

The WFIRM Annual Undergraduate Summer Scholars Program Introducing the 2021 Summer Scholars

Offering undergraduate students opportunities to engage in impactful, multidisciplinary regenerative medicine research at the Wake Forest Institute for Regenerative Medicine, at the interface of engineering and biology.

2021 – Scholar's Profiles

Omar Benavides

University of Texas, Rio Grande Valley

Hi there! My name is Omar Benavides and I am a rising junior at the University of Texas at Rio Grande Valley (UTRGV) studying Biomedical Sciences with a minor in Philosophy. I have always been enamored with the field of medicine, but, only recently have been exposed to the field of research. My acquaintance with research has allowed me to determine not only a different career path, but kindled new passion. The significance behind scientific research is the reason why we have progressed so much in modern medicine. Because of this, I am happy to say I cannot wait to pursue a career in clinical research! Participating in the 2021 WFIRM Summer Scholars Program will allow me to add to the diversity of experiences that can later benefit me in my future career as a healthcare professional.



Currently, I conduct research with Dr. Mario Gil, Ph.D. under the Department of Psychological Sciences in collaboration with Dr. Upal Roy, Ph.D. Our project focuses on how an enriched environment can reduce the neurodegenerative process of Parkinson's Disease through a mouse model. Specifically, we concentrate on the non-motor behaviors and dopaminergic cell counts in the substantia nigra, ventral tegmental area, and hypothalamus. The focus on non-motor behaviors serves the purpose of evaluating the quality of life, including functions such as socialization and mobility. Emphasis on the dopamine neuron numbers serves the purpose of correlating behavioral function with brain pathology. Throughout this process, there have been many incidents of trial and error, yet, these challenges are what feeds my desire to pursue a career in research.

While participating in WFIRM during the summer of 2021, I anticipate gaining new insight into the field of research. I am joining WFIRM with minimal experience regarding regenerative medicine, however, I find myself very curious to learn more about the different types of research there are out there in the world. After completing my B.S. in Biomedical Sciences, I plan to obtain a M.S. in Biomedical Informatics as I believe it will benefit me in terms of the computational work I will conduct while pursuing an M.D./Ph.D.



Ann Byerley

Rochester Institute of Technology

My name is Ann Byerley, and I am a 3rd year at Rochester Institute of Technology (RIT) double majoring in Biomedical Engineering and Biomedical Sciences with a minor in Chemistry. Growing up I was always fascinated by medicine and loved the idea of working to heal others. For the longest time I wanted to be an equine veterinarian because I loved to ride and care for my horses, but over time, I turned my interests towards human medicine and wanting to pursue medical school with an interest in research.

My first exposure to research was at LSU Health Science Center in the Pharmacology department under Dr. Martin Ronis. There I was given my own project to study antioxidants' ability to protect the liver from binge alcohol consumption. To complete this study, I performed many assays including qRT-PCR, triglyceride assays, protein carbonylation assays, and many more. After this project, I realized I enjoyed performing research, but I was interested in exploring stem cell research and learning more cell culture techniques. The following summer, I worked at Tulane's Stem Cell and Regenerative Medicine Center under Dr. Bruce Bunnell studying the characterization of stem cells derived from human amniotic fluid. Outside of course work, this was my first exposure to cell culture and regenerative medicine, and I loved the work and the field of research. This research experience shaped me to want to incorporate regenerative medicine and tissue engineering in my future career as a physician. Alongside an RIT BME professor, I co-authored a review paper on 3-D Bioprinting and Electrospinning techniques for intervertebral disc repairs. Combined with my research at Tulane, this opportunity made me even more interested in tissue engineering techniques for medical applications. I am currently working in a microfluidics lab in the BME Department at RIT under Dr. Abhyankar to assist in making PDMS chips adhered to functionalized coverslips to study collagen alignment to due external factors (fluid flow through channels, pH variations, etc.).

Outside of research I also have experience in the pharmaceutical industry as I worked at GlaxoSmithKline on their Biopharmaceutical Technology Team at a large manufacturing site. There I oversaw how a small vial of cells could be scaled up to 5000L of cell culture and then processed and filtered in order to make a drug product. This experience made me more interested in drug discovery and how certain components of a drug interact in the human body.

I am eager to gain more research experience in the field of regenerative medicine in the WFIRM Summer Scholars Program in the Summer of 2021. I hope to work along side my mentor on a regenerative medicine project to gain more hands-on experience within the field of tissue engineering and stem cell research in order to learn new techniques and research approaches. I would like to be able to combine my course work with research applications within tissue engineering.

After completion of my undergraduate degrees and the WFIRM Summer Scholar Program, I aspire to go to medical school with an interest in Maternal Fetal Medicine, OBGYN with a focus on high-risk patients. As a physician, I also hope to do research on fetal abnormalities to devise new techniques to prevent and/or repair abnormalities in utero.

Christopher DiPerna

Pennsylvania State University

My name is Christopher DiPerna and I am a rising Junior at Penn State University studying Biomedical Engineering with a concentration in biomaterials. I've actually just completed my fourth year of undergraduate schooling, but will not be graduating until spring of 2022. Throughout the 2020 calendar year I worked for the Ethicon division of Johnson & Johnson within WCR Research & Development. Even with the shock of the COVID-19 crisis, I had the opportunity to contribute to a wide array of front-end projects. These efforts varied from robotic surgery assist devices to proving feasibility in an attempt to decrease the occurrence of surgical site infections by leveraging means of chemical transport. I've also volunteered my time over the past three years in the Penn State Cardiovascular Fluid Dynamics and Artificial Heart Lab. My initial project focused on evaluating the rate of platelet activation as part of the Fontan Blood Pump, and has recently added an artificial blood clot component measuring the response of different clotting factors and proteins shortly after formation.



Prior to college, I had always thought that the most rewarding way to help others was by directly caring for patients. This assumption only lasted until my sophomore year of high school, when my anatomy and physiology class was shown a video of a professor at Wake Forest, Dr. Anthony Atala, who had successfully printed a kidney using live cells and novel bioprinting techniques. From that moment on I realized that you could meaningfully effect patients' lives to the same degree, if not more, by conducting research in regenerative medicine. All of my remaining high school and undergraduate involvement has contributed to my future summer 2021 at WFIRM. I am entering this summer eager to learn and gain firsthand experience within the field of regenerative medicine, something I've been waiting patiently for the last 7 years and counting. I cannot speak to the specific area I wish to focus this summer, but I believe that just being surrounded by such esteemed faculty, students, and avant-garde research will help to focus my career goals with a regenerative scope. I am arriving at Wake Forest with an open mind, and hope to better educate myself with every waking moment I have.

I am currently planning to pursue an M.S. upon graduation in spring 2022, with the focus still undecided. I hope to utilize my learnings from summer 2021 to help make this choice when the time comes. I do know, however, that my graduate specialization needs to provide some visualization into the field of nerve regeneration. I hope to eventually lead a translational group fostering both experimental nervous engineering techniques as well as clinical applications. In regard to the summer, I can't wait to meet and interact with the other summer scholars and immerse myself in the highly-distinguished research culture at WFIRM. I'm very appreciative for this opportunity!

Jacqueline Dizon

University of Connecticut

I am a rising senior at the University of Connecticut, studying Molecular and Cell Biology with a minor in Nutrition for Exercise and Sport. Ever since I was a young girl, I have always been enthralled with science and medicine. As I progressed through high school, I fell in love with biology and learning about the fundamental units of life. This passion has stayed consistent through my academic journey and is what continues to drive my desire to learn about the field. In the past, I have had the fortune of assisting in an introductory Biology course as a lab mentor. This included answering students' questions and helping Teaching Assistants run the lab, performing tasks such as Polymerase Chain Reactions (PCR) and Gel Electrophoresis. I have also worked as an undergraduate research assistant, studying oxidative stress and mitochondrial dysfunction observed in skeletal muscles and how it relates to aging.



Unfortunately, the COVID-19 pandemic delayed my time at WFIRM from last summer to this upcoming summer. During summer 2022, I hope to learn from brilliant mentors and meet the other summer scholars, gaining a network of like-minded, equally motivated peers. I am interested in regenerative medicine because it is so different from other medical fields, in a way that closely parallels science fiction. I am fascinated by the ability to fabricate organs, manipulate tissues, and stimulate growth and regeneration in the human body. While the established discoveries and procedures are mind-blowing, many questions have yet to be answered. The endless room for discovery is what drives my excitement towards participation in the WFIRM program. I hope to gain deeper insight into the research field and the monumental breakthroughs regenerative medicine will have on future patients' lives.

After completing my undergraduate degree, I plan to pursue a PhD in developmental biology and eventually work in IVF as a fertility lab director. This career path allows for the perfect mix between research and clinical application, and I am confident that my experiences at WFIRM will help prepare me for this.

Ananya Eeraveni

University of California, Los Angeles

Hi--it's great to meet you! I'm Ananya, a rising sophomore at UCLA majoring in human biology and society. Outside of my pre-med life, I greatly enjoy exploring the city, really analyzing popular artists, and taking photos.

Growing up with Indian parents deeply invested in health, I grew up with the philosophy that great health directly correlates to a great quality of life, and a great quality of life is something everyone deserves to experience. Yet, I noticed chronic diseases with no lasting cures--diabetes, heart disease, gut diseases, etc.--growing increasingly common household names; a majority of people, including myself, either struggled with one or knew someone who did. So, in a world full of prescription pills and dancing around lasting treatments (especially during this trying time of quarantine), regenerative medicine is what deeply sparked my curiosity to explore these cures and has KEPT it there.



At WFIRM, I am genuinely looking forward to researching regenerative medicine's promising potential in curing these chronic diseases. In ten years, I envision myself as an MD/PhD who conducts translational/ clinical research and implements regenerative medicine-based treatments, cures, and procedures where fit for my patients. Whether it be from reconstructing skin grafts from stem cells to replacing failing organs, I seriously hope to be fortunate enough to contribute to advancing the regenerative medicine forefront and ultimately, honestly and significantly better lives through health--for the long run.

Malcolm Frazier

Elizabeth City State University

My name is Malcolm C. Frazier. I am a 2020 graduate of Elizabeth City State University, bachelors of science: Mechanical Engineering Technology. Ever since I was a young boy, I wanted to be a part of the industry bringing artificial tissues and advanced electromechanical technology into human physiology. My goal is to help advance the field of restorative medicine specifically through innovative *cyborgization* to repair or totally replace damaged tissues. I hope that during my 2021 summer research at WFIRM and throughout my ongoing education, I am able to gain the necessary skill to integrate robotic technologies into human bodies. The interface between human and computer/machine has yet to be perfected, and I am excited at the prospect to be a part of the development of these technologies and approaches.



In 2003, a close friend of mine was in a terrible car accident that left him confined to a wheelchair and with limited use of his hands. Over the 16 years since his accident, not much has been done to change and improve his situation. While today's wheelchairs may have a longer charge time and the wheels are

a bit more rugged, it seems like science and technological development has forgotten about him and others in similarly exhausting situations impacting their autonomy and quality of life. Simple things that we all take for granted – like getting out of bed in the middle of the night for a glass of water or stopping by the grocery store to pick up a few things – have not been a reality for him and many others like him in a long time and I get upset thinking that on our current course, maybe it will never be. I am interested in the summer research scholar program at WFIRM because it will provide me a unique opportunity to participate in regenerative medicine research that could really change the lives of many for the better.

With the work that WFIRM has done leading the Armed Forces Institute of Regenerative Medicine as well as the bioprinting breakthroughs, it's clear that WFIRM is on the forefront of solving problems for people the rest of the world might readily forget. With the diversity of projects going on at WFIRM, I may somehow find that the research being done on tissue replacement aligns with my interest more and I'm open to that possibility. Ultimately, what I hope to accomplish by the end of the summer is a greater diversity of understanding as to where the world of regenerative medicine research stands as a whole. I also hope to make lifelong connections that can help point me further down this path I'm trekking while sparking new ideas in me. I know that as an undergrad, my wheels are spinning at 100 miles an hour and that I need help in directing that energy to put it to best use. I strongly feel that a summer research experience at WFIRM will give me that direction and I hope that I can provide meaningful contribution and perspective to whatever project I'd work on.

The pandemic of COVID19 has caused much tragedy, yet progress has been made on other fronts addressing the rising need for more remote and virtual capabilities. Will surgeons be able to collaborate from all over the world to remote into robots and perform surgeries in virtual operating rooms that translate to actual physical surgery for the patient? Will we be able to give a woman without hands new ones? Will the man without legs be able to walk again, maybe even faster than with the two he was born with? I believe we can achieve all of these through innovative research, a united community, a good amount of hard work, a dash of faith and a splash of child-like imagination.

Ellie Gabriel

Yale University

Hi! My name is Ellie Gabriel, and I am a Biomedical Engineering major at Yale University in New Haven, Connecticut. I was initially inspired by the mystery that is the human brain when my younger brother was diagnosed with autism a decade ago, after which I noticed we saw the world in such different ways. My brother always wakes with a smile despite the daily challenges he faces. I strive to make life easier for him and everyone else on the autism spectrum through technology. Medical devices like cochlear implants can mean the difference between a child hearing his/her environment or being deaf to it. There is so much power and potential in technology waiting to be discovered, and I am on a mission to make it happen. Beginning college, I worked in a behavioral lab, building a rat model of schizophrenia. Then I began (and continue) to work in a clinical psychology lab studying biomarkers of autism primarily through electroencephalography data. Using experimental data from this lab, I submitted a proposal to the International Society for Autism Research (INSAR) 2020 Symposium. I am happy to say that my proposal was accepted, and my poster will be published online! Summer 2020, I will be working full-time *remotely* for an autism genetics lab at UPENN, primarily coding in R. I will also be doing a separate part-time biomedical illustration project for a separate autism lab at UPENN seeking illustrations for their journal publications.



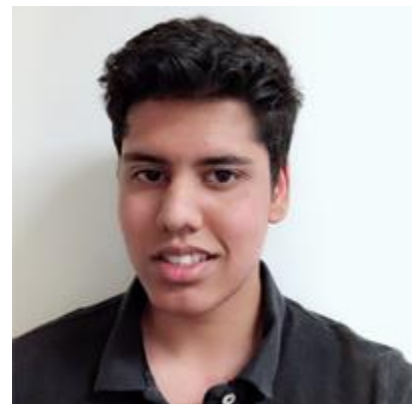
During my time in the pending WFIRM 2021 Summer Scholar program, I hope to learn the engineering lab skills that will provide a foundation for my future research endeavors. I am very excited to learn about the lab techniques that I read about in Science magazine and discuss with my professors at school. A few decades ago, the term “regenerative medicine” would have been inconceivable. Now, it is our present and our future, and I hope to contribute to the revolutionary work taking place at WFIRM and continue in the science field with that same vigor and motivation to innovate that the WFIRM researchers have. I am also intrigued by the prospect of taking the Medicine Essentials course and listening to special seminars on regenerative medicine, topics that I am not exposed to in my college courses but eagerly wish to know more about. Speaking of topics that I do not regularly engage in when I am at school, since COVID-19 has prevented my leaving the house much, I have taken the time to paint more, write more, and code more. It is a hassle to bring canvases and acrylics to college, and I never found the time for it—until now! I have also challenged myself to write one blog post a week on Medium.com to engage the insightful part of my brain even during break. Lastly, even though MATLAB is the only language I am required to learn in the BME major at school, I hope to learn more this summer like C++, Ruby, and Swift. I always find ways to fill my time!

During the remainder of my undergraduate years, I plan to apply to the B.S./M.S. in Biomedical Engineering program, so that I will finish my four years with both degrees. Then I will spend a gap year studying biomedical illustration before pursuing an MD/PhD in Biomedical Engineering. Ultimately, I would like to be a medical scientist, researching autism and the applications of technology to the human brain while also meeting with individuals on the spectrum in a more clinical way.

Nitin Gharpure

University of Alabama at Birmingham

My name is Nitin Gharpure and I am currently a junior at the University of Alabama at Birmingham. I am a public health major and I am enrolled in the Early Medical School Acceptance Program (EMSAP). One of the concepts central to EMSAP is enhancing undergraduate education by enabling members to pursue a broader range of activities beyond the typical premed experience. I maintain an avid interest in narrative medicine, bioethics and medical ethics. At UAB, I am currently the president of our medical literature club and I am the vice president of our model united nations club where I focus on biomedical/health-oriented legislation. My interest in health outcomes and health policy extends towards monitoring and modelling health outcomes in various populations in order to create targeted approaches or find more detailed, demographic-specific information.



I work at UAB’s Department of Cardiology as a research trainee. Cardiology is perhaps the field of medicine most entangled within the realm of public health. Cardiovascular health is heavily associated with comorbidities like diabetes and obesity – two conditions especially targeted by public health interventions. As a research trainee at UAB, I use biostatistics and machine-learning oriented approaches to break up patient populations into smaller, well-defined subgroups. These groups are stratified based on their response to medication as well as demographic and clinical factors. Through this process of patient population segmentation, I can find groups in which certain drugs or therapies work to prevent a condition. I have applied this broad methodology towards multiple publications, mainly in the areas of immunocardiology and heart failure.

Most recently, one of my publications, where I was a first author, was accepted for presentation at the American College of Cardiology conference in Chicago. After nearly a month of preparation, obtaining grants for furthering the project and fine-tuning my presentation, I felt ready to display my hard work on the national stage. Unfortunately, that day never came because the conference was canceled due to COVID-19. Instead, within the span of a week, my college shut down, my PI and mentor contracted COVID at the hospital, and the dorms were vacated. During that week of cancellations, the one bright spot was that the Wake Forest Institute for Regenerative Medicine remained in contact with us regarding the future of our participation in their Summer Scholars Program. Although I've tried to meticulously plan every year of my life from undergrad to medical school to beyond, COVID underscored that while even the best laid plans can collapse, it also revealed invaluable examples of strong ongoing student support from institutions like Wake Forest.

Ultimately, I plan to continue my education as a public health major, member of EMSAP and attend a medical school aligning with my future goals. I am not fully certain as to which field of medicine I would like to pursue, be it building upon my experiences in cardiology or moving into a new field altogether. Despite the uncertainty inherent to the future, or perhaps because of it, I know that what will be invaluable in all aspects of advancing my career, will be close ties to institutions like Wake Forest that care about their members.

Juley Harper

Clemson University

My name is Juley Harper and I am a senior at Clemson University. I am majoring in Biological Sciences (B.S.) and minoring in Psychology. Growing up, science was always my favorite class in school. However, it wasn't until the summer after my sophomore year of high school when I participated in a Neuroscience program at MUSC that I realized I wanted to attend medical school in my future.

This year as a sophomore at Clemson, I partnered with my professor to write a literature review on stem cell therapy as a regenerative treatment for patients with cerebral palsy. The Stem Cell Research International journal actually ended up publishing our final product! As I was working on this research, I developed a very intense fascination in regenerative medicine. I knew immediately that I wanted to expand my horizons and learn more about the potential of stem cell therapy.

I am beyond thrilled for the opportunity WFIRM is going to give me in summer 2021. I look forward to working in a community that values research and its potential. I look forward to waking up every morning, believing that I have the power to find something extraordinary in my work that day... something that could potentially change the world of biology and engineering. I have a passion to serve others and a passion to learn. In fact, these passions of mine have led me in to discovering that medicine is my dream career. I strongly believe that research is the most active way of learning. I also strongly believe that research can be the most active way of saving lives. Of course, I feel disappointed that COVID-19 disallowed us from our WFIRM experience during summer 2020. However, my anticipation to meet all my fellow scholars and mentors has only grown.

Like I mentioned earlier, I want to attend medical school and become a physician. COVID-19 and the impact it has made on healthcare workers has definitely led me to ask myself if medicine is my calling.



Even though I remain unsure of the field I am interested in, I do know that every physician's life has been affected by this pandemic. I can confidently say, however, that COVID-19 has only strengthened my desire to become a physician and uphold the responsibilities a doctor has for his or her patients. It has assured me even more that I want to sacrifice my life for the good and safety of others.

Ms. Schanck, thank you for the opportunity to still grow and connect with my potential fellow summer scholars over the next year. I cannot express my appreciation enough.

Mollie Harrison

University of Missouri – Columbia

My name is Mollie Harrison, and I am a 2021 graduate of the University of Missouri - Columbia with a degree in chemical engineering and minors in math and biology. I started off as a pre-med student my freshman year; practicing medicine appealed to me given my passion for science and desire to make a positive impact on others through my career. However, through my experiences participating in undergraduate research, I realized I could also contribute to the medical field and improve others' lives as a researcher. I found that this path aligns more closely with my goals and my excitement for scientific discovery, but I hope to work closely with medical professionals throughout my research career.



For the past three years, I have worked in a biomaterials laboratory doing tissue engineering research investigating the use of hydrogen peroxide in vascularization for bone tissue regeneration. I've led this project independently, which, although challenging, has been extremely rewarding. I have begun work on a first-author manuscript on my findings which will hopefully be published later this year. In Summer 2019, I had the opportunity to work full-time at my university as a Cherng Summer Scholar on a research project which I designed and proposed myself, where I worked to synthesize a hydrogen peroxide-releasing polymer which could be incorporated into a biodegradable scaffold. I have also had the opportunity to train and mentor several students in the lab, including one high schooler and two undergraduates, one of which is continuing my work on the angiogenesis project.

As a previously pre-med student, I am excited by the field of regenerative medicine and especially by the emphasis on translational research at WFIRM. My previous work in tissue engineering has given me insight into the transformative potential of regenerative therapies. I am excited to learn more about other areas of regenerative medicine this summer at WFIRM, and I am especially interested in learning about how these therapies can be translated to the clinic. I am eager to continue applying engineering principles to solve problems in the field of medicine and can't wait to engage in the impactful research at WFIRM.

In the fall, I will be attending the University of Texas at Austin to work toward my Ph.D. in biomedical engineering. After my recent selection as a Barry Goldwater Scholar, I have more confidence in my dreams to ultimately be able to work at the NIH performing impactful translational biomedical research.



Olivia Jochl
Harvard College

As a member of the Harvard College Class of 2023, I plan to pursue a concentration in Chemistry and a secondary in Economics. During my first two semesters, I discovered my interest in chemistry and biochemistry through the eye-opening lab work associated with these classes. The comparison between theoretical problems and tangible results found in the lab introduced me to the true complexity of physical science and further increased my appreciation for the power

of chemistry. In my second semester, I began working with a postdoctoral fellow in the Aizenberg Research Group on the development of new and improved tympanostomy tubes. While this opportunity was unfortunately cut short by the COVID-19 crisis, I had the chance to learn about materials and their properties in an entirely new and medically focused light.

In transitioning to research at WFIRM, I'm excited to apply the knowledge I gained in the classroom and in the lab to an innovative and important project. As a competitive alpine ski racer throughout high school, my personal experiences with knee injuries and surgical reconstructions first sparked my interest in orthopedics and regenerative medicine. Because my struggles with injury and recovery eventually pushed me to leave an incredible sport, I'm motivated to learn more about the medical science surrounding injuries, especially those related to sports, and pain. In 2021, I hope to combine my knowledge from the classroom and my personal experiences in order to pursue a regenerative medicine project that can eventually help me to lessen the mental and physical hardships facing high-level athletes after injury.

Following my time at WFIRM and the conclusion of undergrad, I aspire to attend medical school and eventually focus on the field of orthopedic surgery and research, specifically in sports medicine. In the future, I hope to positively influence the long-term outcomes following orthopedic injuries by discovering new perspectives and approaches that greatly decrease the struggles of physical recovery and returning to sport.

Mary Kaufmann

Davidson College

Hi! My name is Mary Kaufmann, and I am a rising senior at Davidson College studying philosophy and the biomedical sciences. As a student at a liberal arts college, I have had the opportunity to gain laboratory research experience under the direct guidance of many of my professors. My first exposure to gene-editing technology was in the Genetics laboratory at Davidson, where I investigated the unknown function of a particular gene involved in mitochondrial development in *Drosophila melanogaster*. During this project, my research group and I manipulated this gene in order to determine if mutant forms would affect the fertility and sperm function of *Drosophila melanogaster*. This experience was the first time that I truly recognized the potential of biomedical research to provide clinically significant information and therapies capable of improving health and disease treatment for people everywhere.



I grew up in a small town in North Carolina where health outcomes for community members are quite poor. During an internship for a North Carolina public health coalition, I performed public health research and worked to improve healthcare and access to care for underserved residents of North Carolina. Also, throughout my undergraduate years, I have worked in an end-of-life care home where I have cared for many patients in the final stages of their lives. I witnessed firsthand the detrimental effects on health and well-being that chronic disease, aging, and trauma generate, and I saw many patients face death as a result of disease. I was drawn to the WFIRM Summer Scholar Program because I believe that regenerative medicine has the power to provide cures and therapies capable of alleviating and overcoming many of the different types of suffering that I have witnessed during my clinical experiences.

Through my philosophy major, I have had the opportunity to explore complex issues in the fields of ethics and human well-being, and I am very excited to combine my interests in biomedical research, clinical care, and philosophy this summer at WFIRM. Regenerative medicine represents the future of treating and curing disease, and new technologies like stem-cell therapy and tissue engineering/replacement offer the possibility of an improved quality of life to patients that face discouraging diagnoses and chronic suffering. This summer, I look forward to developing new research skills, learning from an extraordinary faculty, and making discoveries that can impact the lives of patients everywhere.

Following my graduation from Davidson, I plan to attend medical school and pursue a career as a physician/surgeon. As an M.D., I would like to conduct clinical research while serving and interacting with patients every day. In my free time, I really enjoy reading, running, hiking, and simply spending time outside!

Siyuan (Claire) Li

Worcester Polytechnic Institute

Hi! I am Siyuan Li, a senior student at Worcester Polytechnic Institute majoring in biomedical engineering. My crutches have directed my path to biomedical engineering, and I use their motion to keep myself going and to encourage others to continue on their own journeys. I have signed my Christmas cards with a picture of crutches for over a decade, so I can safely say that they are integral parts of my life.

I received my first set of crutches when I was eight while recovering from osteosarcoma, and since then, I have been relying on this basic application of biomedical engineering every day. While I am grateful for my crutches to navigate my world, I have also been wondering if there is a better way to repair my leg completely, and help others with similar issues. I know I was lucky to have good medical treatment and also get used to crutches well enough to live on my own. However, not everyone has the same luck. As I received an allogeneic bone graft and chemotherapy, I witnessed many other patients suffering during and even after recovering from their surgeries.



From the undergraduate study at WPI, I learned regenerative medicine and bioprinting have the potential to provide better solutions to bone grafts. To further explore the concepts, I took related courses, worked on a 3D bioprinting project on pancreatic cancer at California State University Northridge, and now I am joining WFIRM's Summer Scholars Program as well as the Ph.D. program later in this fall. Ultimately, I would like to work on affordable medical regenerative medicine and supply these resources to all patients in need. I believe becoming a researcher at WFIRM will prepare me well as a professional researcher and help close the bone graft's demand gap on a larger scale in the future.



Brianna Lorenz

Marquette University

Hi! My name is Brianna Lorenz, and I am a 2021 graduate of Marquette University. I received a bachelor's degree in Biomedical Sciences with a minor in Business Administration. As a student at Marquette, I have been fortunate to have access to modern instrumentation and the opportunity to engage in laboratory research, which has allowed me to develop my laboratory techniques and piqued my interest in the medical innovation process. Through my research under the direction of Dr. John Mantsch, I am actively involved in studying the relationship between stress, an unpredictable and inevitable aspect of life, and drug addiction to identify the neurobiological mechanisms underlying drug craving and relapse. Aside from my scholastic pursuits, I have also had the humbling opportunity to serve others in a variety of volunteer settings. Most notably, I am a member of Global Medical Brigades, a student-led social responsibility movement traveling to impoverished countries to empower under-resourced communities to resolve global health and economic disparities.

My interest in regenerative medicine has ultimately stemmed from my desire to provide patients a better quality of life and help revolutionize clinical therapies. As a summer scholar at WFIRM, I hope to learn more about the dynamic relationship between regenerative medicine laboratory research and clinical application. I am enthralled by the pursuit of using a patient's own cells in therapy and engineering scaffolds to develop functional blood vessels, muscles, tendons, and organs to provide improved patient outcomes. I truly believe that regenerative medicine has the potential to change the face of medicine by offering an entirely new approach to medical treatment. Through the WFIRM Summer Scholars Program, I look forward to working towards developing novel and efficient treatments for numerous chronic diseases and foresee myself playing an integral part in translating the science of regenerative medicine into clinical therapies in the future.

Upon graduation from Marquette University, I aspire to attend medical school to pursue either an MD or MD/PhD degree, allowing me to make meaningful contributions to the field of medicine. While I have not yet refined my specialty of interest, I am fascinated by the astounding complexity that medicine offers and have great interest in pursuing either cardiology or obstetrics and gynecology.



Christina Palles
University of Florida

Hi! I'm Chris, and I'll be a junior at the University of Florida this fall majoring in biomedical engineering and minoring in music performance and Spanish. I've been passionate about biological sciences for as long as I can remember, but it wasn't until I took calculus in high school that I realized I wanted to be an engineer instead of a doctor. Though the position title may have changed, my goal has been the same since I was 10: to build organs and improve the organ transplant process. Watching a documentary about stem cells inspired me to help people, particularly with such a method that is so complicated and risky.

This spring, I did remote image analysis work for Dr. Kyle Allen's OrthoBME lab by writing MATLAB code to semi-automate histological grading of osteoarthritis in rat knees. This will help reduce subjectivity in the grading methods and was developed for a different stain than the original open-source Graphic User Interface for the Evaluation of Knee Osteoarthritis (GEKO). The results of my work this semester will hopefully be accepted for presentation at BMES 2021. Additionally, this fall, I will work under both Dr. Kyle Allen and Dr. Brittany Taylor, who does musculoskeletal scaffolding. Participating in combination projects and getting a variety of experience under both will help me to broaden my horizons and learn many skills in a multitude of areas. After graduation, I intend to earn my PhD and conduct research at a university where I can mentor students of my own.

Sarah Pennebaker
Georgia Institute of Technology

My name is Sarah Pennebaker, and I am a rising third year undergraduate at the Georgia Institute of Technology, where I study Neuroscience with minors in Science, Technology, & Society and Medical Science. Since beginning my time at Georgia Tech, I have had opportunities to see the impact of research on both the scientific field and on people within my community. In the Natural Products laboratory at GIT, I have been able to work on projects focused on novel drug discoveries: searching for new natural products that could change the fields of treatment through antibiotic and antitumor options. While studying abroad in Lyon, France, I studied organic chemistry while touring sites of scientific innovation, whether that was underground at CERN or in the mountainside at the Melvita Cosmetics processing plant. However, it was at a Head and Neck Clinic in downtown Atlanta that I was blown away through Tumor Board discussions, where physicians described utilizing the most recent treatments and research studies to treat their patients. Each physician brought different evidence to the table, each with a treatment plan fueled by the most recent advancements in the field.



These experiences and interactions with healthcare were what initially drove me to apply for the WFIRM program. Outside of my interests in the sciences, I love to study history and literature and take every

opportunity I can to travel to the places that made history or inspired writers. I am also an avid outdoor enthusiast whether it is backpacking, hiking, or long-distance running.

Looking forward to 2021, I am more than thrilled to know that I will be working on a research project at the Wake Forest Institute for Regenerative Medicine. While I have spent many hours in the lab working to sequence Genomic Data and analyze chemical composition, I have yet to work in a lab geared closer to patient applications. Being able to work with projects that may include the fabrication of tissues and organs presents an exciting challenge to anticipate next summer.

Currently, I am pursuing coursework and positions with the goal of further education in medical school. As a physician, research will be an extremely important part of my career that provides new options to patients as a primary mechanism for the advancement of medical treatments and practices. Following medical school, my goal is to specialize in Perinatology-neonatology, an OBGYN subspecialty that treats high-risk mothers, so that I can open a practice that uses innovative treatments and surgical techniques to provide the best outcomes for mothers and their children.

Kelly Speckl

University of Colorado at Boulder

"Hi, I'm Kelly Speckl. I attend the University of Colorado at Boulder and I am pursuing a B.S. in chemical and biological engineering. I have been interested in researching medicine from a young age, although I didn't understand what it entailed. I was fortunate enough to finally explore research my first year at CU Boulder. I became immersed in a lab where the purpose of my research was to identify biochemical cues that lead to aortic valve stenosis, a heart disease where there is a need for a therapeutic treatment. To explore this disease, I have investigated the different phenotypes of valvular interstitial cells within a 3D hydrogel matrix. This undergraduate research experience has been an amazing inspiration to me and helped me realize my passion for regenerative medicine. I will continue with my same research group this coming academic year, but with different mentors, studying organoids.



I am excited to be a participant in the WFIRM Summer Scholars Program in the summer of 2021. This program will give me the opportunity to learn new scientific techniques and delve into a new regenerative medicine project. I am thrilled at the opportunity to expand my research horizons, as I have only studied aortic valve stenosis up to this point. Regenerative medicine is a field I am passionate about, as it has the potential for real patient impact and I greatly look forward to next summer.

After completing my B.S. I aspire to pursue a PhD and continue studying regenerative medicine. With this degree I hope to work in the biopharmaceutical industry or the biotechnology industry."



David Turicek

University of Wisconsin-Madison

Hello! My name is David Turicek, and I am a rising junior at the University of Wisconsin-Madison studying Microbiology and Spanish. Although it may change, my current long-term goal is to pursue a career in oncological research, particularly with pediatric leukemia. Ever since high school, I have been enamored with immunology and I was very blessed to have been offered a position in the Capitini Lab, a pediatric oncology lab, back in October of 2019. Since then, I have continually been more and more. My research has mainly focused on B-cell acute lymphoblastic leukemia (B-ALL) and has involved in analyzing the synergy of small molecule inhibitors, examining the mechanisms of central nervous system (CNS) infiltration in mice, and employing novel immunotherapeutic advancements to enhance

the cytotoxicity of T cells in facilitating an anti-tumor response. This experience has led my career interests into a focus on pediatric oncology and has further reinforced my fascination of immunology. In the next academic year, I will continue investigating B-ALL in the same research lab and am excited to see where it takes me!

My interest in regenerative medicine is rooted in the versatility of stem cells in the realm of medicine. Given that regenerative medicine will serve as a fundamental pathway in the development of novel treatments, I was drawn to apply to the WFIRM Summer Scholars Program. Through my experience as a summer scholar at WFIRM in the summer of 2021, I hope to continue familiarizing myself with the structure of medical research, readily adapt to a new research setting, establish a profound understanding of what I will be researching, and to master the new laboratory techniques I learn. I am very excited for the abundance of learning and all of the challenges that await me this summer!

After graduating from the University of Wisconsin-Madison, I am planning on either pursuing a PhD or an MD/PhD with a strong desire to participate in oncological research and teach immunology. Thus, my end goal would be to lead my own research group as a principal investigator, facilitating an eclectic mix of research projects, and educate undergraduate or medical students about immunology.

Exel Valle-Estrada

Guilford College

My name is Exel Estrada. I am a rising senior at Guilford College working toward a BS in Biology and Health Science with a minor in Chemistry. I grew up in Guatemala where science is not commonly taught in elementary and middle school. When I started high school in the U.S., I was introduced to science through my environmental class. I loved it because of its precision, and it reminded me of my grandfather in Guatemala. He worked in the field all day while suffering from severe back pain, he used his knowledge of medicinal plants and remedies to relieve his back pain.



I have been introduced to research through several projects in undergraduate. In Chemistry, I collaborated with a team investigating how to better understand and control the mechanism of

Oscillating Chemical reactions, as it promises ways of understanding different biochemical pathways. In Biology, I have been collaborating with two faculty members for a year, searching for new sources of antibiotic sources, as antibiotic resistant threats increase globally. This summer 2020, I will be doing a virtual research experience with NYU, where I will be working on a research project focused on infectious diseases. But my initial excitement in research started when conducting a correlational study in Greensboro, looking at hypertension and exercise. I was shocked by the prevalence of hypertension and the correlation between hypertension and different terminal illnesses. My hopes for being part of different research projects have been to develop techniques and the preliminary skills needed to critically and ethically conduct research.

Sarah Wachtman

Florida State University

Hi! My name is Sarah Wachtman and I am a rising senior at Florida State University, majoring in biology. The summer before last I worked in a High Throughput Drug Discovery lab at Scripps Research, Florida. Drug discovery was entirely foreign to me at the time, but I learned quickly and had an incredible experience in the lab. My focus was tissue culture, and I performed many assays using these cells, allowing me to see how my work fit into the research project as a whole. Seeing and contributing to the interplay between biology, chemistry, and engineering struck a chord with me, and this collaborative nature is something I hope to experience throughout my career.



During the Summer Scholars 2021 program at WFIRM I hope to experience similar collaboration through the application of regenerative medicine. I was introduced to stem cells towards the end of my summer at Scripps, and it is a topic that interests me. There is incredible potential in stem cell research, especially as it applies to regenerative medicine, and I am excited to learn more about it throughout the summer. Foremost, I cannot wait to meet the faculty, staff, and fellow scholars. I am truly elated to be part of this group and learn more about regenerative medicine in such an incredible institute. I am always aiming to expand my horizons, and there is no place I'd rather explore regenerative medicine than at Wake Forest. I have had minimal exposure to regenerative medicine, and I am curious to dive into such a progressive field and explore new ideas with the team at WFIRM. It is unfortunate that this program will have to wait until 2021 due to COVID-19, but I feel the outbreak has drawn a focus to the importance of science and research. The fate of our future is resting in the hands of scientists around the world, all racing to meet the same goals. My prior lab experience granted me a great appreciation for the time, effort, and energy researchers dedicate to finding a cure, and seeing those efforts applied to such a critical, global cause has re-enforced my aspiration to be a researcher. While there may be little action I can take during the fight against COVID-19, it is my hope to decrease the impact of other diseases on our society in the future.

At the completion of my undergraduate studies, I plan to attend graduate school for a PhD in biological research and eventually lead my own lab. Thus far my interests lie predominantly in genetic research, but my goal is to explore as many research fields as possible before graduate school, including regenerative medicine. I am looking forward to enhancing my research experience by joining the team at WFIRM and I am eager for all that awaits in Summer 2021!"



Wen Ting Zheng

Massachusetts Institute of Technology

Hello, my name is Wen Ting, and I am a rising junior at the Massachusetts Institute of Technology (MIT) studying biological engineering. Having a long-term goal of attending medical school in the future and becoming a doctor, I am excited to participate in WFIRM Summer Scholar' 2021 program because of the opportunity to combine both medicine and research. While I have not had much prior exposure to regenerative medicine, I have been very fortunate to gain hands on research experience through MIT's laboratory curriculum and many undergraduate research opportunities.

Currently, I have been working with Dr. Nan Li in the Jasanoff Lab on a project studying the functional input-output mapping of thalamocortical circuitry with genetically-targeted fMRI. The thalamus area of the brain has not been previously studied in depth, and our work focuses on gaining a better understanding of the function of the thalamic circuitry, which will potentially facilitate future applications in treating Parkinson's disease and motor disorders.

In my summer at WFIRM in 2021, I hope to gain valuable research skills through working closely with my mentor on a project exploring regenerative medicine. This field of research is so innovative and intriguing to me, especially in terms of advances in biological engineering, and I look forward to learning so much more. Some specific topics I find particularly interesting are organoids and body-on-a-chip devices, which have the potential to have a transform future clinical studies and medical treatment. While at WFIRM, I also hope to build strong relationships and learn from fellow scholars who are also passionate about research as well as create meaningful connections to leaders in regenerative medicine research.

After completing my bachelor's degree in biological engineering, I plan on obtaining an M.D. while continuing clinical research as a physician. I have always thought of directly treating patients as the most immediate way I could improve patient outcome, but I have also realized how important research behind the scenes is for medical advancements, especially now in the time of coronavirus. Overall, I hope to use my passion for helping others as well my curiosity for discovering novel research to leave a positive impact in my community.