



Newsletter of the
Winston Churchill Foundation
of the United States



CHURCHILL SCHOLARS

2017–18

Christopher Balzer
Shovik Bandyopadhyay
Lucy Chai
Christopher Cooper
Angela Harper
Benjamin Kompa
Jesse Mu
Seth Musser
Daniel Rothchild
Jarrod Shilts
Anthony Tabet
Julian Vigil
Vivian Wang
Michael Zhao
Angela Zou

SCHOLARS CONSIDER SCIENCE POLICY

Late one afternoon in February, all 15 Churchill Scholars gathered across the street from Fitzbillies in the Newton Room of what used to be Cambridge University Press. For three hours, they heard from Churchill College Master Dame Athene Donald, along with a panel of distinguished scientists on a topic that few of the Scholars had spent much time considering, and that none of them realized was part of the Churchill Scholarship program.

During the past academic year, the Churchill Foundation introduced two days of seminars on science policy into the Churchill experience. These were organized, with support of the Winston Churchill Foundation, by the Cambridge Centre for Science and Policy.

This initiative was well-received by the cohort. One of the Churchill Scholars commented, “Using science to make the world better... has always been one of my main motivators for pursuing a career in academia. I never gave much thought, however, to how research translates to actual change in society. I thought of science policy as synonymous with politics and assumed it wasn’t something a research scientist was positioned to participate in. After going to these science policy seminars, however, I realize that you don’t have to choose between going into research and going into policy. Not only is it possible to do both, but this should be the norm, as research scientists are more qualified than anyone to create intelligent science policy.”

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Letter from the Executive Director



How do we measure success? This is a question that looms over every charitable foundation. Some foundations get so mired in measuring success that they design grant programs around easy measurements, rather than around long-term benefits. Such foundations can be short-sighted, looking out at a horizon no longer than the average tenure of an executive director.

For us, the question can be particularly thorny, since we grant awards to students who don't really need them. Most unsuccessful applicants to the Churchill Scholarship go on to graduate school at top-flight universities. Yes, their lives and careers would surely have been enhanced by a year in Cambridge, but their lack of a Churchill Scholarship has not really slowed them down.

While the most obvious impact of a Churchill Scholarship is in how it affects the recipients, our success as a Foundation comes not from what we do for them but from what they do for us. For more than 50 years, Churchill Scholars have had incredible careers, impacting all of our lives through technological advances, medical breakthroughs, and by helping educate the next generation.

Isn't that enough? Sure it is. We at the Foundation are very proud of what we have done and what our Scholars have achieved. Yet I do not think we can be complacent. Following the leadership of Dame Athene Donald, who is passionate about preparing scientific leaders, the energy of our Board of Trustees, and the generosity of Board Member Warren Kanders, we have looked to enhance the Churchill Scholarship experience through the science policy initiative outlined on the front page.

We do not expect every Churchill Scholar to dive into science policy. What we hope is that by sparking an interest in science policy at such an early stage, some of our Scholars will have the tools needed to make positive contributions and impacts in ways that Sir Winston Churchill envisioned when he established this scheme.

What's next? We are considering adding a one-day or half-day science communication seminar for current Scholars, and we are also exploring how to offer workshops to our alumni.

These are complex and challenging times, but they are also exciting times. I think this Foundation can rise to the challenge of enhancing the public benefit aspect of our work, and I look forward to hearing from our alumni and friends with your thoughts and ideas.

"FOR MORE THAN 50 YEARS, CHURCHILL SCHOLARS HAVE HAD INCREDIBLE CAREERS, IMPACTING ALL OF OUR LIVES THROUGH TECHNOLOGICAL ADVANCES, MEDICAL BREAKTHROUGHS, AND BY HELPING EDUCATE THE NEXT GENERATION." MIKE MORSE

"DISTRUST OF SCIENTISTS IS A MAJOR SOCIETAL RISK... AND A PROMINENT ORGANIZATION LIKE THE CHURCHILL FOUNDATION COULD HAVE A LARGE IMPACT ON HOW SCIENTISTS ARE VIEWED BY THE PUBLIC AND HOW FUTURE SCIENTISTS CHOOSE TO ENGAGE WITH THE PUBLIC."

Scholars Consider Science Policy continues

During the first day's seminar, Scholars considered how academic research contributes to policy making, what the main challenges are in linking evidence and expertise to policy making, and what can be done to improve the relationship between government and science.

On the second day, Scholars ventured into London to meet with UK Government science policy officers, in the Home Office, Ministry of Defence, and the Parliamentary Office of Science and Technology.

When Sir Winston Churchill conceived of Churchill College and the Churchill Scholarship, the relationship between science and national interests was clear. This was most obvious in the field of nuclear physics, and it was no accident that the first Master of Churchill College, Sir John Cockcroft, had won the Nobel Prize for splitting the atom.

Today, the relationship between science, national security, and our collective prosperity is more complex. The Churchill Scholars all appreciated the opportunity to consider these issues in the seminar format.

Next year, the Churchill Foundation will further enhance the development of this aspect of the program, while preserving the elite science scholarship that has evolved over the past 55 years. Thanks to the generosity of Board Member Warren Kanders, we will introduce, on a trial basis, a 16th scholarship known as the Kanders Churchill Scholarship.

The Kanders Churchill Scholar will have an undergraduate degree in science, mathematics, or engineering, will take the Master's in Public Policy, and will be part of the Churchill Scholar cohort, participating in the same Foundation-run activities. This should reinforce the messages from the two days of seminars and lead to a fruitful dialogue throughout the Churchill year.

Another of last year's cohort said, "I am a big fan of expanding the presence of science policy in the scholarship program. Distrust of scientists is a major societal risk, in my opinion. And a prominent organization like the Churchill Foundation could have a large impact on how scientists are viewed by the public and how future scientists choose to engage with the public."

Introducing Katie



Catherine (Katie) Hwang has been working at the Foundation since November 2013. She lives in NYC with her two children and husband, Dmitry Green who is a '94 Churchill Scholar. "I love working at the Foundation because I am exposed to new modes of thought and research being practiced by our Scholars today. It's a very intellectual atmosphere as well as a very collegial two-person operation—Mike and Yours Truly." She attended the University of Connecticut School of Law and is a graduate of the University of Chicago.



CHRISTOPHER BALZER

Chris has worked on the synthesis, characterization, and application of metal-organic frameworks (MOFs). In Dr. David Fairen-Jimenez's lab, he will use these skills and his knowledge of computational software to bridge a gap between physical chemistry and chemical engineering as it applies to the adsorption properties of MOFs. He hopes that his research will contribute to the development of cleaner industrial production methods.

After completing a high school research project on "green chemistry," he found that chemical engineering would allow him to study physical processes on the macro/micro/nano scale while also developing techniques that would reduce the effects of climate change. As an undergraduate, he designed an independent research project that studied the detection of harmful volatile organic compounds (VOCs) using MOFs from a quantum perspective. His senior thesis focuses on the accuracy of theoretical models in predicting carbon dioxide adsorption in MOFs.

The first-ever Churchill Scholar from Arizona State University, Chris is the recipient of a Goldwater Scholarship, has co-authored three refereed journal publications and been a first author on one, and has presented his research on MOFs at a national conference. He has accumulated 24 A+ grades, including in each of the six courses he took in the Spring of 2016. He has taken such a high course load that he graduated after just three years. He was recognized for Outstanding Honors Thesis for ASU's School for Engineering Matter, Transport & Energy. He has medaled in two triathlons and is an avid hiker and backpacker.

Christopher Balzer

HOMETOWN
Anthem, Arizona
INSTITUTION
Arizona State University
(BSE, Chemical Engineering)
TO STUDY
MPhil, Advanced Chemical
Engineering
Department of Chemical
Engineering and Biotechnology



Shovik Bandyopadhyay

HOMETOWN
Eureka, Missouri
INSTITUTION
Purdue University
(BS, Biology)
TO STUDY
MPhil, Medical Science
Department of Haematology

SHOVIK BANDYOPADHYAY

Shovik will work with Professor Tony Green, whose lab recently uncovered a novel mechanism in the regulation of proteins in the unphosphorylated STAT (uSTAT) pathway. This discovery may shed light on potential therapies for a group of bone marrow disorders called myeloproliferative disorders (MPNs), for which there is currently no consistently effective treatment. Shovik will analyze the data generated by Professor Green's lab as well as generating his own data sets to identify gene interaction patterns which may yield potential treatment targets within the uSTAT pathway.

As an undergraduate, Shovik created a research proposal that brought together two disparate labs from two institutions (Purdue and Washington University in St. Louis). This collaboration resulted in a first-author manuscript that proposes a novel way to overcome drug resistance in cancer based on the study of cholesterol metabolism. He is also the first author of a book chapter on mass cytometry methodology and was co-author of a paper in *Oncogene* before the end of his freshman year.

In addition to his research, he is also passionate about global health and public policy, having started initiatives to tackle childhood obesity in the community and healthcare challenges in Quito, Ecuador. He was a Purdue Presidential Scholar, a Goldwater Scholar, an Astronaut Scholar, and was named Outstanding Junior in Biological Sciences in 2016. He graduated with a 4.0 GPA with 16 A+ grades. He plans to pursue an MD/PhD after his year in Cambridge.

SCHOLARS' NEWS

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Toni Bluher (1983–84) has been invited to deliver the 2018 Uhlenberg Lecture Series at the Institute for Advanced Studies in Princeton. She will lecture on "Mathematics of Modern Cryptography," May 19–25.



LUCY CHAI

Epstein Churchill Scholar

Lucy's goal is to study how processing in the brain can influence the development of computational intelligence. She will work with the Computational and Biological Learning Lab on the topic of computational vision, with a focus on how parallels between visual and computational processing can guide algorithms in object recognition for images.

Lucy worked at Penn with former Churchill Scholar and MacArthur "genius grant" winner Professor Dani Bassett. Lucy has a first-author publication in *Network Neuroscience*, where she investigated a new method of identifying networks within the brain using matrix factorization algorithms from machine learning and computer vision. She is first author of another paper published in *Cerebral Cortex*, that applied the use of network science techniques to answer the question of how our brains work as we perform language-related tasks, such as listening to stories. She won a prize for Outstanding Poster at the Biomedical Engineering Society Annual Meeting in 2016. She was a Rachleff Scholar (Penn's School of Engineering and Applied Sciences honors program) with a 3.99 GPA, including 29 A+ grades, and was the recipient of several academic and research awards, including the IBM Watson Memorial Scholarship and the Manfred Altman Award for outstanding academic performance.

As a varsity swimmer, she has taught swimming to low-income children in Philadelphia and taught adapted baseball to young people with cognitive disabilities. She is also a classical pianist. She has already won an NSF graduate fellowship.

CHRISTOPHER COOPER

As a part of Jacqui Cole's Molecular Engineering lab at Cambridge, Chris will work on the development of next-generation solar cells. Using both experimental and computational techniques, he will study absorption properties and binding configurations of different dyes on titanium dioxide (TiO_2) nanostructures. The hope is that the research will one day provide a simple and low-cost way of improving energy sustainability in windows, buildings and even whole future cities.

As an undergraduate, Chris studied the properties of stretchable fibers filled with liquid metal and their potential use as soft electronic fiber sensors, which led to a first-author publication. He also coated polymers with liquid metal nanoparticle films to create flexible circuit boards and antennas.

Chris is the second-consecutive (and second-ever) Churchill Scholar from NC State. He was a Goldwater Scholar, completed an REU at Norfolk State University which led to a first-author paper, and is the recipient of multiple grants and University scholarships. He also has a first-author paper in *Advanced Functional Materials*. He has accumulated 37 A+ grades. In addition to his accomplishments in chemical engineering, he was recognized as Outstanding Senior of the Year in economics, an accolade he received during his junior year because of the number of credit hours he had already accumulated. He served in leadership positions across several campus organizations. He lists Death Valley, CA, as one of his favorite hiking trails. He has already won an NSF graduate fellowship.



Christopher Cooper

HOMETOWN
Virginia Beach, Virginia
INSTITUTION

North Carolina State University
(BS, Chemical Engineering,
Economics)
TO STUDY
MPhil, Chemical Engineering
and Biotechnology
Department of Chemical
Engineering and Biotechnology

Mira Bernstein (1994–95) was featured in a New York Times article in February thanks to her work with BEAM (Bridge to Enter Advanced Mathematics), a math tutoring program in New York City. The article described Mira as "a leading figure in the extracurricular math ecosystem that incubates many of the nation's scientists and engineers."

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2012

Noël Bakhtian (2005–06) was named Director of the Center for Advanced Energy Studies in Idaho Falls, Idaho.

2013



Angela Harper

HOMETOWN
Downingtown, Pennsylvania
INSTITUTION
Wake Forest University
(BS, Physics/Mathematics,
Computer Science)
TO STUDY
MPhil, Physics
Department of Physics



Benjamin Kompa

HOMETOWN
Columbus, Ohio
INSTITUTION
University of North Carolina
–Chapel Hill
(BS, Mathematics, Computer
Science/Biology)
TO STUDY
MPhil, Computational Biology
Department of Applied Mathematics and Theoretical Physics

ANGELA HARPER

Dyer Churchill Scholar

Using experimental and computational techniques, including *ab initio* random structure searching (AIRSS), Nuclear Magnetic Resonance (NMR) and Electron Loss Spectroscopy, Angela's long-term research goal is to identify improved battery materials with longer lifetimes and higher capacities. She will work in Professor Andrew Morris's lab using AIRSS to understand how a theoretical graphene-phosphorus hybrid material may overcome deficiencies in current sodium and lithium ion batteries.

Angela's experience in computational methods began as a freshman in a biophysics lab developing parameters for the classification of certain proteins. Her work on proteins culminated in a first-author manuscript in *PLOS Computational Biology* and an oral presentation at the International Protein Society Symposium in Barcelona, Spain. On the experimental side, she began work on "small molecule" organic semiconductors and presented her results on organic printed transistors at the Harvard Undergraduate Research Conference. She completed an REU at Cornell where she used quantum mechanical calculations to predict the efficacy of certain additives in the development of new solar cell materials.

She has a passion for mentoring and teaching and created many leadership roles in her school community, including the creation of a mentorship program to help freshmen women in STEM. She is the recipient of a Goldwater Scholarship and the winner of several University academic scholarships, including the prestigious Stamps Scholarship. She plays the flute and was a soprano with the Wake Forest choir, with which she performed a solo in Italy. Angela is the first Churchill Scholarship winner from Wake Forest. She was recently awarded the LeRoy Apker Award from the American Physical Society and has been invited to present at the 2018 American Physical Society Conference in Los Angeles. She has already won an NSF graduate fellowship.

BENJAMIN KOMPA

Gabelli Churchill Scholar

Ben applies techniques in computer science and statistics to current biomedical problems. He will work in Dr. Pietro Lió's lab where he will leverage the pattern-predicting power of neural networks to identify disease comorbidities and hopes that his research will one day improve health care by creating more personalized medicine.

Through a summer internship at Harvard Medical School, Ben was introduced to "deep learning," a concept that requires the mastery of multiple computational skills, including linear algebra, probability theory, calculus, and advanced programming. He created an algorithm using neural networks to predict the location of a brachial plexus. During the school year, he worked on a chromosome simulation project that proposes to model the organization of the miotic spindle, a pioneering work that utilizes his data skills.

Ben is a co-author of several manuscripts, including a publication in *Molecular Biology of the Cell*. He is a semi-professional, two-time national bridge champion, who draws parallels between the interaction of data sets and the possible combination of cards on the gaming table. Ben came to UNC-Chapel Hill as a Colonel Robinson Scholar, a full scholarship for exceptional STEM students. He is Chapel Hill's third Churchill Scholarship winner in three years.



JESSE MU

Jesse will work with Dr. Anna Korhonen, co-director of the Language Technology Laboratory, on the problem of *word embedding*, a key area within Natural Language Processing. He will develop machine learning algorithms to recognize and predict different classes of verbs.

Jesse had long been intrigued by the challenges of language-learning, dating back to his time as a young child attending a weekly Mandarin Chinese school. As a Computer Science major at Boston College, he was hoping to find ways to apply his computer skills to this question. With no faculty at BC working on this, he introduced himself early in his sophomore year to a post-doctoral researcher at MIT named Dr. Joshua Hartshorne and began working in his lab, despite the long commute. He became very enthusiastic about the work at MIT, where he explored the Winograd Schema Challenge (a test of artificial intelligence involving ambiguous pronoun referents). This collaboration helped lead to Dr. Hartshorne taking a faculty position at BC, and the two were able to continue their work without the commute. Jesse has also worked with the Computational Intelligence Group at the Technical University of Madrid, examining subtypes of Parkinson's disease and coming up with ways to predict a patient's subtype near the onset of symptoms.

Jesse was recruited to Boston College with a Gabelli Presidential Scholarship, a full-tuition merit scholarship that is supported through a benefaction from Churchill Foundation Board Member Mario Gabelli. He won several academic awards at BC, including a Goldwater Scholarship. He won a Boston College Legacy Grant, which enabled him to direct and edit a documentary called "A Boston State of Mind," which focused on mental health in the greater Boston area across different socioeconomic communities. He also composed the music for the documentary.

Jesse Mu
HOMETOWN
Omaha, Nebraska
INSTITUTION
Boston College
(BA, Computer Science,
Mathematics)
TO STUDY
MPhil, Advanced Computer
Science
Computer Laboratory



Seth Musser
HOMETOWN
Newmanstown, Pennsylvania
INSTITUTION
University of Chicago
(BA, Physics, Mathematics)
TO STUDY
MASI, Applied Mathematics
Department of Applied
Mathematics
and Theoretical Physics

SETH MUSSER

Seth is interested in problems related to Quantum Field Theory in curved spacetime and in geometric approaches to unification, such as noncommutative geometry. The MASI in applied mathematics and theoretical physics will enable him to explore a broad range of approaches to topics in high energy theory, which he will pursue for his PhD.

Seth traces his interest in theoretical physics to encountering an illustration of Schrödinger's cat during a trip to the library in the third grade. While in high school, online university courses in physics and mathematics enabled him to become the first student in decades from his small rural district to attend a top-tier university. At the University of Chicago, he was a double major in physics and mathematics, and he completed every honors mathematics sequence available, earning a near-perfect GPA. A Goldwater Scholarship recipient and a participant in three separate NSF REUs, he has researched Poisson geometry, non-canonical Hamiltonian structure, and he built a simulation of an airfoil moving in a superfluid.

Seth is passionate about sharing his love for physics, and he has worked as a tutor since his sophomore year, not just to help students understand the material, but to help them enjoy it as he does. He has already won an NSF graduate fellowship.

FALL CAMPAIGN

In each of the past two years, Churchill Scholar alumni have given over \$100,000 to the Foundation. Since we only have addresses for around 500 of you, that's amazing! Each year, around one-third of our alumni donate to the Foundation, and we hope to drive that percentage higher.

You can send a check to the Winston Churchill Foundation of the United States, 600 Madison Avenue, Suite 1601, New York NY 10022. Or you can donate by credit card by clicking the Donate Now button on our website, www.churchillscholarship.org. If you are interested in donating appreciated securities, please contact the Executive Director for details.

Thank you!



Daniel Rothchild
HOMETOWN
Ann Arbor, Michigan
INSTITUTION
Harvard University
(BA, Physics, Computer Science)
TO STUDY
MPhil, Astronomy
Institute of Astronomy



Jarrod Shilts
HOMETOWN
Hingham, Massachusetts
INSTITUTION
Vanderbilt University
(BA, Molecular and
Cellular Biology,
Neuroscience/Scientific
Computing)
TO STUDY
MPhil, Biological Science
Wellcome Trust Sanger Institute

DANIEL ROTHCHILD

The Large Synoptic Survey Telescope (LSST), currently under construction in Chile, will take a series of panoramic 30-second exposures and enable astronomers a high-resolution and dynamic view of the sky. As an undergraduate, Daniel developed an algorithm to help the LSST take images more efficiently by avoiding clouds and ensuring uniform coverage. In Cambridge, Daniel will continue his work on this project with Professor Richard McMahon, who is a key international partner for the LSST. The Cambridge team also works on other similar large-scale projects, such as the Gaia and PLATO space telescopes, the VISTA infrared telescope, and the Dark Energy Survey, and Daniel will be able to both draw on and contribute to these surveys as well.

Since working as his school's webmaster in the eighth grade, Daniel has been looking for a discipline where he could apply his computer science skills in a way to make the biggest impacts. He started in areas where the impacts were societal: mapping unlawful employment practices, aiding cancer research, helping non-profit organizations in networking, and tracing fraudulent websites. With his concentration in physics and a secondary concentration (minor) in computer science, he was thrilled to discover that in astrophysics, he could apply his computer skills to his main academic interest and contribute to answering fundamental questions about the Universe.

Daniel's other passion is music. He has played cello in a classical piano trio which has been coached by members of the internationally acclaimed Parker Quartet, and he had a leadership role in the River Charles Ensemble (a student-run conductorless chamber orchestra). He has won numerous academic prizes including the Phi Beta Kappa Patricia King Harvard Summer Research Grant, one of three given to Harvard undergraduates. He has already won an NSF graduate fellowship.

JARROD SHILTS

Jarrod is focused on developing novel genetic technologies to solve "meta-problems" in human health, where solutions are designed to tackle challenges shared by multiple specialties. At Cambridge, he will join the Cell Surface Signalling Laboratory of Dr. Gavin Wright, where he will work on improving the AVEXIS technique to efficiently test for interactions between modified extracellular proteins.

Working his way up from a job cleaning glassware, Jarrod earned a spot in a lab where he became an early adopter of the CRISPR genome editing system in *Drosophila*. He used these genetic approaches to elucidate the role of extracellular proteolysis in neural development, which may suggest new therapies for neurodevelopmental disorders. This work is currently under revision for publication with Jarrod as sole first-author.

Jarrod founded and was the scientific director of the Vanderbilt iGEM (International Genetically Engineered Machine) team, which operates an undergraduate research lab that participates in an international genetic engineering competition. His team designed and implemented a project on modifying DNA sequences and gene circuits to make them more resilient against evolutionary change, winning a Silver Medal in 2016. He was recruited to join Vanderbilt's Searle Undergraduate Research program in systems biology and bioengineering, where he developed a microfluidic system for accelerating directed evolution experiments. He was awarded the program's top individual award in 2016.

He was a Goldwater Scholar, a recipient of multiple academic and research awards and had a near-perfect GPA. Outside of the lab, he is a student of philosophy, having studied and written on epistemology and ethics for many years. He has also taught dozens of undergraduates through a semester-long extracurricular course he developed and has worked with local science outreach programs.



1

Anthony Tabet

HOMETOWN
Blaine, Minnesota
INSTITUTION
University of Minnesota
(BS, Chemical
Engineering/Mathematics,
Chemistry)
TO STUDY
MPhil, Chemistry
Department of Chemistry



2

Julian Vigil

HOMETOWN
Albuquerque, New Mexico
INSTITUTION
University of New Mexico
(BS, Chemical Engineering)
TO STUDY
MPhil, Chemistry
Department of Chemistry

ANTHONY TABET

Russo Churchill Scholar

Glioblastoma multiforme (GBM) is an aggressive brain cancer with a poor prognosis.

Anthony will work in Professor Oren Scherman's lab to develop a supramolecular biocompatible hydrogel that can efficiently deliver and slowly release anti-cancer drugs directly into the brain post-surgery to prevent glioblastoma metastasis and recurrence, or serve as a novel cancer vaccine adjuvant.

Anthony's undergraduate background has been in soft-materials related research. His research experience eventually led to his passion for discovering solutions for complex drug-delivery, immunological and tissue engineering problems. He developed an injectable drug delivery system for promising, hard-to-deliver, poorly soluble drugs, allowing for easy syringe-based injections of therapeutics with improved long-term delivery and release profiles. As an Amgen Scholar at Stanford in the Materials Science and Engineering Department, he developed a new class of protein-based dual cross linking 3D bioprinting inks that address major challenges in scalability. He also worked in collaboration with the University of Minnesota Medical School and Precision Horizons, where he developed 3D printed in vitro cell culture and drug release models for studying a rare lysosomal storage disease (MPS 1).

He had a near perfect GPA, with just one A- since he started taking courses at the University of Minnesota during his junior year in high school. He was a recipient of a Goldwater Scholarship, an Astronaut Scholarship, and several undergraduate research awards. He co-founded an early-stage accelerator called CoCreateX which provides engineers, inventors, and young scientists with an incubator space and resources to commercialize their discoveries. Anthony is the third Churchill Scholar in a row from the University of Minnesota. He has already won an NSF graduate fellowship.

JULIAN VIGIL

Gerschel Churchill Scholar

Interconverting electrical and chemical energy is crucial to the viability of renewable power and requires efficient catalysts. Precious metal catalysts (such as platinum) are used commercially, but these elements are in short supply and expensive. Julian is interested in identifying new alternative catalysts derived from earth-abundant materials. At Cambridge he will pursue this goal in Dr. Erwin Reisner's lab, working on a project to develop novel molecular catalysts for hydrogen production and further explore solar-assisted water electrolysis.

Julian began his research career as a rising high school senior at Sandia National Laboratories in Dr. Timothy Lambert's group and continued to work there as an undergraduate. His group has focused on developing non-precious metal nanostructured electrocatalysts such as manganese oxide and cobalt oxide for the oxygen reduction, oxygen evolution, and hydrogen evolution reactions. His group's work recently resulted in one of the first publications elucidating the role of the Mn³⁺/Mn⁴⁺ on manganese oxide surfaces for the oxygen reduction reaction. His more recent focus has been on solar water splitting through the use of composites which have bifunctional surfaces for catalysis and electron transfer. He has co-authored seven peer-reviewed articles and is first-author on three of them, with two more under review or in preparation for submission.

Julian received an A+ in 35 courses. He was the chapter president of the American Institute of Chemical Engineers (AIChE) and, as part of the first generation in his family to attend college, is passionate about promoting STEM to local students and underrepresented minorities. He was a Goldwater Scholar and a Regents Scholar and the recipient of multiple academic awards for undergraduate research. He has already won an NSF graduate fellowship.



VIVIAN WANG

Kanders Churchill Scholar

Vivian will work with Professor Ulrich Keyser (Department of Physics: Biological and Soft Systems) to develop a method for detecting alterations in concentration levels of certain proteins and for quantifying them in order to identify elevated disease risk. Her thesis will involve the design of a nanopore-based device capable of real-time quantification of biomarkers.

Vivian is interested in electrical biosensors that can sense biomolecular and cellular properties. She would like to develop a device to analyze biological quantities at the nano-micro scale level, in order to provide real-time health information to patients and consumers. As an undergraduate, she has done research on fluorescence-based biosensors as well as label-free, impedance-based biosensors. She has also done research at the Leibniz Institute for Solid State and Materials Research in Germany.

Vivian had a GPA of 4.096 with 23 A+ grades. A mathematical artist, she has exhibited twice in the juried Bridges Conference Mathematical Art Exhibition and is the recipient of a departmental design award given to the top undergraduate final project. Vivian is the third Churchill Scholar in a row from Stanford. She has already won an NSF graduate fellowship.

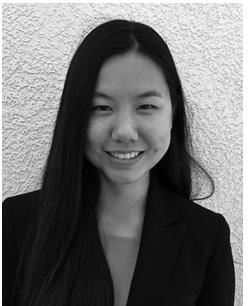
Vivian Wang

HOMETOWN
Ellicott City, Maryland
INSTITUTION
Stanford University
(BS, Electrical Engineering)
TO STUDY
MPhil, Physics
Department of Physics



Michael Zhao

HOMETOWN
Salt Lake City, Utah
INSTITUTION
University of Utah
(BS, Math, Computer Science)
TO STUDY
MASt, Pure Mathematics
Department of Pure Mathematics & Mathematical Statistics



ANGELA ZOU

Angela will work in Dr. Sarah Teichmann's lab studying changes in gene transcription and chromatin accessibility in mice CD4+ T cells activated with live malaria infection. Using computational methods and genomic sequencing technologies, Angela hopes to uncover the regulatory mechanisms affecting T-cell fate decision making and plasticity.

As an undergrad in the lab of Professor Weg Ongkeko, one of her first tasks was to find a panel of non-coding RNAs that might serve as biomarkers and potential treatments for head and neck cancer. She helped conduct some of her lab's first whole-transcriptome analyses of sequencing data. She has taken terabytes of

Angela Zou
HOMETOWN
San Diego, California
INSTITUTION
UC-San Diego
(BS, Bioengineering, Bioinformatics)
TO STUDY
MPhil, Biological Science
Wellcome Trust Sanger Institute

MICHAEL ZHAO

While taking a number theory course in eighth grade, Michael became captivated by deceptively simple math questions which were posed in class, such as Goldbach's Conjecture and Fermat's Last Theorem. In high school, he attended the Canada/USA Mathcamp. Most recently, his interests have turned to the Langlands program, a unified explanation of certain phenomena in algebraic geometry, number theory, and representation theory.

Michael has worked on research projects from many different areas of mathematics, including materials science, random graph theory, computer vision, and number theory. His senior honors thesis on the subject of quaternion algebras developed a quaternionic analogue of Gauss's composition law. Michael has also completed a competitive internship with Google's Identity Testing team and was awarded a spot in the Research in Industrial Projects for Students (RIPS) program held on the campus of Hong Kong University of Science and Technology, where his team successfully built a logo recognition program.

Michael was a Goldwater Scholar and had a near-perfect GPA. He is the second mathematician in two years from the University of Utah to win the Churchill Scholarship.

data and made novel discoveries about cancer-associated non-coding RNAs and found links to patient prognosis as well as to regulation of cancer progression.

Angela was a Goldwater Scholar and a Regent's Scholar. In one of UCSD's most difficult majors, she has achieved 27 A+ grades. She is first author on three of her four publications and is currently in the process of submitting three more papers for publication as first author or co-first author. She was editor-in-chief and founder of the *Undergraduate Research Journal*, her University's first interdisciplinary research journal bringing together students from all majors. She intends to pursue an MD/PhD after her year in Cambridge.

Alphabet Soup of Advanced Degrees

Churchill Scholars did not always earn a degree for their one year of study. Over the years, Cambridge granted a range of certificates and diplomas. Mathematicians once earned the CAS (Certificate of Advanced Study). Many Scholars were given a CPGS (Certificate of Post-Graduate Study).

Today, all Churchill Scholars get the chance to take home a Master's degree for their troubles. While this seems a much fairer way to reward Scholars for a year of post-graduate study, Cambridge maintains a confusing web of acronyms, which the Winston Churchill Foundation is happy to decode for you.

One degree not available to any Churchill Scholar is the MA (Master of Arts). With its misleading name, the Cambridge MA is not a post-graduate degree at all, but is an honor given to all holders of a Cambridge BA, once they have managed to live for two or three years past their graduation. Possession of a Cambridge MA confers some benefits, such as the ability to borrow books from the University Library and sit at some college high tables.

The MAST (Master of Advanced Study) is what our mathematicians earn by going through what is commonly called Part III of the Mathematical Tripos (although, technically, it is only considered Part III for students who have already gone through Part I and II, and they earn an MMath rather than an MAST). There are currently three math courses, all of them lecture-based, that can lead to the MAST: Pure Mathematics, Mathematical Statistics, and Applied Mathematics and Theoretical Physics. There are Churchill Scholars in one of these courses virtually every year, and we have had as many as seven in a cohort.

The most common degree for Churchill Scholars is the MPhil (Master of Philosophy). Confusingly, Cambridge now allows this for mathematicians who wish to do a research project rather than take courses. The MPhil is, in most cases, a research-only degree where students join a laboratory, conduct research, and take no courses at all. This is the signature Churchill Scholarship experience, and is perhaps the most liberating research experience one can have other than being on a sabbatical year.

Cambridge Centre for
Mathematical Sciences





600 Madison Avenue
Suite 1601
New York, NY 10022

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Left-to-right: 2017–18 Churchill Scholars Angela Harper, Lucy Chai, Angela Zou, Michael Zhou, Seth Musser, and Vivian Wang at Chartwell, Churchill's country home in Kent.