, but have access to all the resources possible.

I often met with victims to ask about their needs. He and I listened to them cry, scream, and overcome. This was a truly impactful experience because it showed me the human side of the law. So often our laws and systems are based on small snapshots of how people live, but not the totality of their existence. Mr. Koch’s job was to ensure that the Justice System brought justice to all aspects of a victim’s life and make sure that they were able to return to a sense of normalcy. This opportunity was so amazing because it made me recognize that my future work can and should bridge psychology and the law.

I also read Missoula: Rape and the Justice System in a College Town by Jon Krakauer and Policy Paradox by Deborah Stone. Missoula taught me what can happen in the aftermath of such a horrendous crime and how victims are changed forever. It also reinforced what I was learning in the courtroom with Mr. Koch. Often times it seemed as though one side would surely win, but the judge did not always settle on that side. This taught me that attorneys need to be quick on their feet and not only think of strong arguments, but creative ones.

It also reminded me the importance of having a Victim Advocate, like Mr. Koch, to bridge this gap. Policy Paradox showed me the shifting morals and continual trade off whenever any policy is enacted. It is ironically human to shift on major issues and not take human needs into account, thus showing that Mr. Koch’s work is vital to the Justice Systems true efficacy and job: helping those who need it when they need it most.

Spring semester I decided to further my work with Criminal Justice with a young woman named Steph, a Criminal Justice Major at the University of Missouri who is also on a Pre-Medical track has been able to speak both personally and intellectually about issues of domestic violence and how the justice system should function as a whole. A victim of domestic violence herself, she brought a very personal viewpoint to this topic. She and I examined how crime and the justice system impact a person’s medical needs. Ranging from ideas such as therapy and psychological assistance it becomes clear that there is a massive stigma around domestic violence. Here I was able to apply some of what I have learned at the Prosecuting Attorney’s Office and look at how Victim’s Advocacy is just one way of trying to solve the issues that victims face. One example of this is Thurman v. City of Torrington. Settled in 1985, Tracey Thurman was suing the Torrington Police Department, claiming that she did not have equal protection under the law from her abusive husband. This case in particular is so critical to the discussion of domestic violence in America because it highlights the pervasiveness and the passive way that society often handles these sorts of issues. By taking what can be learned from Thurman v. City of Torrington and looking at similar cases and working on statistical analysis of various meta-analysis case studies about domestic violence we were able to look at the rise and fall of domestic violence and, mathematically, determine risk factors.

We also began to look at this issue in the context of politics. One of the most major issues in Missouri Politics revolves around Governor Greitens’ alleged assault in an extra-marital affair. This has raised questions about the Missouri Gubernatorial Line of Succession and how, in general, do we deal with politicians that are accused of sexual assault. Coming out of the 2016 Presidential Race, this was particularly salient. Through research I found that these sorts of negative discussions often dissuade women from coming forward because it makes their abusers seem highly powerful and many women fear a backlash.
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The more that these sorts of issues are handled improperly and lackadaisically by our governments on any scale, all people (especially women) suffer. Through this work I was able to learn about niche legal details and how the laws that lawyers work with are decided and what social pressures drive those legislative decisions.

My time at the Prosecuting Attorney’s Office taught about the importance of how the law can truly aid victims. I was reminded of what the Justice System is supposed to do, which is help all those who enter it. Interning with Mr. Koch showed me that psychology does have a place in the law and that my future work will be important, but for it to be helpful I have to ensure that my mind is set on so much more than just the court date because the person that I am representing lives outside of the day that I spend with them and that my actions should help them for all of those days. Working with Steph allowed me to be with a victim of domestic violence who had dedicated her life to stopping it. I was able to approach these complex issues in a far more grassroots way than I was able to with Mr. Koch. Steph allowed me to look at three critical ways that lawyers and law makers can impact either positive or negative change, but also how societal rhetoric around such issues changes the discussion. I was able to bridge my passions of psychology, politics, and the law into one discussion and learn the fact about how and why domestic violence occurs, allowing me to begin to extrapolate ideas on how I can apply a future career in the legal system to impacting real change for those in our society.
During my 45 hours of interning at Central Missouri Orthodontics, I not only learned about what goes on in the day to day life of an orthodontist, but also how to talk to patients and parents, and how to reassure and form a relationship with each one of them. I enjoyed my time at Dr. Taylor’s office. Every day I came in to a smiling, welcoming staff and watched them work through their afternoon appointments. I spent most of my time watching Dr. Taylor and his staff treat patients. The majority of whom were having their teeth straightened.

There was not much for me to do hands-on wise because they work on real people all day, but they had models of teeth that they allowed me to practice putting wires and the colored ties on and off. Other than that, though, I mostly just watched the professionals do their jobs. I got to see them every day at their most busy time, which is from about 2:00 pm to 4:00 pm. At that time, almost all of the patient chairs are full and they do back to back braces tightening. That is when the orthodontic assistants remove the ties and wires from the patient’s braces, and then Dr. Taylor comes over to look at the tooth positioning and jaw alignment and tells the assistant how he wants them to apply the next round of wires, ties, and rubber bands if they are there yet. That is considered just a regular monthly check up/tightening. Other than that, I saw several other types of appointments as well. I saw several kids getting their braces on for the first time, as well as getting them officially removed.

The orthodontist is the only one who can actually put the braces on patients, that is something an orthodontic assistant cannot do. They use a special type of glue so that the braces stay stuck to the teeth, so when they take the braces off, they have to use a tool that grinds the glue off of the teeth. I have never had braces so I did not know this, but apparently the grinder shoots very cold air out when it is on, so people with sensitive teeth have a hard time with this.

Other kinds of appointments I saw include broken or poking wires, popped ties, bite plate adjustments, retainer checks, and rearranging placement of braces. The patients names and picture are on the computer, but it amazed me how Dr. Taylor was able to remember specific things about every patient. He would ask them how basketball, track, band, or whatever they did was going. This personal touch makes the patient feel important and welcome, and Dr. Taylor said its good for him too as he enjoys getting to know people as he straightens their teeth. I also got to see how Invisalign works. Since Invisalign is a separate company, the orthodontic assistant takes a 3D photograph of the patient’s mouth and sends that to Invisalign and then Invisalign sends the retainer to the office.

To be honest, after completion of this internship, I realized that orthodontics is no longer what I am interested in pursuing, but that is not a bad thing in my mind at all. Without having done this internship, I would not have been able to see the parts of the job that are unappealing to me as a career. Overall, I had a great experience interning at CMO, and I am very thankful for the opportunity to see orthodontics up close like this, and to be able to refocus my plans for college now instead of later.
During my first semester internship, I shadowed my pediatrician, Dr. Anuradha Rajagopalan, at the South Providence Pediatrics. I also read Between Expectations, by Meghan MacLean Weir, a reflection on her year in pediatric residency. Additionally, I volunteered for Myanmar Christian Fellowship (MCFC) Sunday School program. I would like to thank Dr. Rajagopalan, Mrs. Struchtemeyer, the director of the MCFC Sunday School program, and others who made this internship experience possible. Through this experience, I have learned a lot about working with children from many different backgrounds, and I believe these lessons will continue to serve great importance for the rest of my life.

Dr. Rajagopalan has been my pediatrician since 2010, and until this job shadow, I saw her clinic through the lens of a patient. Shadowing her daily life allowed me to see patients through her eyes. In the beginning of October, I began my job shadow experience at the South Providence Pediatrics.

On my first day of the job shadow, I met Shawn, Dr. Rajagopalan's secretary, who helped me schedule the job shadow dates by printing and explaining Dr. Rajagopalan's hectic schedule. I also met Annie, Dr. Rajagopalan's nurse, who also always informed me about the patients currently in the room with the doctor, along with how many patients were left for the day and the reasons for their visits.

Through this experience of shadowing Dr. Rajagopalan, I learned the procedures before meeting patients, such as reviewing their medical histories, making sure their vital signs are normal, and checking that they are growing at a healthy rate. During their visit, we checked their eyes, nose, ears, throat, and sometimes also their balance, coordination, and reflexes. Based on their symptoms and the result of the checkups, patients and their parents are sometimes be given questionnaires on health conditions and disorders such as depression and ADHD. I realized how important it was for parents to comfortably ask questions and notify the pediatrician of any concerns they have for their kids as it allows the pediatrician to carefully and accurately assess the situation. After the visits Dr. Rajagopalan updated the results of the visit onto the patient's medical records, wrote notes to their school, if needed, and prescribed medications as needed.

During my job shadow experience, I noticed some of the challenges Dr. Rajagopalan faces in her clinic. We sometimes encountered parents who did not want their children to be vaccinated, due to thinking vaccinations can contain...
harmful ingredients and can cause serious and sometimes fatal side effects. These beliefs may be true, but according to American Academy of Pediatrics, vaccinations are 90%-99% effective in preventing diseases and only one in a million children have the chance of experiencing a dangerous allergic reaction to the vaccines.

Also, although ingredients such as thimerosal, formaldehyde, and aluminum can be harmful in large doses, they are perfectly safe in the small amounts used in vaccines. Vaccines are saving the lives of many children around the world by preventing deadly diseases that are much more dangerous than the small amounts of ‘harmful’ ingredients in the vaccines.

Additionally, I’ve volunteered for the Myanmar Christian Fellowship (MCFC) Sunday school program. I prepare and teach Bible lessons to ten four to six-year-old kids, while also providing child care, from 10 to 11 a.m. every Sunday. Through this experience, I’ve truly understood the fact that each child is inimitable and special. Some kids in my class are shy compared to others, some have shorter attention span than others, and their likes and dislikes are completely different. This experience improved my listening and talking skills with kids, and I believe this lesson will greatly help me in my future career as a pediatrician. Other than volunteering for Sunday school, I also read *Between Expectations*, by Meghan MacLean Weir for my internship. By reading this book, I was able to take a glimpse into pediatric residency, something which I’ll have to go through in the future.

Like with Dr. Rajagopalan’s practice, a pediatric doctor sees newborns to teenagers.

In this book, Weir talks about how difficult it can be when delivering difficult news to parents, and how helpless she feels when she can’t do anything to save her patients. Although the sleep deprivation and the stress of a pediatric residency sounds frightening, reading about someone else’s experience and the reward of it all is reassuring, and have made me more prepared than I was before reading this book.

“Although the sleep deprivation and the stress of a pediatric residency sounds frightening, reading about someone else’s experience and the reward of it all is reassuring, and have made me more prepared than I was before reading this book.”
While a medical pacemaker may regulate the rhythm of the heart, what role does technology play in regulating emotions? Psychology? Self-awareness? These questions not only provoke abstract inquiries, they begin a curious conversation with uncertain applications. These multidisciplinary discussions provide infinite avenues for discovery and invention, which is juxtaposed by necessary limitations to minimize unnecessary human involvement. The advent of biotechnology inevitably began a philosophical debate concerning the role of humans in an ever-increasingly-unnatural ecosystem and the extent of control to which we exert over realms that may be better left untouched. These arguments are amplified by differing cultural viewpoints, each interacting with nuanced stimuli to shape billions of perpetually-adapting perspectives. Each person has a unique worldview; each person lives in a slightly different variation of the same Earth.

After exposure to higher-level science classes in high school, I realized the significant overlap between physical, biological, and chemical concepts in everyday life. Thermodynamics was neither exclusive to biology or physics, but an overarching scientific concept that describes many aspects of the physical world and its role in regulating chemical systems within living organisms. Life seemed to take on a whole new image, and the more I learned, the more I learned I didn’t know. Though we were taught that the definition of life was “a series of self-regulated chemical processes,” this word became much more than that simple definition could encompass. After an upperclassman introduced me to this opportunity, I began interning in professor Chris Pire’s lab at the Bond Life Sciences Center with my graduate mentor Shawn Abrahams.

Shawn a graduate student studying botany, had a few research projects that I could help out with. At the time, he was focusing on how insects predate upon certain species of plants and what, genetically, caused certain species to attract more predation than others. In order to study this phenomenon, many generations of a variety of plants had to be harvested and studied. We immediately got to work as he introduced me to “threshing”, a process used to separate grain from a plant. This was just one among many new terms that I would encounter in my future at this lab. After realizing that I could only understand 50% of the vocabulary Shawn used to explain the experiments, I asked him for some introductory scientific papers to get me more familiar with the terminology in this specific study. We even had mini study sessions in which we reviewed the papers and discussed possible implications.

As I grew more comfortable with threshing and the nature of the study, Shawn introduced me to other activities common to him in the lab. We would go up to the rooftop greenhouse at least once a week to water the plants and occasionally harvest the plant for threshing. We’d also plant seeds, and organize data according to their family and stage in the maturation cycle. One thing that I found especially interesting was the process we used to germinate the seeds. We used the same sterile procedure as we did in my sophomore biology class for an E. coli experiment. I believe that it was very worthwhile to see how our schoolwork applied to research in the field.

In addition to the biological applications, Chris Pires was also an advocate of incorporating my other interests into this internship as well. After learning that I participated in robotics and had an interest in bioinformatics, Shawn began to teach me how he used genetic technologies, such as how he analyzed the plant leaves for predation and the programs he used to log this information into an online database. Just as I thought things were becoming routine, I was quickly introduced to an entirely new area in his research, which had its own special thrill. Shawn’s new project will incorporate Raspberry Pi (a small, multipurpose affordable computer that can be programmed for various tasks), so I am actually very excited to see how I can apply knowledge outside of biology to this interdisciplinary field.
The floorboards vibrate as the melodies fill the Missouri Theatre. Adrenaline courses through my blood as I lift a pair of Zildjian cymbals from their respective stand. I eye the conductor as he cues me in with a smirk. Ecstatic, I rhythmically crash the two plates of metal together in unison with the blaring French Horns. As the piece ends, silence briefly plagues the performance hall, audience members standing seconds after in applause. I smile not for the attention, but for the significant feeling of accomplishment.

This past summer and first semester, I continued exploring my musical interests through a highly selective apprenticeship with the Missouri Symphony Orchestra. Attending lengthy rehearsal, I worked alongside professionals who happily welcomed me into the enriching atmosphere. Surrounded by musicians with degrees in musical performance from world-renowned institutions, such as the Eastman School of Music, I naturally felt intimidated. However, as the rehearsals progressed, I relaxed as I realized I could play together with them. Of course, their level of musicianship was of supernatural sorts compared to mine – I was merely a high school student! Nevertheless, I continued to play, paying close attention and mirroring the unique techniques and musical approaches fellow percussionists executed.

Under the direction of internationally recognized conductor and cellist, Maestro Kirk Trevor, the Missouri Symphony Orchestra performs for the community at various venues. Of those include the 6-week Hot Summer Nights concert series, the Shelter Insurance Holiday Concert, and various other "on-call" community performances throughout the year. Typically, there are only one or two days of 8-hour-long rehearsals prior to a concert (excluding built-in lunch and dinner breaks). To put this in perspective, high school ensembles prepare at most four to five pieces that are rehearsed over the span of two months. As a musician for the Missouri Symphony, it was expected for ALL musicians to prepare a minimum of eight highly advanced pieces within a combined rehearsal time of less than 20 hours. No doubt, it was a challenge, but I was able to accomplish all of these difficult feats with the support and encouragement of remarkably skilled percussionists, including Brian Tate (Adjunct Professor of Percussion at Central Methodist University, Adjunct Faculty of Music at Columbia College, and Instructor of Music Theory and Aural Skills at Moberly Area Community College), Megan Arns (Ethnomusicologist and Assistant Professor of Percussion at the University of Missouri – Columbia), and Dr. Julia Gaines (past Director of Percussion Studies and current Director of the School of Music at the University of Missouri – Columbia).

I contracted with the professional ensemble as an apprentice the winter of my Sophomore Year in high school. However, this past semester I focused more on the societal implications following the pursuit of music in the hope of improving my own compositional skills. Analyzing the scores of various musical compositions, such as the William Tell Overture composed by Gioachino Rossini and the Sheherazade Suites composed by Nikolai Rimsky-Korsakov, I explored the important role music had in society.

In fact, I realized that music is not only a collection of memories or emotional expressions, but they’re also a set of suggestions that can be felt, not just heard. In the 1812 Overture composed by Pyotr Tchaikovsky, one of the pieces I paid close attention to, a series of melodies and phrases depict the warring conflict between the empirical Napoleon Bonaparte's "Grande Armée" and inferior Russian defenses in 1812. As the orchestration ends with a reiteration of O Lord, Save Thy People in representation of the unexpected Russian victory, the 1812 Overture instills a remembrance of the past conflict as well as the arbitrary suggestion that with hope, faith and unity, a society can accomplish any barrier.

As a composer and percussionist, I've grown a lot this past semester through this breathtakingly rewarding experience. I want to personally thank Brian Tate, Megan Arns, Dr. Julia Gaines, and Maestro Kirk Trevor for giving me this wonderful, life-changing experience – without their attention, I would not have become the musician that I am today.
spent second semester interning for the Missouri Cancer Associates at Boone Hospital. Patients of varying ages sat among an array of cushioned chairs, their pale faces transfixed on the burgundy carpet beneath them. Nurses filed in and out, escorting patients to private examination rooms annexed from the waiting area. I was greeted by a nurse behind the registration counter who promptly assisted me, “Dr. Bala told me he was expecting you!”

After providing my signature for a few legal documents, I fastened a nametag to my shirt and followed the nurse down a maze of halls to the metaphorical classroom I’d reside in for the next four months: the office of Dr. Elangovan Balakrishnan.

My internship began swiftly. Visiting the office twice a week for a minimum of three hours per visit, I was dedicated to personally exploring the intricacies of clinical medicine. My time spent with Dr. Bala, his preferred designation, was much like an extensive job shadow. He and I would discuss multiple patient cases, the severity of each situation ranging from borderline anemia to terminally aggressive cancers. Because Dr. Bala specializes in oncology and hematology, I was exposed to a variety of complications involving both blood and somatic cell behavior. My favorite aspect of my internship with Dr. Bala was observing many of his consultations with patients. Though I did not directly interact with any of them, I was able to passively connect to their emotional responses as Dr. Bala would present them good and bad news.

Each time I visited the office, there would always be a new, unique set of patients waiting to be seen. Following a fairly routine path, Dr. Bala and I would review cases, visit the patients, then discuss resolutions and general prognosis. The most difficult aspect, however, was listening to their stories – many were normal people living normal lives. Dr. Bala was highly respected, and as a result, his moralistic advice was often requested. Questions like, “What do you recommend?” and “If this was happening to your family, what would you do?” were common conversations, each begging for an end-all-be-all treatment. In these situations, and what I’ve come to admire most about Dr. Bala, is that his requested advice was both medically relevant and emotionally supportive. Never did I doubt Dr. Bala’s committed care toward his patients.

Having completed this internship, I’ve experienced a more intrapersonal perspective in clinical medicine. Though I may not specialize in oncology or hematology in the future, my ambition to pursue a path in medicine has only grown. I’m truly honored to have been given this opportunity, and I extend my gratitude to Dr. Bala, nurse Julie Maledy, and all other staff affiliated with Missouri Cancer Associates for strengthening my desire to promote the welfare of society via medical intervention.
I have always known that I wanted to be a biomedical engineer, someone who designs and experiments with medical devices and treatments. It has stood out to me as simultaneously rewarding, challenging, and interesting. I’d be able to explore the world of medicine and help those around me while satisfying my constant itch to discover. That is why I was ecstatic to meet and work with Dr. Heather Hunt and her graduate students from the University of Missouri.

Before I could enter any of her numerous labs, I had to first become safety certified by the university. There were in-person and online classes that needed to be completed in full. This was my first “real” internship experience. It introduced me to all the tools I’d be working with the next four months and taught me the procedures of a real scientist: how to handle dangerous chemical and biological agents, what substances were dangerous and how to deal with them, and what machines were used in the lab and how they functioned.

Unfortunately, I ran into a few problems after the completion of my trainings: I was not a Mizzou student and therefore could not be registered in the University System as having completed the trainings. The next month may have been one of the most valuable parts of my internship. I had to work with authority figures and tech support constantly to figure out the solution to the problem.

Very quickly I began to get more comfortable talking to people I didn’t know on the phone and sending emails to various those in charge to sort out my issues. I finally got everything sorted out and was able to begin working in the lab. By itself, this problem helped me grow as a person. I became a better communicator and a more persistent advocate for my interests and beliefs.

When I attained access to her lab, Dr. Hunt gave me some take-home assignments meant to help me familiarize myself with her research. At the same time, I met and began working with two graduate students, Mason Shellenberg and Eduardo Dominguez.

Mason and I discussed his research into burn wound sensing. Apparently burn wounds are extremely difficult to diagnose and are often over treated. Mason’s goal was to develop a “gun” which could shoot a laser that hemoglobin, a protein in blood, would absorb more effectively than the surrounding tissues. A sensor would detect the light absorbed by the hemoglobin and measure the depth at which the blood was. Different degree burns result in different levels of blood depth in the surrounding area, so by measuring this, would simultaneously measure the severity of the wound. Mason was trying to learn the exact properties that hemoglobin had when light was shone on it. It was my job to sift through scientific papers to find this information. Scientific papers are extremely dense and difficult to decipher. The experience I got working with Mason helped to fine tune my skills in working with such papers, a skill that will be useful throughout my entire life.

The second graduate student I met with was Eduardo. His project involves developing a special type of Titanium coating that is antimicrobial in nature. This means that many unwanted microorganisms could be kept off metal surfaces in factories. This would be especially helpful in hospital and factories that mass produce food. I helped Eduardo with numerous tasks.

We read through scientific literature to find properties of titanium, calibrated a machine used to test pH levels, tested various protocols, and even prepped for the first of a series of experiments to develop the desired material. Eduardo was very good at working with me and explaining steps of the scientific process. He valued my inexperience by having me test his protocols. These were a series of instructions meant to be “fool proof” so that Eduardo’s experiment could be replicated by others; replication is an extremely important step in establishing reliable data. He asked for feedback on the protocols so that he could better the chances of his experiments to be replicated.

There were many amazing experiences that I got through my internship. I learned to better deal with authority, I gained knowledge on how to efficiently read scientific literature, and even got real lab experience that I can use moving forward. The entire experience has helped me truly solidify my position on wanting to be a biomedical engineer. The two main projects I was involved with aimed to make the world a healthier, safer place, and I want to continue doing that well into my adulthood.

Dr. Hunt has offered to extend my time in her lab so that I can work on one more project with another of her graduate students. I’m excited to see what I can learn next!
When I walked into Columbia Orthopedic Group (COG) on my first day, I was promptly put right to work. This school year I’ve had the enlightening opportunity of interning with Dr. Chris Farmer at COG, who specializes in sports medicine and non-operative care. Every day, I found an x-ray or an MRI of a patient on the computer. Then Dr. Farmer would walk me through the patient history and what brought him or her in. In those couple minutes before we saw the patient, Dr. Farmer described what he thought the problem was and how he’d go forward in prescribing treatment options. He pointed out how to observe arthritis and calcifications in a joint or how a displaced vertebra affects the other vertebra around it. And if the picture came back clean with no injury, then I learned the problem may be from disfunction or another stress.

From here, we went into the patient’s room where I got to see first-hand how a doctor interacts with someone after their initial impression. Sometimes a patient would know exactly where the pain was coming from and when it occurred, but other times Dr. Farmer would have to ask questions for diagnosis. Regardless of whether the patient knew the origin or onset of their pain, the next step would be physical tests in attempt to find the severity of the injury. These might include a simple forward and backward pulling on the knee to test ligament tension, lifting and pushing down on the hip to test strength, or asking a patient to raise their arm to the side to measure flexibility. These tests would help in the decision of what to do next.

Often the solution had multiple steps. The patient could start with therapy to combat the problem for the long term. They could get a steroid or lubricant shot to soothe, and sometimes end the pain. Dr. Farmer could prescribe oral medication or a topical cream. And if the injury was severe enough, he would suggest fixing the problem with surgery from one of the surgeons in the COG building.

The most common solution from patients seemed to be the quick fix – a shot. In this setting, I got to see Dr. Farmer use an ultrasound to find the exact point in the joint the shot needed to be released. In special cases, an ACP blood transfusion shot was used as an advanced, but much more expensive, practice for healing. Autologous conditioned plasma (ACP) is a platelet-rich plasma that is extracted from autologous blood using centrifugation. It can support regeneration in a variety of orthopedic conditions and surgical procedures. This shot separates the platelets from the red blood cells which are then spun and used for their self-healing agents in the blood which then help to heal the muscle typically better than other shots or simply waiting. Not only did I learn about the different methods, but I was able to learn a little about the insurance side of medicine. Some insurance companies are more likely to pay for steroid shots on the day of the appointment, but others make you come back another day or force the doctors to use a prescription from a pharmacy instead of using the same medicine from their cabinet. At the end of 2017, I learned that one insurance company suddenly chose not to cover a very common injection that almost every other company does. Dr. Farmer and I talked a lot about the capricious nature of insurance and how it affects his patients and his practice. Once I observed a woman wait two hours on the phone negotiating with her insurance company to cover a shot that would ease her pain.

While at Columbia Orthopedic Group, I saw many different types of patients and injuries. I saw frozen shoulders where the patient couldn’t lift their arm past 90 degrees, torn calf and biceps muscles, boxer’s fractures, and drained cysts. I learned to recognize key words one might use and places one might point when describing hip bursa pain and how one hip strength test can reveal weakness. Those that stand out though are not always those that had the most severe or the most interesting injuries. Instead, they return for a follow up appointment and can say they are pain free and back to living their normal lives. The most satisfying part of this internship was being able to see the improvement in one’s movement and their relief when they returned without a reoccurring problem. Working with Dr. Farmer has given me a whole new insight and excitement on the world of medicine and care for patients. But most importantly, it’s shown me that giving back to people through their health is the biggest reward.
As a child, I spent countless hours “playing school” in the basement of my best friend’s house. We would plan lessons, make nametags for our students and say the Pledge of Allegiance. As I ventured into middle school, and my first two years of high school, I explored a variety of career options such as medicine, physical therapy, and business. It was not until the last six months that I became deeply interested in elementary education. Looking back on it, playing school in my best friend’s house was probably a sign that I would end up passionate about teaching, and have the desire to help children every day.

This semester I had the opportunity to intern with four inspiring teachers from Fairview Elementary—two of whom I had when I attended Fairview. Mrs. Webb, Ms. Garrett, Mrs. Turpin, and Mrs. Heavin all supported me, inspired me, and have confirmed my excitement to become an elementary teacher. For their time and guidance I could not be more thankful.

Going into my internship, I was both nervous and excited. I would be returning to the school that brought me so much joy as a child, and interning with two of my favorite teachers. (Mrs. Webb and Mrs. Turpin) I felt pressure to succeed and be accepted because I knew I owed it to Fairview to continue their academic standard of excellence, and I also wanted to connect with the students in the way that my teachers connected with me.

As a second grader in Mrs. Turpin’s class, I had an excellent student teacher who made a significant impact on my life, and I knew that was what I wanted to be to these kids. I didn't just want to walk in there every day and help them learn.

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Every day I switch classrooms to get experience with multiple grade levels. Half of my days begin with Mrs. Webb (4th grade), then transition to Ms. Garrett (3rd grade), and finally to Mrs. Heavin (1st grade). The other days are the same except they begin with Mrs. Turpin instead of Mrs. Webb. With Mrs. Webb, I walk around and help students with math and often play games with them. The exuberance that her students have is infectious, and every day I feel lucky that I am able to learn alongside them and from such a wonderful teacher.

Fourth grade is very important as it is when students make the switch from learning to read to reading to learn. It is also where math becomes much more complex with long division. Getting experience with 4th graders has been both rewarding and beneficial. I’ve really enjoyed my time in Mrs. Webb’s class because I’ve created strong relationships with her students, and I continue to be inspired by her patience and responsiveness while teaching.

After I work with Mrs. Webb’s class, I walk to the third grade classroom with Ms. Garrett. There, I help students with projects and often watch “mystery readers” read a book to the class. Ms. Garrett is unfailingly kind, positive, and patient. The level of energy she brings to her classroom is infectious and I hope someday to teach in a similar way. All over her classroom are positive quotes and fun ideas that I hope to someday incorporate into my own classroom. Ms. Garrett wore a shirt the other day that read “If you can’t find the sunshine, be the sunshine” and she truly embodies that message.

Finally, I visit Mrs. Heavin’s first grade classroom. The energy, affection, and excitement from not only the students, but Mrs. Heavin is amazing to watch. Most of the time I play math games with students, or help them with writing. It’s been wonderful to see young children so eager to learn, and I think that reflects well on the teaching style of Mrs. Heavin. In a conversation that I had with her, she said “at the end of the day, all the students really want to know is that you love them,” and she certainly makes sure they know this and it explains their receptiveness to her teaching.

On my other days, I first visit Mrs. Turpin’s second grade classroom which is full of happy, smiling eight-year-olds. Most of my time is spent helping them to read, which has helped me work on my patience. The imagination of her students is funny, insightful, and an important reminder that some of the most delightful minds are only eight years old. Mrs. Turpin is one of the kindest people I’ve ever met, and that definitely reflects in her teaching style. She is consistently truly excited about her student’s work and is clearly proud of them.

Interning at Fairview has been one of the most rewarding experiences of my high school career. Thank you to Principal Diana Demoss who allowed me to teach and learn alongside these dedicated teachers and students. Thank you to Mrs. Webb, Ms. Garrett, Mrs. Turpin, and Mrs. Heavin who let me in their classrooms and inspired me to be a more energetic, positive, and kind person.

Finally, thank you to all the students who let me into their days and lives. This internship has assured me that I want to be an elementary teacher. Each and everyone one of you has truly made an impact on my life, and I am forever grateful.
Since I was young, gazing at the sky looking for airplanes has been a delightful experience. I am passionate about airplanes, and amazed by their complexity. This passion encouraged me to begin a journey in aviation. Through the EEE Internship course, I was able to explore different areas of aviation.

I am grateful for Mr. Sebastien Heintz, president of Zenith Aircraft Company, for hosting my internship. Zenith Aircraft Company is a business focused on designing, developing, and manufacturing kit aircraft. The company is based at the Mexico Memorial Airport (KMYJ) in Mexico, Missouri.

Immediately after arriving at Zenith, I was accompanied to a tour around the factory. It was a remarkable experience understanding how kit aircraft are assembled, and shipped. The company operates different machines to accurately manufacture the aircraft's components.

The aircrafts produced by Zenith Aircraft Company offers its customers the experience of assembling their aircraft. Every aircraft manufactured by the company is carefully shipped to the customer. With the components of the aircraft, the owner also receives a manual on how to properly assemble the aircraft. An average price of the fuselage is 75K and the engine and electrical components are another 75K. But when you think that $150 can buy you an airplane, it’s really quite amazing.

Zenith currently offers four different models of aircraft, Zenith CH650, STOL CH701, STOL 750, and CH750 Cruzer. Each aircraft is designed with a specific purpose. STOL aircraft were developed for Short Takeoff and Landing; while the Zenith CH650, and the CH750 Cruzer were designed for longer trips. They also carry historical fuselages, so you could purchase a plane that resembles a WWII flying ace if you wish.

I have had the opportunity to fly with Mr. Sebastien Heintz, on the Zenith CH750 Cruzer. This model is equipped with an UL350iS 130 Horsepower Fuel-Injected UL-Power Engine. This engine enables the aircraft to cruise at 118 Miles per Hour, while having an empty weight of only 780 pounds. This aircraft can be assembled at home in about 400 hours.

During the local flight, Mr. Heintz demonstrated the great performance of the aircraft, and its avionics. I was particularly impressed by the great climbing performance (1,200 feet per minute), and the great visibility of the outside. I had the opportunity to fly with him over the city of Mexico, Missouri; and perform a few touch and goes.

After the flight, I accompanied a routine maintenance on the aircraft. While checking the engine, it was great to explore how the engine, power, and fuel system works. This was the first time I saw an open aircraft engine, and I was able to understand how the different components work.

Guided by an expert in three dimensional modeling, I was taught about how computer designs help in the aircraft manufacturing process. The ability to model all of the aircraft’s components facilitates the search for possible problems, and improvement opportunities.

This internship provided me an in-depth exploration of how Experimental Aircraft are designed, manufactured, and assembled. Guided by experts in the field of aviation, I could learn more about experimental aircraft. I would like to thank Sebastien Heintz for the wonderful opportunity to learn about kit airplanes, aircraft design, aircraft manufacture, and Zenith Aircraft Co. I have just completed a solo cross-country trip of roughly 80 miles and am anticipating earning my pilot’s certificate in the next month. I will be attending Embry-Riddle Aeronautical University in Daytona, FL to become a commercial pilot, but this internship has left me also interested in the kit and STOL airplane manufacturing industry.
I spent my EEE internship at the Confucius Institute at the University of Missouri, preparing for and helping put on the Chinese New Year festival. The Confucius Institute first brought Chinese to Columbia Public Schools when I was in seventh grade at Gentry Middle School. While other students opted for Spanish, French, or even German, my dad encouraged me to enroll in Chinese. My dad claimed it world “give me new opportunities” and “set me apart from other students,” at the time, I resented his decision. I wished to be in Spanish class with my friends and the rest of my peers. When I was in seventh grade, I had no idea of the opportunities and advantages I would gain from learning Chinese. To this day I am grateful for my dad’s encouragement to take Chinese, and I know that it has provided me new opportunities.

The summer after my seventh grade year, the Confucius Institute sponsored a trip for my classmates and I to go to China for two weeks. The first week was spent studying at Shanghai Normal University in the morning, and touring the city in the afternoon and night. We traveled as a class, with our own private bus, tour guides, and even our own photographer. We saw shows, performances, ate at Chinese restaurants, explored the old and new parts of the city, and received incredible cultural insight from our teachers and guides. The second week, we traveled to Xi’an and Beijing, where we saw gardens, temples, museums, and the Great Wall, among other places. To this day I regard this trip as one of my very fondest memories. I learned so much about the Chinese culture, and I saw firsthand the lifestyle differences of the Chinese people. This trip was funded entirely by the Confucius Institute, which is extremely significant because without the Institute’s funding, I would have never been able to experience such a life-changing endeavor.

The Confucius Institute has hundreds of locations across the world. With institutes and classrooms across Asia, Africa, Europe, America, and Oceana, the Confucius Institute adopts flexible teaching patterns and adapts to local conditions when teaching Chinese language and promoting culture in foreign primary schools, secondary schools, communities and enterprises. In 2009, Confucius Institutes/Classrooms around the world offered 9,000 Chinese courses of a multitude of styles, with a total enrollment of 260,000, a 130,000 enrollment increase from the previous year. The goal of the Confucius Institute is to spread the Chinese language and culture, while creating ties with the regions in which they reside. China is one of the world’s most rapidly growing economies, so with efforts like the Confucius Institute, China can make connections with otherwise unfamiliar areas, which opens doors for business partnerships and cultural expansion.

In the United States, there are 110 Confucius Institutes and 501 Confucius Classrooms, according to the institute’s headquarters, one of which located at the University of Missouri. I worked with program coordinator Bridget Caddell and executive assistant Lena Ajans. Lena gave me an overview of the type of things they did, and what her typical day was like. Lena said she had spent the morning scanning in receipts from the recent day-trip she and the Chinese teachers had taken to the Kansas City Nelson-Atkins Museum of Art to see the Chinese New Year exhibit. She explained that funding was short; previously the University of Missouri had partnered with the Confucius Institute to split the cost 50-50, but due to Mizzou’s budget cuts, the Confucius Institute was left to become self-sufficient. With the institute paying more than they were used to, Lena and Bridget had been working to try to adjust the budget adequately. The free China trip that I, along with other first or second year Chinese students, had been on would not be happening again this summer 2018. Instead, the Confucius Institute plans to host a “Chinese Camp” of sorts, in which Chinese high school students come to Mizzou from July 8 to July 30, 2018. This camp, Lena said, will provide cultural and English learning opportunities to the Chinese students. As for us American students, Lena says that they will want a number of American students to come help “host” the camp, by participating in cultural activities and aiding the teaching of English. In turn, we American students will benefit by making connections with the Chinese students, while learning much of the Chinese language as we attempt to help our Chinese counterparts.

I spent my internship talking to Lena and Bridget about their work, speaking to the Chinese teachers, and sitting in on meetings to discuss productivity and plans for the Chinese New Year festival. One of the meetings I attended featured the superiors talking to the teachers about the impor-
tance of planning and getting things done on time. I never thought I would say that a single meeting could fundamentally change how I saw business, but on that day, it did. I saw firsthand how people of different cultural origins had to put aside their differences and work toward a common goal. I saw how a variety of different personalities had to work together and compromise. This humanistic aspect of business was one to which I had never given much thought. However, that day I saw people communicating with one another in an emotional, sometimes heated state, and it truly grounded my beliefs. I learned that day that people are not machines, and how in real life, not everyone is going to communicate perfectly, and people have to collaborate in order to overcome their obstacles.

One of the biggest things I learned was to shift how I see business, and specifically, international business. Before the internship the only idea I had about how a global business worked was from TV. I pictured Trump tower, New York City skyscrapers, and downtown Shanghai and Beijing. I imagined people in suits running around, sitting in conference rooms, or talking fast on cell phones. What I saw at the Confucius Institute made a job in the business profession seem much simpler, more realistic, and closer to home.
Over the past year and a half, I’ve had the opportunity to explore the field of microbiology under the direction of Dr. Margaret Lange. I’ve learned how to work with bacterial and cellular DNA, specifically how to extract and elongate it. The purpose of this is to see if I can add an operon into the DNA for a protein that has been trained to detect HIV.

The protein TLR9 (Toll-Like Receptor 9) detects foreign bacterial and viral DNA. It then latches on to the DNA and produces a signal to the immune system. B lymphocytes surround the bacteria or virus and produce antibodies that destroy the invader. Some viruses are able to evade TLR9 by inhibiting the signal they send. HIV is able to do this.

The purpose of our research is to see if we can genetically modify the TLR9 to react to HIV. Dr. Lange has created a modified TLR9 gene as well as a control, which is just the normal TLR9 protein. My job has been to cleave the bacteria and cells for the experiment. I then elongate the bacterial DNA by doing a Polymerase Chain Reaction. This lets us see which bacteria samples to use because some samples have more DNA present. Then I use a spectrometer to count the amount DNA per microgram. After the samples are picked, we add TLR9 to them. Using the bacteria as a shield, we add the protein to the cells, which are infected with HIV. The cells also have a dye added to them. The dye is programmed to bind to cells without HIV. If the treatment works, these cells will glow under a black light.

While this sounds and is exciting research, there is a lot of time-consuming repetitive work involved. Lab research requires precise attention to detail. We’ve run into some setbacks with cells getting contaminated, or not having enough DNA to work with. According to Dr. Lange, “Science is 90% figuring out ways not to do things.”

My internship has helped me to better understand how a lab works, it has also helped me understand the practical application of principles in AP Biology. AP Biology has, in turn, helped me understand how and why to process cells in the lab. It’s been the perfect combination of theory and practice. Even more than this, my internship has really transformed me as a student and a person. My grades are solid. I’m much more responsible and appreciative of those around me who support my interests. I can see my future in microbiology and know I can achieve it. I’m now planning on going into medicine because of this amazing experience. I’m indebted to Dr. Lange for being such a terrific mentor, and to Mrs. Struchtemeyer for finding Dr. Lange. Thank you.
I love chemistry. In Belarus, I had studied under Dr. Vadim Matulis, a chemistry professor at the Belorussian State University. At the end of my first semester in AP Chemistry, my teacher, Mr. Barry Still, suggested I enroll in EEE Internship. I was introduced to Professor Gary Baker and a graduate student, Nate Larm, who became my mentor. We worked in the Baker Group Lab, which uses a cross-disciplinary approach to problem-solving with sustainable nanoscience and task-specific solvent-engineering. Nate Larm and I were assigned to determine which of given organic acids could potentially be used as reducing agent and capping agent for gold nanoparticles (AuNSP). To do so, we needed to use following formula: $m(\text{Organic Acid}) = \frac{(17 \text{ moles} \times 0.02 \text{ L (volume of the final flask)} \times M(\text{molecular weight of the Organic Acid}))}{1000 \text{ L}} = \text{mass of the Organic acid required to add to the 20 mL flask for the analysis of AuNSP}$.

**Preparation of gold nanoparticles using 4-(methylthio)phenylboronic acid**

Yahor Vazmitsel and Nate Larm

During investigatory experiments searching for reducing agents toward gold nanoparticle (AuNP) synthesis, we stumbled upon this compound: 4-(methylthio)phenylboronic acid (Sigma, 456802, ≥95%, known herein as BA due to the boronic acid moiety, a defining aspect when compared to the other organic acids tested).

While most of our procedures thus far involved aqueous solutions, this compound dissolves well in ethanol (EtOH) but not water. To accommodate this, we prepared a 17 mM solution of BA in EtOH and added 1.0 mL of this stock to 4 mL of EtOH and 5 mL of H2O in a PTFE centrifuge tube. This solution was then rapidly added to 10 mL of a 0.50 mM aqueous solution of HAuCl4 in a PTFE centrifuge tube under vortex to produce a 20-mL reduction solution consisting of 0.85 mM BA and 0.25 mM HAuCl4 (reducing agent to gold ratio, or “R” value, of 3.4) in a solvent consisting of 1:3 EtOH:H2O. It is worth noting that, for consistency, all solutions produced in this report possess a final Au concentration of 0.25 mM. The solution rapidly turned bright yellow (both parent solutions were pale yellow) which faded to a pale yellow after 5 min. The solution rested on the benchtop undisturbed and uncovered overnight, during which time it turned green, indicating AuNP formation. This solution remained colloidally stable over several days, with minor shaking required to disperse particles after four weeks of storage. The production of a green AuNP solution via simple mixing of two reagents at room temperature compelled us to tune the reaction conditions and determine the structure of these AuNPs. As such, this study was extended in several directions.

**Ethanol volume percent.** First, the vol % of EtOH used during AuNP formation was investigated. Through several trials involving a range of EtOH:H2O ratios (1:0, 3:1, 1:1, 1:3, 1:9) it was found that AuNP formation only visibly occurred if more than 50 vol % H2O was present in the reaction medium (that is, a 1:1 EtOH:H2O medium did not yield AuNPs whereas a 1:3 EtOH:H2O medium did). Additionally, colloidal stability was poor in the 1:9 EtOH:H2O sample, causing AuNP aggregation. While this study was not extensively analyzed, it appeared that a solvent ratio of 1:3 EtOH:H2O was semi-optimal for AuNP formation and stabilization. This ratio was carried forward in future investigations. The requirement for this aqueous environment is currently unknown, but it may relate to a pH or hydration requirement for the BA compound to act as a reducing agent. The presence of EtOH for AuNP stabilization is needed due to the insolubility of the BA compound in H2O, alluding toward a similar requirement of EtOH for dispersion BA-stabilized AuNPs.

**R value.** It is known that the molar ratio of reducing agent to gold plays a role in AuNP formation and stabilization. R values of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, and 10 were tested to make AuNP solutions, as seen in Figure 1.

![Figure 1](image-url)
UV-vis analysis shows the respective plasmonic properties of these AuNPs (Figure 2). The resulting localized surface plasmon resonance (LSPR) bands will be analyzed to determine the location of $\lambda_{\text{max}}$. However, of particular note is that the location of the plasmon band for $R = 3$ is at 788 nm, which coincides closely with the Raman laser used in a collaborator’s lab. This lends to the possibility for these AuNPs to be used for surface enhanced Raman spectroscopy (SERS). Such an analysis was performed using these BA-AuNPs deposited on a gold plate; however, the resulting enhancement has not been analyzed fully. It is anticipated that a stronger understanding of the effects imposed on AuNP formation by the reaction parameters will result in the production of AuNPs which are better suited to such applications.

**Figure 2.** Extinction spectra for BA-AuNPs made at various reductant-to-gold reagent ratios ($R$) measured 48 h after their preparation.

**Effects of sugars on AuNP formation.** It is known that this boronic acid compound binds sugars, leading us to believe that the addition of sugar to the reduction media could tailor AuNP growth. To this end, several sugars (i.e., sucrose, glucose, dextrose, sorbitol, and mannitol) were screened spectroscopically to determine the presence of this effect. It is worth noting that each sugar independently reduces Au3+ to Au0, but during control testing they did not appear to act as capping ligands. Each sugar was added to the BA solution prior to the mixing. Sugar molar ratios listed are with respect to BA, which was kept constant at $R = 3$. The cyclic sugars (i.e., sucrose, glucose, dextrose) did not appear to alter the solution color of the colloidal AuNPs, even with sugar-to-BA ratios of 10:1. However, the linear sugars (i.e., sorbitol and mannitol) exhibited some tuning of color in the AuNP solutions (Figures 3-6). Note that these AuNPs deposit on the bottom of the storage container and must be shaken to redisperse, and the lower sugar concentrations still resulted in solutions which lighten over time even after shaking. It is likely that some of the AuNPs in these lighter solutions adsorb onto the plastic surface of the PTFE centrifuge tube. We have not yet performed an in-depth study of particle interaction with sugars post synthesis; however, preliminary addition of aqueous sucrose to an $R = 3$ AuNP solution did not visually alter the solution.

**Figure 3.** Sorbitol-modified BA-AuNPs ($R = 3$, 25:75 EtOH:H2O). From left to right: 0.5, 1.0, 3.0, 5.0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. All sugar ratios are with respect to BA. This photograph was taken about one month post-synthesis.

**Figure 4.** Extinction spectra for sorbitol-BA-AuNPs measured 48 h after their preparation.

**Figure 5.** Mannitol-modified BA-AuNPs ($R = 3$, 25:75 EtOH:H2O). From left to right: 0.5, 1.0, 3.0, 5.0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. All sugar ratios are with respect to BA. Of note, the solutions appear to be sporadic with regard to coloration. The interesting aspects of this study will be redone. This photograph was taken about one month post-synthesis.

**Continued on page 95**
Figure 6. Extinction spectra for mannitol-BA-AuNPs measured 48 h after their preparation. The LSPR profiles are more sporadic for these AuNPs than for those prepared in the presence of sorbitol.

We have performed a brief analysis concerning the effect of the solvent alcohol species on the synthesized AuNPs. All previous studies were performed using ethanol, but it’s possible that the alcohol alkyl chain can have an effect on AuNP growth; to this end, methanol and isopropanol were used as the solvent for BA solvation and incorporated 25:75 alcohol:H₂O as AuNP synthesis media. The photographic result is presented in Figure 7. UV-vis spectroscopy has been performed but the results have not yet been analyzed. Visually, the methanol media appears to promote AuNP aggregation, as evidenced by the presence of black particulate. On the other hand, an isopropanol medium resulted in a slightly blue solution of colloidally stable AuNPs.

A short temperature study was conducted to determine the effects of reaction temperature on the synthesis of AuNPs. Three reaction temperatures were compared: ~5 °C (ice bath), ~20 °C (room temperature), and ~70 °C (heated oil bath). Of note is that these reactions occurred in 100-mL glass round-bottom flasks using magnetic stir bars, providing the first such change in reaction environment for this project. To perform the temperature study, 19 mL of HAuCl₄ solution was brought to the appropriate reaction temperature while stirring (500 rpm) using a magnetic stir bar, followed by rapid addition of 1 mL of the BA solution (performed to create final solutions with R values of 3 and solvent ratios of 25:75 EtOH:H₂O). All three solutions turned yellow rapidly and were left covered and at their respective reaction temperatures overnight. The following day, the heated and room temperature solutions were colorless but showed signs of Au³⁺ reduction in the form of aggregated black particulate and a slight green staining of the glass vessel. The cold sample (~5 °C) was a deep green color resembling that of the BA-AuNPs produced previously. From this study, it is concluded that AuNP formation should occur in plastic (PTFE) containers. A similar study using PTFE centrifuge tubes is planned. Finally, transmission electron microscopy (TEM) analysis has been performed on the BA-AuNPs synthesized using an R value of 3 in 25:75 EtOH:H₂O (absent of sugar). The resulting micrographs (example in Figure 8) display interesting crystalline structures resembling flowers. An investigation into whether these crystalline structures are entirely gold is ongoing. Due to their size, it may be possible to deposit this material on a substrate for imaging using scanning electron microscopy (SEM), thus making X-ray diffraction (XRD) elemental analysis substantially cheaper.

Figure 7. BA-AuNPs synthesized using (from left to right) methanol, ethanol, and isopropanol. Notably, the methanol synthesis did not produce colloidal-stable AuNPs. A short temperature study was conducted to determine the effects of reaction temperature on the synthesis of AuNPs. Three reaction temperatures were compared: ~5 °C (ice bath), ~20 °C (room temperature), and ~70 °C (heated oil bath). Of note is that these reactions occurred in 100-mL glass round-bottom flasks using magnetic stir bars, providing the first such change in reaction environment for this project. To perform the temperature study, 19 mL of HAuCl₄ solution was brought to the appropriate reaction temperature while stirring (500 rpm) using a magnetic stir bar, followed by rapid addition of 1 mL of the BA solution (performed to create final solutions with R values of 3 and solvent ratios of 25:75 EtOH:H₂O). All three solutions turned yellow rapidly and were left covered and at their respective reaction temperatures overnight. The following day, the heated and room temperature solutions were colorless but showed signs of Au³⁺ reduction in the form of aggregated black particulate and a slight green staining of the glass vessel. The cold sample (~5 °C) was a deep green color resembling that of the BA-AuNPs produced previously. From this study, it is concluded that AuNP formation should occur in plastic (PTFE) containers. A similar study using PTFE centrifuge tubes is planned. Finally, transmission electron microscopy (TEM) analysis has been performed on the BA-AuNPs synthesized using an R value of 3 in 25:75 EtOH:H₂O (absent of sugar). The resulting micrographs (example in Figure 8) display interesting crystalline structures resembling flowers. An investigation into whether these crystalline structures are entirely gold is ongoing. Due to their size, it may be possible to deposit this material on a substrate for imaging using scanning electron microscopy (SEM), thus making X-ray diffraction (XRD) elemental analysis substantially cheaper.

Figure 8. TEM micrograph of BA-AuNPs (R = 3) formed in 25:75 EtOH:H₂O. While the “petals” are crystalline (diffraction of the electron beam was observed), it is currently unknown which parts comprise Au and which comprise crystallized BA. The scale bar in this image is 100 nm.

The resulting micrographs display interesting crystalline structures resembling flowers. An investigation into whether these crystalline structures are entirely gold is ongoing. Due to their size it may be possible to deposit this material on substrate for imaging using scanning electron microscopy (SEM), thus making X-ray diffraction (XRD) elemental analysis substantially cheaper. This research is more based on the theoretical part, but it is may show good potential in the bimetallic in the water filtration. I need to thank Mrs. Struchtemeyer for providing me this internship opportunity, Dr. Baker for allowing me to work in his lab, and Nate Larm, for being a great teacher and partner during the research.
Through my internship with Mrs. Knocke at the planetarium, I have explored the technical management of the planetarium as well as the facilitation and management of educational events that are held by the planetarium. I’ve learned how to operate the planetarium’s many programs and functions as well as how to run the educational shows and star tours. Another large part of the planetarium responsibilities, are events like the public shows every month, the STEM expo at Rock Bridge (where Mizzou professors set up booths and exhibits to teach kids about practical applications of sciences and mathematics), and Astronomy Day.

I worked on a number of different exhibits that explored different technologies and applications of astronomy. In doing so, I was able to utilize professional adobe programs like Illustrator, Photoshop, and After Effects. Some exhibits require complete construction while some just require refurbishing or updating. Exhibits that I focused on in the first semester of the internship include: the 3D views of Saturn and constellations, as well as a large physical geological features exhibit, with images from satellites that compares the Earth’s light emissions at different times of day and analyzes the view of these geographical features from space.

These projects involved a lot of physical problem solving through formatting and constructing the pieces of the exhibits both efficiently and to improve the effectiveness and to make the exhibit interactable. The 3D views exhibit required complete electrical wiring of a complex battery system which, at the beginning, baffled both Mrs. Knocke and me—but we finally figured it out!

Second semester led me to focus completely on building new exhibits from the ground up. We decided to create a
display of the United States Mars rovers. The project included days of research in comparing the missions, the rovers, and the fundamental findings and implications of these missions. More research was necessary to find panoramas and images that the Mars rovers captured to display on the exhibit. We paired this Mars themed exhibit with our globe of Mars and the planetary show for public viewings in the future. A big challenge in creating this was to write in an educational format. The style of writing for the exhibits is both complex and simple (as you need to explain rather difficult concepts to a target audience of elementary school students).

Working in the planetarium introduced me to new methods of work and problem solving techniques. Mrs. Knocke's favorite quote is "If something can go wrong, it will go wrong," which has proven to be faithfully fulfilling in regards to the planetarium work and functions.

Being in the planetarium has given me a sense of the practical application of knowledge I've learned in many of the science classes at Rock Bridge along with the skills that I have gained through the Career Center. What I was hoping to gain from the internship at the planetarium was to further explore my interest in astronomy as well as to get a sense of what working in one of the main outlets for professions in astronomy: education.

Being in an educational setting has shown me the functions of the programs within our public school system as well as exploration in this specific field of study, while being guided by an experienced expert. Thank you, Mrs. Knocke, for opening the planetarium doors—and my eyes—to your fascinating and fulfilling job.
Learning about Rollercoaster Design, Marketing and Safety

Cassidy Viox

When I tell people that my dad sells roller coasters, they usually think I’m joking. Some accuse him of being an undercover government agent that disguises himself as an amusement ride salesman there are only a small number of people in the world who do what he does. I grew up around theme parks and I had the privilege of working with my dad this past year as an intern, so I can assure you that he isn’t a secret government official.

During winter break of my junior year, my dad, Tim Viox, offered me the opportunity to travel with him. I jumped at the opportunity. I asked my dad if I could be an intern, mostly expecting the duties of filing papers, booking flights, and bringing him coffee when he’s running low. An intern in his eyes, though, is someone who learns through experiences and establishes him or herself as a true professional. This meant more than spending a couple hours a day in his home office; this meant accompanying him on his travels to places that no 18-year-old should be lucky enough to visit.

In June of 2017, my dad and I took off for Singapore, Thailand, and Hong Kong to visit theme parks and trade shows. In Singapore, I helped one of the companies that my dad represents, Great Coasters International (GCI). I networked extensively with people from around the world and attended a Young Professionals Forum where I met up and coming people in the industry. After Singapore, we went on to Hong Kong. Hong Kong was an incredible experience, and certainly one that allowed me to see how culture affects theme parks. My dad’s good friend, George Tso, is the head engineer at Ocean Park, a sea-themed park that is built into the beautiful mountains of Hong Kong.

There were certainly some familiar western elements of this park, such as the common roller coasters, but there were also some unique ways that the park adapted to its surrounding areas, which I’ve seen of every park over the past year. The food sold is generally a local cuisine, and the theme of the attractions is oftentimes popular in the culture of the specific park. Adapting to culture is a trend I have seen all over Asia, and it seems to be what drives attendance more than the actual quality of the ride. For example, at Universal Studios of Japan, there are several rides that have themes completely unrelated to Universal movies, but are solely for the purpose of attracting park goers. Noticing the cultural differences in these parks allowed me to understand how to grasp an audience and blend western ideas with other cultures.

My second trip with my dad and Great Coasters International was to an ASTM F24 committee meeting on amusement industry safety. Here, I sat through discussions on safety standards for the industry and what could be done to improve such standards. This was an extremely valuable week for me as I engaged in real discussions on important topics that affect amusement park attendees. About two months prior to these meetings there was the horrible accident at the Ohio State Fair where a man was killed due to corrosion on a portable ride. There is an F24 committee that discusses erosion, so being included in a conversation that could save future accidents and lives made me feel like the work I was doing is real and important, which is a feeling that many people don’t experience at a young age.

In late October, I had the pleasure of attending the SWENext High School Leadership Academy in Austin, which was a part of the larger Society of Women Engineers conference. Spending time meeting young women with similar dreams was not only beneficial for me professionally, but also provided a sense of sisterhood as I pursue an education in engineering. I first heard about the Leadership Academy through a woman I had networked with earlier in the year, so I was already experiencing the benefits of my internship.

The International Association of Amusement Parks and Attractions (IAAPA) Expo is the largest trade show for the industry in the world. In early November, I spent a week on the show floor as an assistant to my father and attending special events including business dinners and banquets. As a child, I attended IAAPA nearly every year solely for the theme park food vendors handing out samples. While I certainly took advantage of the free mini corn-dogs this year, I appreciated the business side of the show and the memories it offered me.

At this point in the year, I had little idea of what I wanted to do with my life, where I was going to college, or my interests. In January, AIMS International held their annual safety training in Galveston. This safety training is for theme park owners, operators, lawyers, and anybody else involved in creating or maintaining rides.
The week in Galveston was educational and inspirational; I heard new perspectives on previously introduced ideas, experienced amazing presenters, and learned a significant amount about the intricate processes of the amusement industry. Some classes caught my attention more than others, though. The classes that involved ADA, riders with disabilities, and the human factors of safety fascinated me. I had never thought about the importance of making rides or parks accessible to everybody, and the idea of providing an experience to someone who in other circumstances would get turned away excited me. Because of my interest in this subject, I was able to speak up about my questions and comments despite being the youngest attendee there by 10 years. I left with a clearer idea of what I could do to make a difference in the world of theme parks and more confidence about my future.

Although there were some trips in between, the next significant event in my internship was my opportunity to travel to Asia for nearly four weeks. I could write a book on the value of that experience and all that I learned. I traveled from India to Hong Kong to Japan to Korea to China all in 24 days. Two trade shows, several business meetings, and a leadership conference later, I not only made incredible friends, but I also created memories that I will never take for granted. I visited breathtaking theme parks, met future potential employers, and had a new global perspective, which is valuable in every stage of life and career. I experienced both relaxing exciting aspects of my father’s job, but also challenging and irritating moments. I learned that business, no matter how wholesome or passionate someone is, can be frustrating and disappointing. Being with my father for three weeks with little alone time taught me about making impossible decisions and dealing with difficult coworkers. While I treasure the positive memories like business dinners and networking, experiencing the negative sides of a job are just as important and educational.

This year was everything I dreamt it would be and more. I was absent from school a lot, but I got an incredible education in the process. I’m grateful to my dad for letting me join him, and truly learn what he does and how he does it. I’ve always been planning to study engineering in college, but now I’m considering following in my father’s footsteps.
For my internship, I had the pleasure of working under Dr. Tushar Ghosh at the University of Missouri’s College of Engineering. I primarily worked with his graduate research assistant, Faten Alzubidi, a mechanical engineering student, whose research focused on the emissivity of stainless steel 316. I’ve always been interested in pursuing mechanical engineering, and this was the perfect opportunity for me to explore the area further.

My first day working in the lab with Alzubidi was incredibly intimidating- I had little knowledge about the work she was doing, or how she was doing it. Fortunately, she turned out to be one of the most wonderful teachers I’ve ever had, and was incredibly patient with my plethora of questions. Her research applies mainly to the industrial world.

Developments in solar energy, nuclear power, coal gasification, and other high-temperature services are all causing designers to look more closely at what happens to construction materials when they are elevated to extreme temperatures. Stainless steels are widely chosen because of their mechanical properties and resistance to corrosion. They are also versatile in their ability to meet the requirements of high-temperature service. There are many different stainless steel alloys, and Alzubidi and I were looking more deeply at the alloy 316. Focusing on the effectiveness in emitting thermal radiation (the emissivity) Alzubidi showed me the different mediums she had put into place to observe this.

A cylindrical apparatus (built in accordance with the standard ASTM C835-06) was ordered to measure total hemispherical emissivity of 316, and a few different surface conditions of the samples were used. First, we tested samples in the cylinder “as-received” from the manufacturer. We found that the emissivity of the as-received samples increased from 0.25 at 436K to 0.36 at 1166K. Then, the samples were sandblasted with alumina beads- which showed us that the emissivity increased from 0.32 to 0.44 in the temperature range from 561 to 1095K when the alumina beads were 60-grit. The emissivity continued to increase with sandblasting with 120- and 220-grit alumina beads, despite decrease in surface area associated with the more finely sized alumina beads.

To test another condition, the samples were sandblasted and coated with synthetic graphite powder (nuclear grade), which further increased the emissivity of the sandblasted surfaces. The samples were also oxidized in air at 973K for different durations. When the samples were oxidized in air at 973K for 5 minutes, the emissivity, again, increased. Oxidations for 10 and 15 minutes provided an additional increase, but it was not as significant.

While Alzubidi has a lot more work to do before she is satisfied with the results, I’m glad I was able to help and observe a small part of her research. Throughout my internship, I truly saw how success can only be attained through multiple failures. Sometimes it would take us 500 hours to heat up our samples in the furnace, only to find out that we had made a mistake and would need to restart the process all over again.

It was painstaking to have to wait and readjust minute details that seemed insignificant- but would affect the results of the experiment entirely. I’m grateful that I had the
opportunity to be humbled by the scientific process, and that I was able to learn so much about working in labs and conducting research.

Knowing what I know now about what mechanical engineering deals with has only increased my desire to go into the field, and I’m glad I took this opportunity to explore it further.

I chose to do a different internship during second semester, one that aligns a bit more with what I hope to do when I graduate college. Ms. Struchtemeyer introduced me to David Buster, a product manager at the 3M Production Plant, and gave me the incredible opportunity to intern there. 3M is an applied sciences company that makes just about everything. From medicines, tape, sticky-notes, stethoscopes, and even to computer parts, 3M makes just about everything. I work in the purification department, primarily manufacturing biopharmaceutical purification systems. The two different types of purifiers I work with are called the Emphaze AEX Hybrid Purifier and the Zeta Plus Encapsulated System.

The Emphaze is is an all-synthetic, multi-mechanism clarifying product that contains a Q-functional anion exchange media and a fine particle, bioburden reduction membrane. This product can substantially reduce turbidity, DNA, HCP and bioburden for improved downstream purification. In less scientific terms, it makes a lot of drugs safer and more effective to use. The Zeta Plus filters are designed to exhibit a lower β-glucan response to LAL testing. They also provide superior clarification of bioprocess, biological, and pharmaceutical fluids. In addition to mechanical filtration, these capsules exhibit a positive electrokinetic charge that removes sub-micron particles through adsorption - the adhesion of particles to the charged filter surface. I get to see how both of these systems are made, and work alongside engineers who are constantly finding ways to streamline the process, and make it a better product.

I’m incredibly grateful to have the opportunity to work at 3M. I believe it’s an amazing company that is committed to solving modern-day problems, and takes care of the environment while doing so. Not only do they produce great quality of products, they also make sure everything being done inside the plant is sustainable and eco-friendly. 3M’s main mission is to make the world a better place through science. I’ve only been working here for a few weeks, but I can’t wait to see what else I learn from David and the other engineers at 3M over the summer!
Ever since I was a student, I’ve wanted to be a teacher. Choosing an internship, then, was an easy decision for me. I had a friend who interned at Title 1 Preschool just the year before and I was an English Language Learner in elementary school, which taught me a lot and brought fond memories. The only issue was I did not know which opportunity to pick! Fortunately, I did not have to choose. Ms. Struchtemeyer made it possible for me to do an alternating internship with both organizations.

Title 1 Preschool serves children with developmental needs from low-income families. Initially, I was interested in the program because I wanted more exposure to people of different demographics. However, the preschoolers soon became more than a case-study to me, and I quickly came to cherish each of them as unique individuals. At Title 1 Preschool, the schedule is broken up into several sections: greeting time, small group time, planning time, work time, cleanup time, recall time, snack time, large group time, and outside time. This routine helps the children transition smoothly from task to task and also prepares them for what classes in later education will look like.

Title 1 Preschool is more structured than the average daycare, but the activities are varied enough that even I, as an eighteen-year-old, never get bored. Every day I walk in, the sound of children welcomes me as we go through the tasks of the day and wish those who are absent well. We also cover the three school rules: be kind, be safe, and be responsible. Then the preschoolers split into two groups. Often small group time covers practical skills like learning to butter a slice of bread, write with mechanical pencils, grow grass, and make applesauce. Other times, the block is dedicated to exploring new materials such as foil, bubbles, and stamps. These lessons have inspired several of my Sunday school lessons at church.

During planning time, the children decide what to play with for work time. Work time is the most flexible period as well as when I am most active in the classroom. Preschoolers are free to play at different work spaces, such as toy area, block area, which has train tracks, rain sticks, and, as the name suggests, various blocks, book area, art area, and table area, which held sand first semester and rotated to other small objects second semester including colored water, corn kernels, and even mud! The children get a five-minute warning before clean up time, a practice that has greatly helped me with babysitting because giving children a forewarning before play time is up mentally prepares the children so they are less likely to protest when the time comes.

Additionally, Title 1 Preschool was the first place I witnessed children disagreeing on who gets to pick up toys. I never thought I would see the day preschoolers would compete on who could help tidy the classroom the best! The last portion of my stay is recall time and sign in. Recall time is when the preschoolers remember and share what they did during work time. These sessions have improved my memory as well because I consciously recollect what I observed each child do. Now instead of feeling like each day is a blur, I am able to list of what I accomplished each class and what I still need to do. The exercises Title 1 Preschool introduces to children have been very helpful to me, and has inspired me to apply them to my teaching and daily routine.

Honestly, with seven AP courses, it is difficult to dedicate
a class period to watching children in place of studying, but I have found it to be a worthy investment, particularly as I got to personally know each child. My favorite memory is when a preschooler included me in a drawing of her family -- it made me feel like all of my sacrifices for the internship was worth it. Through Title 1 Preschool, I realized that rather than instruction, what I love about teaching is developing relationships with people. At my graduation, I will be taking more than tools for interacting with students -- I will be carrying the priceless memories I have made through interning at Title 1 Preschool with me all my life.

The English Language Learner (ELL) Program works with students who are new to the states and would like assistance with English since the classroom can present a linguistic barrier to non-native speakers. I thought my multilingual abilities would come in handy for this internship, but soon realized that there was much more to bridging cultural gaps than speaking a common language. ELL Resource is an unstructured study hall where I make myself available as a tutor for the students. When I first began helping, I thought I would primarily help with Language Arts and history classes. Instead, I mostly taught Algebra and Chemistry. It was a challenge explaining multiplication in terms of English -- I had long taken the concept for granted. I really enjoyed coming up with scenarios to help enhance the students' understandings though, and it was rewarding witnessing the moment when the ideas clicked. I believe the ELL students have taught me much more about embracing diversity and appreciating different backgrounds than I did tutoring them in math or civics. They continuously show me that language truly is an art and inspire me to work even harder so I am able to not only solve math problems but understand them so thoroughly that I am able to instruct others how to do it.

"Both of my internships have taught me practical applications for my current teaching rules and inspired me to strive for greater heights in my future career. Additionally, I have realized once again the importance of treasuring all the people who have poured into my life and made it possible for me to succeed as a student as well as a teacher, including the precious pupils I have had the privilege of interning with this year."

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I haven’t always been interested in science, or math; and I am most definitely not interested in being a doctor. But when a few of my good friends recommended I take Honors Anatomy and Physiology, my eyes were opened to the possibilities and promises of medicine. Many of my friends from orchestra had parents who were doctors, and I chose Dr. Eric Kimchi because I am interested in surgery, and he is a well-established surgical oncologist at the Ellis Fischel cancer Research Center.

During the summer, and part of the first semester, I shadowed Dr. Kimchi during his clinics. I did not get the opportunity to shadow him while he was performing surgeries, but I learned a lot about what it takes to be a physician. Dr. Kimchi was kind enough to slowly guide me through how his day usually looks like seeing patients in clinics, and letting me follow along with his three-year residents.

I learned many interesting facts, for example, that 75% of a liver could be removed up to 75%; as long as the liver still has 25% of its original form, it will grow back over time. I mean, how awesome is that! Since he specialized in oncology, many patients have MRI and CT scans that we looked over. To see if whether or not they have, or still have a tumor. Sometimes the radiologists take a little longer to respond, and Dr. Kimchi would just take us up to the radiology room to demand answers. It gave me an opportunity to see what a reading room looks like, and a couple minutes to see how radiology works. I have to say, it actually looked a lot more interesting than I imagined.

The third week I shadowed there were some of the most depressing experiences I have known. There was a couple who found out that the husband’s tumor in the pancreas has returned; another man found out that his tumor has gotten so out of control, that even surgery would be pointless. Dr. Kimchi handled these situations with grace and humanity. The following week there was a patient who said that after surgery he felt random heartburns. So, we listened to his heart through a stethoscope, and sure enough, there was a heart murmur that we could all hear very clearly. I have listened to a regular heart before, but this was very different. Even Dr. Kimchi said he’s never heard anything like it before. This patient was referred to the cardiologist to find out what was wrong. Fortunately, it was not a problem; this man just had a very unique heartbeat. Dr. Kimchi allowed me to do rounds with his residents. Here, we checked on patients who had undergone operations to see that they were healing normally and feeling good. Some patients I saw were ready to be discharged, and some had just came out of surgery. I observed how they interacted with Dr. Kimchi and the residents and followed suit, learning about each patient’s history, and where the surgery was performed.

This internship not only confirmed my interest in medicine, but also opened my eyes into a much bigger world. I learned so many valuable things that I never would be able to learn in school. Through this internship, I understood how valuable life is, and how amazing people fight with it every day. I truly hope I am able to aid and guide people through their hardships and making them laugh, just like Dr. Kimchi did. So although I came in unsure whether or not medicine was the path for me, I am now absolutely
Since first semester I saw the clinical side of medicine, second semester I decided to see the research side. I got the opportunity to shadow Dr. Lixing Reneker at the Mason Eye Institute. Since my EEE Internship class and AUT were stacked together, I would go to the lab every other school day for several hours. I worked with a graduate student Bethany who runs the lab during the day. Dr. Reneker studies the corneas and lenses of mice to better understand how heal eye problems. She has many published articles in scientific journals on these topics.

A typical day went like this: Dr. Reneker would retrieve DNA samples from the mice. Then Bethany and I would create a mixture to put in the test tubes containing the DNA. After that, we put them in the refrigerator to chill for about twenty minutes; meanwhile, we make the master mix to blend with the remaining DNA samples. Afterwards, with the DNA samples blended with the DNA samples, we put the test tubes into the PCR machine. The PCR is a laboratory apparatus most commonly used to amplify segments of DNA via the polymerase chain reaction (PCR). Thermal cyclers may also be used in laboratories to facilitate other temperature-sensitive reactions, including restriction enzyme digestion or rapid diagnostics. The PCR machine takes around two hours and fifteen minutes to process, so most of the time I would have to leave and go back to school, which is fine, because the next time I returned we would usually run the gel.

The gel is a mixture of distilled water and a gelatin powder thrown in the microwave for a minute and eleven seconds. This process needs to happen twenty five to thirty minutes before the PCR process is over, because we need the gel to set before doing anything else with it. Then, we mix the blend from the PCR machine with some coloring so we can see it within the gel; afterwards, we carefully fill them in the holes we've molded in the gel. Then we put a lid with a lot of electrical wire on, and wait for another couple of minutes while that finishes. After the results are printed out, we hand them over to Dr. Reneker, who analyzed the and followed up with different DNA samples for us to repeat the process.

I really enjoyed being able to get some hands on experience in a professional lab setting. Dr. Reneker and Bethany were welcoming and shared their knowledge and skill with me. However,

As much as I like the lab work and research, I still very much rather be interacting with patients in a clinical setting. So, without even knowing it, this lab experience has even further ensured what I am interested in as a career in the most high quality and enriching way. I am grateful to Dr. Kimchi and Dr. Reneker and Bethany for their openness to host me and share their work.
Interning at the Mizzou Civil Engineering Department
Leo Zhuang

This year I have been fortunate to work alongside Dr. Gopalaratnam in Civil Engineering at MU. Throughout the year, he has helped me understand the fundamentals of beam bending theory as well as understanding composite action. The goal of our internship is to develop a closed end mathematical model for the forces on a bridge.

There are two major components when analyzing the forces acting on the bridge: The bridge deck and the wearing surface. For a long time, engineers calculated the forces on the bridge assuming the bridge deck and wearing surface as one beam.

However, as bridges in the U.S have started to age, wear on the bridge deck proves costly to replace. Wearing surfaces, such as asphalt, are much easier and cheaper to replace. To maximize wear on the wearing surface and minimize the wear on the bridge deck, engineers have started to analyze the bridge deck and wearing surface as a composite beam, a beam made of two different parts. By analyzing it as a composite beam, engineers can maximize the life of the bridge deck.

Currently, most analysis of wearing surfaces involves open-ended models, which involves lab testing. However, this limits the ability to manipulate variables such as temperature, which effects composite action. The goal of this internship was to develop a closed-end model, which is based on mathematics, which allows for other variables to be tested more easily.

At the beginning of the year, Dr. Gopalaratnam helped build my knowledge of beam bending theory. He taught me the major forces when analyzing beams, which included moment and shear force. One of the major concepts that I learned was Moment of Inertia. Moment of inertia is essentially the resistance to moment. Just as more mass means more resistance to linear forces, moment of inertia means more resistance to rotational forces. Another concept was the factors of stress and strain. Stress is similar to pressure, essentially the force experienced by a beam. Strain is the displacement caused by the force. All these concepts are very important when analyzing forces in a beam. These different concepts help describe the rigidity of a beam, which is important in analyzing composites.

After the first month, I had a good grasp on these fundamental concepts. We then dived into a research paper that described composite action. The research paper expressed the forces and moments on the beam in terms of constants. An important concept that was introduced to me was the idea of a slip coefficient. In a composite, there are two layers. However, these two layers don’t always bend together. If the two layers are bound together very well, then the two layers will have a high slip coefficient. If the two layers are not bound together very well, then the two layers will have a low slip coefficient. A low slip coefficient can be visualized with two sheets of paper. When both are bent, there is a visible slip, and the edges of the pieces of paper are no longer aligned. With the knowledge of a slip coefficient, I worked through the research paper, trying to understand each step of the explanations.

The goal of understanding the research paper was to take the knowledge of how the document was organized as well as its information about composites, and develop my own model for composite action in bridges. A goal for our new model, is to have some constant such as alpha that expresses the slip of the composite, with 1 being full composite action and 0 being no composite action. So far, no close ended mathematical model has been developed with an adjustable slip coefficient in mind.

During second semester, we grasped a greater understanding on how to generate values for the forces on the beams. Using the constants of various wearing surfaces and bridge decks, used the equations from the research papers to find forces, and to see how accurate these equations actually are. Then, we started developing our own new model.

This internship has changed the way I view the engineering and physics. Before this internship, I thought that physics, especially mechanics, didn’t have lots of advancements. I erroneously believed that most research pertained to the development of new technologies. After this internship, I now know how much more there is to learn.”

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After the first month, I had a good grasp on these funda-
me to recall differential equations that I did not remember very well. It has inspired me to go back and relearn much of the math I have learned, to develop a stronger foundation for my future.

I am very happy to have done this internship. Not only has it expanded my knowledge of areas within civil engineering, but it has also given me perspective into the real world of creating safe structures, like bridges, and how demanding the mathematics are to do this. As I aspire to be an engineer, I now know with more clarity what my future will look like, as well as how to better prepare me for that future. I am indebted to Dr. Gopalaratnam for his time and expertise in teaching me so much and allowing me to work alongside him in his research.
Going into my senior year I was convinced that I was going to be a physical therapist. I’ve been a competitive swimmer all my life, and the physical wear and tear on the body starts to show after more than a decade of this rigorous sport. After injuring my shoulder two years ago, I’ve spent countless hours at Missouri Orthopedic Institute recovering and rehabilitating. I enjoyed the atmosphere, the people who helped me heal, and the ongoing pace of physical therapy. Lucky for me, Lindsey Colbert, my personal therapist, offered to host me for an internship to see if this was really a good fit for me as a career choice.

For most of my life I have wanted to study law or business, but when I tore my labrum in my shoulder, I was introduced into the world of medicine. For a competitive swimmer this kind on injury can be career ending. I went through many orthopedic doctors and surgeons before I met Lindsey and Dr. Bohon, my orthopedic surgeon. Surgery was not an option for me since it carried the risk of never competitively swimming again. Dr. Bohon and Lindsey Colbert worked together closely and created a plan in which I would get steroid injections to relieve pain and then a recovery plan that involved a significant amount of physical therapy. I spent three days a week for a year and a half with Lindsey at Missouri Orthopedic. During that time with medical professionals, I started to learn things about the trade of physical therapy that I wouldn’t have normally been able to learn in a classroom. What surprised me the most wasn’t the new information I was gaining, but that I had a knack for this work. Understanding how the body moves came very easily to me. This is when I started to consider a career in medicine which influenced me to choose physical therapy for my internship.

For the first month of my internship I only observed as Lindsey worked with patients. We went through a handful of patients varying in ages, injuries, and fitness. I had a new experience each time I went to work with Lindsey. Since every patient is very different, it was hard to get a full understanding of what was going on every time I saw him or her. It wasn’t until I started working continuously with one specific patient, a Mizzou baseball player, that I learned that I really wanted to focus on shoulder injuries like my own to see the repair process from start to finish. The patient was a pitcher and had overworked his deltoids. His injury was not as severe as mine, but his recovery plan was much more intense. Every visit he would leave dripping in sweat as if he had just left the gym after grueling workout. I noticed that he was also progressing through recovery faster than I was. I asked Lindsey about this and she said his plan was so rigorous since baseball has an off season while swimming year-round sport. The fact that I continued to swim through my injury caused my recovery plan to be about twice the amount of time it would have been if I had taken a break from the sport.

About a month and a half into my internship another swimmer on my team experienced an injury very similar to mine and began to see Lindsey for help. I tried to attend all her appointments. This is when my internship really started to take off. I felt comfortable with the patient since I knew her and felt like I could help more since I had gone through a similar experience. Her muscles and tendons were badly damaged and needed to be broken down further before they could be built back up. Lindsey would use a metal tool and scrape her tissue right underneath the skin into the correct direction. After a couple sessions of this we would attach Russian stimulations, a type of electrode, to certain muscles in her shoulder we wanted to work. She would perform...
exercises with the attached electrodes. This taught her how to work the muscles in her shoulders properly. Once Lindsey thought she was ready, we would have her perform the exercises without the electrodes. It is very important that a patient learns to perform not only their exercises on their own, but also transform the way they play the sport to discourage further injury. The patient can't use electrodes when she swims, so she needs to learn how to move muscle correctly on her own. I'm happy to say that my swimming friend is doing well in and her injury has not progressed. It was great experience to take part in her recovery.

At the beginning of second semester I started to realize that I might have fallen in love with the people I worked with during my internship instead of what I was studying in my internship. The swimmer I had worked with during first semester moved on to a home program, so I began to work with another woman who had appointments during my internship time. I didn't have a connection with her like I did my swimming friend, so it was hard for me to relate to the patient the same way. This allowed me to take a step back and observe again like I did in the beginning. This is when I started to realize that physical therapy might not be the right profession for me.

In swimming, you go to practice every day for months and years to always be improving. Each practice is an opportunity to get better. There are rough spots, but, in general, you are always climbing up the mountain. This isn't the case if you work as a physical therapist.

With each patient you start at the base of the hill, climbing until they are fully recovered, discharge them and then start again at the bottom of hill with a new patient. It may be because I have been swimming for more than a decade, and have always been climbing, but I realize that it would be difficult for me to adjust to a lifestyle of always restarting again at the bottom and knowing where the peak of the mountain. I guess I'm a competitor at heart. I feel like I am better equipped for a job that requires climbing the entire time and perhaps not knowing the destination. I have no idea what I am going to study in college or what area of work I will eventually go into, but this internship has taught me that not knowing is okay.

The path to figuring it out starts with being honest with myself about what I want. My internship this year was my first step in exploring opportunities that will lead to me to a profession that I'm passionate to engage in every day. I am very thankful to Lindsey Colvert for this learning experience. While I’ve learned a lot about shoulder injuries, I’ve learned more about myself.