2019-20 Churchill Scholars

Esteban Abeyta	University of New Mexico	Biochemistry
Michael Aling	UC-Santa Barbara	Physics
Daniel Assumpcao	California Institute of Technology	Physics
Meenakshi Chakraborty	Massachusetts Institute of Technology	Genetics
Ryan Chen	Princeton University	Pure Mathematics
Anthony Coniglio	Indiana University	Applied Mathematics
Edridge D'Souza	UMass-Amherst	Genetics
Alexander Hwang	Rice University	Physics
Cindy Liu	Stanford University	Advanced Computer Science
Clara Ma	Yale University	Public Policy
Cameron Owen	University of Utah	Chemistry
Jesse Palmer	United States Military Academy	Chem. Engineering & Biotech.
Anita Qualls	University of Georgia	Obstetrics & Gynaecology
Brian Seymour	University of Virginia	Applied Mathematics
Jamie Tucker-Foltz	Amherst College	Advanced Computer Science
Eric Wang	University of Maryland/College Park	Chemistry

The Winston Churchill Foundation of the United States is pleased to announce the cohort of 16 Churchill Scholars, including one Kanders Churchill Scholarship in Science Policy, for the 2019-20 academic year.

The Churchill Scholarship and Kanders Churchill Scholarship are for one year of Master's study at Churchill College in the University of Cambridge. The awards cover full tuition, a stipend, travel costs, and the chance to apply for a $2,000 special research grant. The Churchill Scholarship dates to 1963.

The Kanders Churchill Scholarship is awarded from a pool of applicants to the Cambridge Master's in Public Policy. For the 15 Churchill Scholarships in mathematics, science, and engineering, we received 105 nominations from 76 of our 114 Participating Institutions. The most popular department to which nominees applied, as it is most years, was mathematics, with 21 applicants. The next most popular department was engineering, with 20, followed by physics, with 10.

For further information, contact Michael Morse, Executive Director of the Winston Churchill Foundation of the United States, 600 Madison Avenue, Suite 1601, New York NY 10022. Telephone 212-752-3200, Email mmorse@churchillscholarship.org
www.churchillscholarship.org

Esteban Abeyta

HOMETOWN
Española, New Mexico

INSTITUTION
University of New Mexico
BS, Biochemistry

TO STUDY
MPhil, Biological Science (Biochemistry)

Esteban credits his STEM-rich school environment in Los Alamos and his mother's science mentorship for his passionate pursuit of the "why" in scientific problems. Exploring the relationship between genotype and phenotype has been an interest since his youth, and now he is poised to gain a more nuanced understanding of this connection, specifically in defects of the DNA repair process and its effect on the severity of neurological diseases. Ataxia-telangiectasia (A-T) is a rare neurological disease where the patient exhibits a variety of seemingly unrelated phenotypic ailments (neurodegeneration, premature aging, insulin resistance, deficient immune response). Esteban will work under the guidance of Dr. Svetlana Khoronenkova, to investigate the role of the microenvironment and its potential in regulating the severity of the neurodegenerative response in diseases like A-T.

While still a high school student, Esteban began an internship at Los Alamos National Lab where he worked with a team that developed an algorithm to study global historic outbreaks of infectious diseases. This work led to an increased interest in the prevention of communicable diseases, especially in developing countries, an interest which he later pursued at the University of New Mexico's College of Pharmacy. Under the guidance of a post-doc fellow, he formulated a dry powder live vaccine that requires no refrigeration. Esteban has also worked as a research assistant investigating the role of proton-ion transporter genes in the proliferation of *C. albicans*, a particularly virulent hospital-acquired infection. In the summer of 2018, he was selected as a Broad Summer Research Intern where he was pivotal in providing experimental data to back-up the viability of data-driven models which were able to accurately predict gene expression levels in yeast. This work is under review at *Nature Biotechnology* with Esteban as a contributing author. He has also received a travel award to present this work and more at the Ringberg Seminar in Bavaria, Germany. He is currently working on T-cell migrations in infected lung tissue at the University of New Mexico's School of Medicine.

Esteban is a Goldwater Scholar and Regents Scholar as well as a member of Phi Beta Kappa among other recognitions. His GPA is 4.14, including 17 A+ grades so far. He has served as a selection committee member for the Regents Scholarship and has helped organize the annual University of New Mexico's Health Professions Symposium in addition to many other community organizing events centered around youth and academic success.

Michael Aling

HOMETOWN
Goleta, California

INSTITUTION
University of California, Santa Barbara
BS, Mechanical Engineering

TO STUDY
MPhil, Physics

Michael brings an engineering background to applied physics and materials science, creating advanced synthesis and measurement apparatuses. Undergraduate design work on a record-setting high-pressure furnace has prepared him to enter Dr. Suchitra Sebastian's group in the Cavendish Laboratory and join their efforts in bettering *diamond anvil cells* (DAC) and *uniaxial strain cells* for measurements in fundamental materials research under high-pressure, cryogenic conditions.

Quantum materials research attempts to revolutionize global power infrastructure, computing, and transportation through the synthesis of room-temperature superconducting materials, among other electronic and magnetic phenomena. In this pursuit, it is crucial to develop tools which allow rapid and reliable probing of material properties at a range of temperatures and pressures. At Cambridge, Michael will be improving such devices in the study of pressure-induced superconductivity, optimizing low-temperature probes: a DAC for electrical transport measurements, and a strain cell for torque magnetometry. Each will combine techniques from disparate research groups into a single, high-throughput device enabling searches for novel materials.

Since freshman year at UCSB, Michael made himself indispensable in the Wilson Lab's design and application of a high-pressure optical furnace for the growth of bulk, high-purity quantum materials. This *floating zone* furnace suppresses molten volatility by growing samples at up to 1,000 times Earth's atmospheric pressure, tripling the pressure capabilities of any predecessor. For his continuing pressure vessel, machine and optical design, he was credited as second author on the resulting paper in *Review of Scientific Instruments*. In a separate project on quantum effects in correlated electron systems, Michael adapted crystal growth techniques and performed electronic characterization of single crystals of $Sr_3(Ir_{1-x}Ru_x)O_7$, leading to co-authorships in *Physical Review B* and *Physical Review Letters*.

In his senior year, Michael became mechanical engineering technical lead on a project designing, fabricating and testing a powered assistive walking device for a local seventh-grade girl with cerebral palsy, helping to manage an interdisciplinary team of eleven and a $20,000 budget. Prior to joining Cambridge, he will also perform device optimization work in a microfluidics group at Lawrence Livermore National Laboratory. Michael is a Goldwater Scholar with a GPA of 3.98 and 36 A+ grades, among smaller awards. Over breaks, he loves to hike, camp, backpack and photograph natural landscapes in California, Oregon, Washington, and Utah.

Daniel Assumpcao

HOMETOWN
Issaquah, Washington

INSTITUTION
California Institute of Technology
BS, Electrical Engineering

TO STUDY
MPhil, Physics

The computational performance of the microprocessor continues to improve, but at the cost of unsustainable levels of energy consumption and heat power emission. Daniel wants to investigate practical, alternative devices that will continue to power computational technology. Professor Jeremy Baumberg, a leader in the field of nanophotonics and plasmonics, will host Daniel as he investigates the possibility of integrating nanophotonic techniques with Resistive RAM (RRAM) devices in order to provide a way to observe the morphological changes that occur at the nanoscale level and thus develop an understanding of the underlying kinetics involved. Eventually, these investigations may lead to the development of high-efficiency electronic devices as well as potentially new nanophotonic-powered computational devices.

Daniel discovered the power of nanotech-empowered devices as well as their fabrication challenges during his first quarter at Caltech. Sparked by this introduction, he joined a medical nanodevices lab where he eventually took on his own project which involved the design and fabrication of improved micro-scale temperature sensors. Upon completing this, Daniel began working in the field of nanophotonics, studying the quantum limits in plasmonic waveguides. Daniel's work has been published and he gave a presentation of his findings at the Materials Research Society Meeting in the fall of 2018.

Daniel has a 4.0 GPA with 10 A+ grades thus far. He is Secretary for the Caltech branch of Tau Beta Pi and has been named a Saul and Joan Cogen Memorial SURF Fellow (for his work at Harvard in the summer of 2018) and a J. Weldon Green SURF Fellow (for his work at Caltech in the summer of 2016). Daniel has won an NSF Graduate Research Fellowship. He is an avid rower.

Meenakshi Chakraborty

HOMETOWN
Lexington, Massachusetts

INSTITUTION
Massachusetts Institute of Technology
BS, Computer Science and Molecular Biology

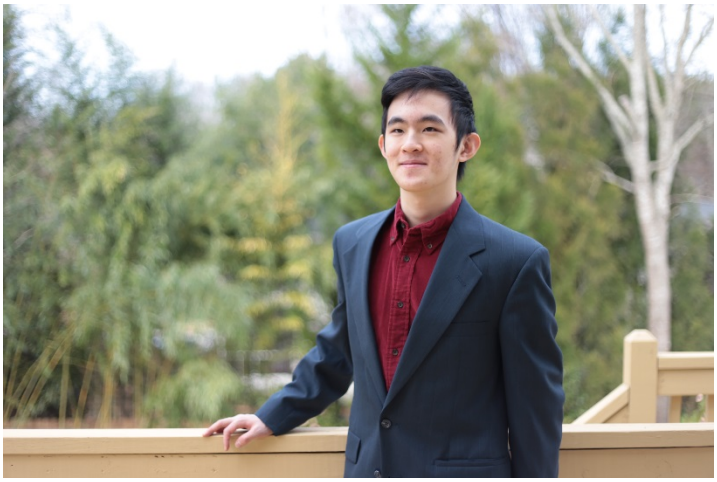
TO STUDY
MPhil, Genetics

Meena cites a trip to Calcutta's poor neighborhoods and to a children's HIV ward in South Africa as motivation for her to consider how to do good in the world. She realized that in place of guilt, action was the more effective tool against human misery. By the summer before her freshman year in high school, she began to take an active interest in the pursuit of the sciences to achieve the goal of relieving human suffering. She hopes to combine her understanding of biology and wet-lab techniques with computational methods to determine the genetic basis of human diseases.

While only a high school student, Meena wrote a successful epidemiological paper under the mentorship of Dr. Bruce Walker, a well-known AIDS researcher at Massachusetts General Hospital. She presented her paper to the broader MGH community, and the videotape of her presentation was used to familiarize new Walker Lab members with HIV/AIDS research. Also in high school, Meena wrote another paper about the discovery of circular RNAs and their potential impact on therapeutics, resulting in the first Wikipedia page on the topic that others have built upon as the field has evolved. Since 2016, she has worked in the lab of Nobel Laureate, Professor Philip Sharp. Along with her postdoctoral mentor, Dr. Salil Garg, she has studied how microRNAs and enhancers coordinate transitions between different gene expression programs in stem cells. Failure to transition can lead to abnormalities like cancer. Her computational and experimental work, where she is first-author, is expected to be published later in 2019. At Cambridge, in the genetics lab of Professor Alfonso Martinez Arias, Meena will continue her undergraduate investigation into the genetic regulation of stem cell behavior. Upon her return to the US, she will pursue a PhD in the Genetics department at Stanford University.

Meena has a nearly perfect transcript. She is a Goldwater Scholar, Amgen Scholar, and MIT Johnson & Johnson Scholar. MIT awarded her with the Susan Hockfield Prize for Life Sciences and the Wei Research award. She has been inducted into the HKN Electrical and Computer Engineering Honor Society and the Sigma Xi Honor Society. Meena is the speaker outreach chair for MIT's Effective Altruism (EA) Club and hopes to be similarly involved with Cambridge's chapter of EA. As Co-President of MIT's Biology Undergraduate Society (BUSA), she organized the first BUSA Undergraduate Summer Research Poster Session. She is the Head Freshman Advisor of her dorm and a member of the Delta Phi Epsilon sorority. She was also Publicity Chair for MIT's Concert Choir, in which she sang for several semesters.

Ryan Chen



HOMETOWN
Lawrenceville, Georgia

INSTITUTION
Princeton University
AB, Mathematics

TO STUDY
MASt, Pure Mathematics and Mathematical Statistics

Ryan wishes to pursue a research career in mathematics. At Cambridge he will be enrolled in Part III of the Math Tripos where he plans to focus on courses in algebra, algebraic geometry, and number theory. Within number theory, he is excited about studying the connection between modular forms, elliptic curves and L-functions, ubiquitous objects in modern number theory. He is also enthusiastic about the opportunity to write a research paper that aligns with his interest in arithmetic geometry.

After his freshman year, he was accepted into Cornell University's math REU under Professor Florian Frick, where he worked on topological methods in discrete geometry, resulting in a paper and conference presentations. The next summer, he was accepted into Professor Steven Miller's summer research group in Number Theory and Probability as part of the REU in Mathematics at Williams College. He contributed significantly to four different research projects, involving random matrix theory, statistics of elliptic curve Fourier coefficients, and the distribution of Gaussian primes. He attended the Young Mathematicians Conference at Ohio State, where all four of his projects were accepted and all were in the top 15 submissions. After his junior year, he was accepted into Professor Ken Ono and Professor John Duncan's REU at Emory University, where he and his collaborators studied modular form coefficient congruences in relation with moonshine, a topic with relevancy in problems of string theory and black hole states. The resulting paper has since been solicited for publication in a journal edited by one of the world's leading mathematical physicists. For his senior thesis, he is studying integral points on certain algebraic surfaces via moduli spaces of hyperelliptic curves.

Ryan has a GPA of 3.99 with 24 A or A+ grades. He has completed all the course offerings in his area of interest and has designed several individualized courses. He is a Goldwater Scholar, a member of Phi Beta Kappa and winner of Princeton's Shapiro Prize for Academic Excellence and the Manfred Pyka Prize in Physics. Ryan appreciates the research mentoring he has received and hopes to foster an interest in STEM with younger students. Through high school and college, he has helped coordinate math/science competitions and academic bowls. Ryan has won an NSF Graduate Research Fellowship. He plays the piano and self-trains in the sprints.

Anthony Coniglio

HOMETOWN
Delray Beach, Florida

INSTITUTION
Indiana University
BS, Mathematics, Physics, Astronomy/Astrophysics
BM, Piano Performance

TO STUDY
MASt, Applied Mathematics and Theoretical Physics

Anthony will take Part III of the Mathematical Tripos, where he will pursue his interest in partial differential equations (PDEs) and analysis. He looks forward to taking classes like Analysis of PDEs and Elliptical PDEs, with the hope of applying this knowledge to the field of mathematical general relativity.

Anthony is a quadruple major, having tacked on three majors (B.S. in Mathematics, Physics, and Astronomy/Astrophysics) in addition to a degree in music (B.M. in Piano Performance). In the summer of 2018, he worked on the Mathieu differential equation at Cornell University. He and his group studied the convergence of solutions to the equation and investigated a method by which the Mathieu differential equation can be generalized to be defined as a "fractal differential equation." The research is currently being prepared for publication, and Anthony has presented the findings as one of just two undergraduate invited speakers at the AMS Special Session on *Differential Equations on Fractals* at the 2019 Joint Mathematics Meetings. In the summer of 2017, at a research experience at Valparaiso University, Anthony worked on perturbed Hamiltonian systems of differential equations. This research resulted in a paper which will appear in *The American Mathematical Monthly* in addition to a second paper which has also been submitted for publication.

Having played the piano since the age of nine, Anthony has found that his interest in analytical mathematics is befitted by his love of classical music, with its complex organization of harmony and rhythm. He is currently studying classical piano under renowned Grammy Award-winning pianist André Watts and feels that the pursuit of mathematical research requires creativity at its core in the same way that musical interpretation does. Anthony is the recipient of multiple named music awards as well as numerous departmental distinctions in mathematics and astronomy. He has a near-perfect GPA of 3.97 while averaging more than 20 credit hours per semester (the typical student takes 12-18 hours). He has taught piano to many young students, including those with physical and/or neurological disabilities.

Edridge D'Souza

HOMETOWN
Shrewsbury, Massachusetts

INSTITUTION
University of Massachusetts/Amherst
BS, Biochemistry, Molecular Biology/Mathematics

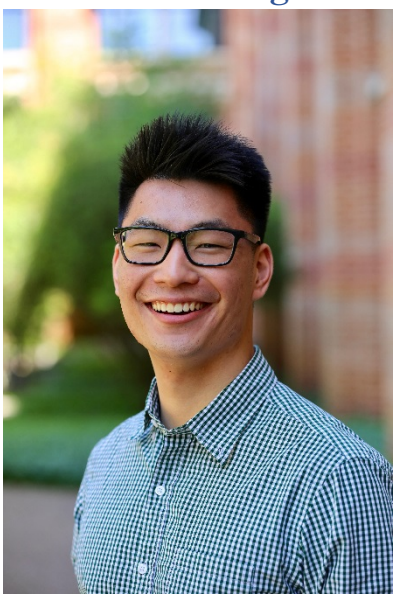
TO STUDY
MPhil, Genetics

Edridge believes that everything in the natural world presents as a form of data. By combining biochemistry and statistical inference, he hopes to discover how epigenetic effects and hidden patterns in RNA transcription/processing can affect the expression of an organism's genome. At Cambridge, he will work on the *SoxN* gene with Dr. Steve Russell, who first identified the gene's role in the development of the central nervous system (CNS) of the common fruit fly. Edridge will try to differentiate the regulatory and functional differences of *SoxN* from another partially redundant gene within the Sox family, *Diachete*, in order to gain a more nuanced understanding of the regulation of CNS development.

Edridge's first research project combined traditional lab-based techniques with computer programming, mathematical modeling, and statistical data analysis. His findings helped to develop a mathematical model of cell growth kinetics in yeast, which was later published with Edridge as co-author. During his second year, he used his programming skills to find and visualize statistical differences in gene expression between stem cells and their daughter cells. This work has been used as part of an RO1 NIH grant submission. Early in his junior year, he presented the initial finding of his project on "dosage compensation" at the Northeast Chromosome Pairing Meeting in Maine. Edridge had discovered a DNA sequence signature on the human X chromosome that also mirrored a similar motif on the X chromosome of male Drosophila, which may explain a conserved mechanism that regulates sex-linked traits and diseases in humans. He is currently exploring the role of transposon invasions to explain the motif. Edridge also worked during the summers at the University of Massachusetts Medical School, where he worked under Nobel Laureate Craig Mello on questions of piRNA-target mRNA base-pairing as well as "RNA degradome" sequences.

Edridge has a perfect GPA of 4.0 with no grade lower than an A. He is a Goldwater Scholar, National Merit Scholar, and Phi Beta Kappa. He was also awarded an AT&T National Scholarship as well as other internal academic and research awards. He is certified as a Rape Crisis Counselor and works the crisis hotline. Edridge started the UMass Genetics Club, which aims to increase "genetic literacy" and be a voice against misuses of science.

Alexander Hwang



HOMETOWN
Palo Alto, California

INSTITUTION
Rice University
BS, Physics
BA, Electrical Engineering

TO STUDY
MPhil, Physics

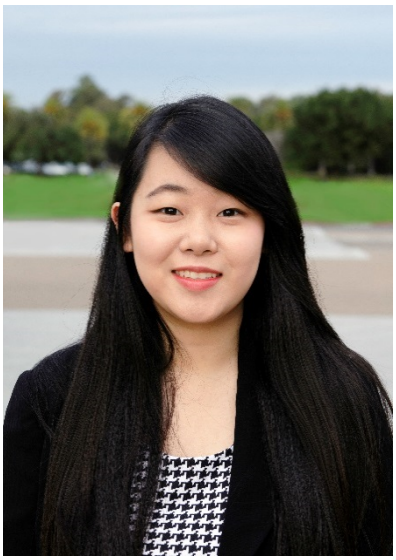
Alex will work on the nanoscale properties of light-matter interactions in order to improve current limitations in silicon-based electronics. Extraordinarily thin, two-dimensional nanomaterials (2D TMD) comprised of transition metal and chalcogen atoms have great potential as future components of nanoscale optoelectronic systems. Professor Jeremy Baumberg's NanoPhotonics group will host Alex's project, which will attempt to verify hybrid light-matter states at the nanoscale by incorporating 2D TMDs into nanocavities. If successful, it would be a big step in creating the next generation of technology using nanomaterials.

As a high school senior, Alex became interested in light's ability to treat illness. He joined an investigative lab at Stanford University where he studied the use of light to treat the build-up of bilirubin in infants. He continued his study of light at Stanford the following summer, where he used machine learning to investigate light-emitting smartwatches. He then became interested in light-matter interactions at the nanoscale. Alexander has worked on improving the design and fabrication of nanophotonic biosensors and has also pushed to address electrical inefficiency by exploring ways to send signals with light, which is ultrafast and dissipates no heat. After winning a competitive research grant, he traveled to Kyoto, Japan, where he demonstrated a practical way to increase information storage times in light-emitting 2D TMDs. After this, he received an NSF-funded REU to UC Berkeley's Integrated Photonics Lab, where he investigated the use of nanoLEDs in 2D TMDs in developing nano-antenna paradigms and later, their shape optimization.

Alex is a Goldwater Scholar and the recipient of the Rice University School of Engineering's Outstanding Research Award, the Physics Department's Top Junior Award as well as other internal academic and research awards. His major extracurricular interest is the STEM outreach work he has led focused on addressing educational inequalities. Alex has won an NSF Graduate Research Fellowship. He loves the viola and looks forward to performing with Cambridge's "Orchestra on the Hill."

Cindy Liu

Russo Churchill Scholar



HOMETOWN
San Jose, California

INSTITUTION
Stanford University
BS, Biomedical Computation

TO STUDY
MPhil, Advanced Computer Science

Cindy is working towards an MD/PhD. As a physician scientist, she hopes to improve patient outcomes by becoming the type of doctor who can reliably judge whether new technology can be realistically implemented in the clinical setting. At the same time, she will leverage her engineering background to drive tech innovation to improve current diagnostic techniques. At Cambridge, she will work with Professor Pietro Lio' on the PROPAG-AGEING initiative, focusing on computational methods to uncover common molecular and cellular markers in both the progression of Parkinson's disease (PD) and the aging process. Her research has the potential to develop targeted PD treatment methods as well as identifying PD patients at an earlier stage of disease progression. In addition to her PD research, she will expand her knowledge of among other topics, Machine Learning, Deep Learning and Natural Language Processing.

As an undergraduate, she worked on a new technique for 3D RNA-sequencing of biological tissues, for which she is listed as a co-author in *Science*. In addition, she was awarded a competitive Bio-X Undergraduate Research grant where she helped her lab identify 12 select surface markers (out of nearly 300 screened) as the best candidate markers for cancer stem cells (CSCs) involved in the formation of Glioblastoma Multiforme (GBM). She further differentiated these 12 candidates into the top few candidates for CSCs using Extreme Limiting Dilution Analysis and in-vitro validation studies.

Cindy led the Stanford Health Innovations in Future Technologies (SHIFT) Health++hackathon, where 300 clinicians, engineers, product designers, business school students and hackers were challenged to reimagine health care. She also served as Editor-in-Chief for *Intersect: The Stanford Journal of Science, Technology, and Society*, and worked as a tutor with the East Palo Alto Stanford Academy (EPASA), tutoring seventh and eighth grade students from disadvantaged communities. She is also a talented photographer, having won several top awards in international photography competitions, such as the International Photography Awards (IPA), and has had her photos published on the prestigious fine art website 1x.com.

Clara Ma

Kanders Churchill Scholar

HOMETOWN
Lenexa, Kansas

INSTITUTION
Yale University
BS, Geology & Geophysics
BA, Political Science

TO STUDY
MPhil, Public Policy

As the Kanders Churchill Scholar in Science Policy, Clara will pursue a Master's in Public Policy at Cambridge, where she will refine her interest in energy and environmental research and policy analysis. Clara is confident that meaningful solutions to environmental problems must come from an approach that combines science, engineering, and public policy perspectives. Her career goal is to work in government administration at the United States Department of Energy's Office of International Affairs, managing Sino-U.S. partnerships in global climate change mitigation, adaptation, and clean energy research initiatives.

Clara studied Geology & Geophysics and Political Science at Yale in addition to completing a certificate in Energy Studies. Her undergraduate research employs global climate modeling in the study of air quality, climate change, and aerosol-climate interactions. At the Lamont-Doherty Earth Observatory, she worked with scientists from Tsinghua University as part of the Columbia Global Policy Initiative to predict surface ozone pollution levels over the next several decades under climate change and future emissions scenarios in China. She presented her work at the American Geophysical Union Fall Meeting in 2017 and was the second author on a paper submitted in 2019 to *Environmental Research Letters*. Most recently, at the DOE's Argonne National Laboratory, she worked to improve the representation of aerosols in the newly released DOE Energy Exascale Earth System Model (E3SM) – she is the lead author on the resulting conference abstract.

After winning a nationwide essay contest in 2009 to name NASA's Mars Science Laboratory rover, "Curiosity," Clara worked with NASA and with the Kansas Cosmosphere and Space Center in her own community to promote youth engagement in science and space exploration. In 2014, she gave a TEDxYouth talk on both the intrinsic and material value of space exploration. Her personal reflections, essays, and letters have been featured in publications including Mashable, Highlights Magazine for Children, and in the time capsule marking the 50th anniversary of the City of Cape Canaveral, Florida, the site of NASA's primary launch center for human and robotic spaceflight. Ma's senior essay won the James Gordon Bennett Prize for best in international relations.

Clara is a 2015 United States Presidential Scholar as well as a recipient of the Coca-Cola Scholarship. At Yale, she served as president of Yale Women in STEM, treasurer of the Yale Student Environmental Coalition, and as a science instructor for the largest class of the Evolutions Afterschool Program for local Connecticut high school students at the Yale Peabody Museum of Natural History. She is an avid writer, dancer, and chess player.

Cameron Owen

Gerschel Churchill Scholar

HOMETOWN
Boise, Idaho

INSTITUTION
University of Utah
Hons BS, Chemistry
BS, Physics

TO STUDY
MPhil, Chemistry

Methane is the main component in natural gas and because of its low chemical reactivity, does not easily convert to more valuable chemicals. In fact, the ability to convert methane into a functional biofuel like methanol is regarded as a "holy grail" problem in catalysis, with many scientists failing to find a solution that is both functional and efficient. At Cambridge, Cameron will investigate one approach to the problem by focusing on the surface absorption of methane. Working under the direction of Professor Stephen Jenkins, he will develop a theoretical investigation of doped-metallic surfaces for the purpose of activating the very inert C-H bonds in methane. He is excited about the future potential of his work to mitigate the role of methane in the greenhouse gas effect and to create liquid fuel sources.

As a freshman, Cameron began a fruitful residency with Professor Peter Armentrout's research lab where he has investigated the oxidation chemistry of holmium, a rare earth metal, as well as the use of gold in activating methane for catalysis. Both these projects were in under request by the US Air Force Research Laboratory. He has been invited to participate in two international REU's with Professor Armentrout where Cameron gained experience working with IR spectroscopy at one of the world's best free electron laser facilities (FELIX) at Radboud University, Netherlands. There, he was able to acquire IR spectra using different instrumentation which he then analyzed and interpreted for the purposes of elucidating metal activated methane complexes and characterizing metal-amino complexes. Cameron has multiple manuscripts in progress as first author as well as several published works including two first-author publications in the *Journal of Physical Chemistry* and the *European Journal of Mass Spectrometry*. He has been invited by the Gulf Coast Undergraduate Symposium at Rice University, twice, where he was awarded with the Best Presentation in Spectroscopy award during his first visit. He is currently working on the activation of methane by gold dimer cations in Professor Armentrout's lab under the request of the Air Force Research Lab and has just submitted another lead author publication on the bond dissociation energy of gold dimer cation to the *Journal of Physical Chemistry*.

Cameron is a Goldwater Scholar as well as the recipient of numerous academic scholarships, including the College of Science Dean's Scholarship, the Ronald Ragsdale Scholarship, the James B. and Betty Debenham Honors College Scholarship, and the Ferdinand Peterson Scholarship at the University of Utah. He is a member of Sigma Xi, Phi Kappa Phi, Golden Key and Phi Eta Sigma Honor Societies. He enjoys outdoor sports such as rock climbing, mountain biking, and skiing.

Jesse Palmer

Gabelli Churchill Scholar

HOMETOWN
Plano, Texas

INSTITUTION
United States Military Academy
BS, Chemical Engineering, Eurasian Regional Studies

TO STUDY
MPhil, Advanced Chemical Engineering

From life-enhancing medical devices to sustainable energy solutions, Jesse is motivated by a desire to improve quality of life through practical devices. His current interest is the development of alternative energy sources for internal-combustion engines. These alternative sources require nano-structured metal catalysts which add bulk and cost to the completed device. In Dr. Laura Torrente's Process Integration Group, Jesse will focus on the use of renewable biological catalysts, using cellulose nanofibers to create lighter and more scalable metal-organic catalysts.

Jesse began his work in the Multi-Functional Materials Laboratory as a freshman, where he worked on biological constituents to build aerogels for catalysts in fuel cells and batteries. His later investigations centered on the synthesis of noble-metal aerogel frameworks. Working with a fellow undergraduate, he was able to reduce the formation time of these aerogels from days to minutes while maintaining high electrochemical performance. Building upon his work, he tackled the challenge of integrating aerogel catalysts in existing energy storage systems by producing biological templates that could be used for noble-metal deposition. With his foundation in chemical engineering, he proposed the use of cellulose nanofibers for their high surface area potential for metal deposition. He also proposed ways to increase the mechanical durability of biological templates. In the summer of 2018, he worked with the Harvard Disease Biophysics Group to produce a template for fuel cell catalysis using a Kevlar-cellulose composite hydrogel. He has published four journal papers with a fifth in review.

Jesse will be commissioned as an officer in the U.S. Army upon graduation. He is a Goldwater Scholar and the recipient of a Stamps Scholarship. He has also been awarded a scholarship from the Society of American Military Engineers as well as several institutional awards from West Point including the Dean's Pentathlete Award and the Distinguished Cadet award. He is a member of the Tau Beta Pi and Phi Sigma Iota Honor Societies. Jesse has also developed international collaborations with scientists in South Korea and Australia to further promote research opportunities for underclassmen.

Anita Qualls

HOMETOWN
Johns Creek, Georgia

INSTITUTION
University of Georgia
BS, Biology

TO STUDY
MPhil, Obstetrics and Gynaecology

Human cytomegalovirus virus (HCMV) affects up to 1.2% of all pregnancies in the developed world. The mechanism of transmission is currently unknown, and the congenital infection can result in neurodevelopmental sequelae in the fetus. At Cambridge, Anita will work with Dr. Francesco Colucci in the Department of Obstetrics and Gynaecology. She will conduct research on the role of uterine lymphoid cells (g1 ILCs) and their response to mouse cytomegalovirus (MCMV) during gestation. This investigation may be used in the prevention of congenital transmission in human infants. Anita will train in obstetrics after her Cambridge year and looks forward to a career in academic medicine, where she can follow her triple passions: basic science research, clinical care, and the mentoring of future physicians.

She is a named Regenerative Bioscience Fellow at the University of Georgia's Skeletal Muscle Dysfunction Lab. She studied the role of mitochondrial maintenance on skeletal muscle and repair. She also co-led an investigation into improved rehabilitation techniques in patients with volumetric muscle loss (VML), focusing on the role of cytokine-mediated inflammatory response on mitochondria. During a summer internship at Harvard Medical School, she worked on pediatric clinical cases of rare genetic diseases like hypermagnesemia. Anita's work led to three separate contributions for clinical papers, with one as a first-author, where she discussed genotype-phenotype correlations in rare cases of congenital myopathy. In addition, she was selected for a summer undergraduate research program at NYU School of Medicine, where she used shRNA technology to decrease expression on specific leukemia cell lines with NSD2 mutations in order to shed light on the pathways that drive drug resistance in acute lymphoblastic leukemia (ALL).

Anita is active with service organizations that impact children's health, community health and outreach. She is the co-founder and president of Health 4 Kids, an initiative that encourages children to pursue a healthy lifestyle and has developed a stroke awareness program which was distributed to over 200 senior citizens in the Atlanta community. She is a Leonard Leadership Scholar and Honors Policy Scholar, among other awards and honors. She has a perfect 4.0 GPA.

Brian Seymour

Dyer Churchill Scholar

HOMETOWN
Ruckersville, Virginia

INSTITUTION
University of Virginia
BS, Physics and Mathematics

TO STUDY
MASt, Applied Mathematics and Theoretical Physics

According to Brian, the nature of scientific and mathematical discovery is not vertical and linear but random and cumulative. Each scientist contributes an idea which the scientific community integrates into a grand mural, capable of explaining the fundamental laws of the universe. Brian will be a Part III MASt student at Cambridge, where he will take courses in General Relativity and Cosmology among others. He hopes to add to his understanding of gravitational physics, astrophysics, and quantum gravity in order to apply it to his studies of strong gravity. He further wants to understand the physics of both large-scale structure and the early universe in cosmology.

He began his first research project in high school, working on a soft condensed matter project, the rheology of foams. As a rising junior in college, he worked at the Laser Interferometer Gravitational Wave Observatory (LIGO) in Livingston, Louisiana, a joint project of Caltech and MIT. This collaborative research program detects gravitational waves with light interferometry. However, these waves are 1,000 times smaller than a proton and are buried "in an ocean of ubiquitous environmental noise." Working from first principles, Brian was able to model angular noise and test it on the LIGO instrument offline, thereby suggesting that this source of the noise was insignificant. During his junior year, he began working on tests of modified theories of gravity, exploring gravitational the wave signal of a pulsar in orbit about a black hole. The resulting manuscript was published in *Physical Review D*. He is currently working on two additional follow-up projects, both in the field of gravitational wave astrophysics.

He is a Goldwater nominee as well as the winner of an Astronaut Scholarship, and the recipient of multiple research grant awards. He is the outreach chair for the Society of Physics students and has a science blog to help high school and college students figure out a path to study physics. He has created an open source android app that typesets equations in LaTeX to help students study physics and mathematics. Brian is an Eagle Scout and hopes to one day write a popular science book.

Jamie Tucker-Foltz

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HOMETOWN
Boulder, Colorado

INSTITUTION
Amherst College
BA, Computer Science and Mathematics

TO STUDY
MPhil, Advanced Computer Science

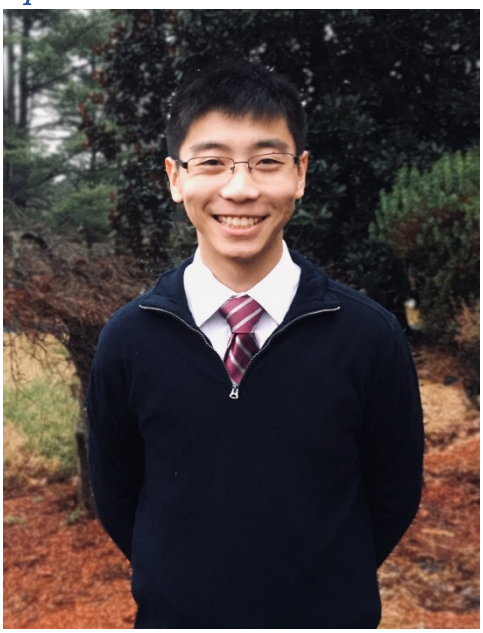
Jamie's first interest was pure math. However, it became clearer with time that the most exciting questions for him involved computer science. At Cambridge, he will pursue an MPhil in Advanced Computer Science. He is excited about studying the mathematical theories behind computer science topics such as metaprogramming and type theory. On the research end, he is interested in pursuing a project involving logical systems, such as verifying cryptographic protocol security.

After his sophomore year, he and Professor Josh Grochow (UC Boulder) worked on a theoretical computational problem and published the results of the research with Jamie as coauthor. He presented the results (on a connection between "unique games" and algebraic topology) at the 34th International Symposium on Computational Geometry in Budapest in the summer of 2018. His senior honors research project involves adiabatic quantum computing and graph theory. Another one of Jamie's main intellectual interests is the connection between computer science and game theory. He was invited to attend the 29th International Conference on Game Theory at Stony Brook, where he presented and discussed his game-theoretic solution to the gerrymandering problem in a two-party setting. His paper is now being prepared for submission. Jamie has also held a summer internship at Google as a software engineer.

Jamie has 18 A+ grades with no grade lower than A and is a member of Phi Beta Kappa and Sigma Xi. He is the recipient of consecutive Amherst's Walker Prize in Problem Solving, Math and Statistics, Amherst's Schupf Scholarship for incoming exceptional Amherst students, and the Charles Cole Scholarship. During his senior year he won three more Amherst awards including the Addison Brown Scholarship, the Computer Science Prize, and the Woods-Travis Prize. He is the president of the Strategic Board Games Club and Juggling Club, where he can juggle up to 9 balls standing or 5 clubs on a unicycle. He also plays volleyball competitively.

Eric Wang

Epstein Churchill Scholar



HOMETOWN
Potomac, Maryland

INSTITUTION
University of Maryland/College Park
BS, Bioengineering

TO STUDY
MPhil, Chemistry

Advances in computing speed have allowed for greater scrutiny of the complex interactions of molecules at the atomic level. Molecular dynamics (MD) is a computational method that Eric believes has the potential to transform bioscience research. At Cambridge, Eric will work with Dr. Michele Vendruscolo, whose lab focuses on computational approaches to understanding molecular structures implicated in Alzheimer's and Parkinson's disease. Eric will focus on the amyloid beta (Aβ) peptide and its possible role in the formation of lipid membrane defects. This research can pave the way for the design of small molecule drugs that could inhibit the aggregation of Aβ to potentially halt disease.

Eric began learning MD techniques using instructions he found on the internet, in order to run and analyze simulations of lipid raft models, his first project. For this work, he was presented with the Jeffry Madura Outstanding Research Award at the American Chemical Society meeting. Shortly after, he began his study of the molecular structure of the skin. Using MD and free energy simulations, he devised a novel model of ethanol permeation. In the summer of 2017, he began work at the National Institutes of Health (NIH) where he expanded the application of MD to study the effect of an influenza peptide on membranes. After an initial disappointment, he created a novel method to evaluate pore stability, and he also used confocal microscopy to image peptide-induced pore leakage. This work has now evolved into additional projects on membrane permeability, leveraging his previous work with ethanol and his experience with theoretical modeling. He has also written a code that is being used to calculate lipid interdigitation. Eric is the first or co-first author of 7 papers in journals such as *Chemical Reviews* and *The Journal of Physical Chemistry B*, and he has another first author paper in review in *The Journal of the American Chemical Society*. He also serves as a reviewer for *The Journal of Physical Chemistry*.

Eric has twice been awarded the Howard Hughes Medical Institute Research Fellowship. He is a Goldwater Scholar and the recipient of a President's Scholarship among other merit and leadership recognitions. Eric has won an NSF Graduate Research Fellowship. He is active with the Knights of Columbus and the Catholic Student Center where he serves as bible study leader and altar serving coordinator. He also served as a research mentor for high school students and a volunteer tutor.