Churchill Scholar Entrepreneurs

“Right now I supervise a group of ~ 15 scientists,” says Katie Warner (Pathology, 2009-10). “In academia I might still be a postdoc.” For Judy Savitskaya (Plant Sciences, 2012-13), a venture capitalist focusing on biotech, synbio, and climate tech, “Startups can operate with more resources: more money and bigger teams pursuing smaller projects.”

There’s a lot to be said for the entrepreneurial path. And there’s a growing number of Churchill Scholars taking that path after graduate school. But you would not guess that from reading applications.

Most candidates for the Churchill Scholarship write on their applications that they aspire to be professors. The next most popular career path is to be a medical doctor or physician-scientist. A few are open-minded to working in industry. In this year’s pool, three are hoping to become astronauts, possibly the most elite profession in the world. The least popular career path, articulated by just two of the 110 applicants, is to become an entrepreneur.

Perhaps this apparent low level of interest is not surprising. Applicants may imagine that the Churchill is like other competitions, which only support future research professors. They may not realize that we do not have such a bias when selecting Scholars; we award based on past achievement. (After all, Sir Winston Churchill’s vision was not to keep scientists confined to universities, and this Foundation started with funding from industry.) More likely, entrepreneurship is something that only seems to become appealing during graduate school.

For Warner, the change in perspective came halfway through her PhD. “I thought that two of the things I liked most about my research to that point were working on big, hard problems, and being part of a team that was all working towards the same goal. I began to consider that it might be easier to do that outside of an academic track.”

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Students cannot apply directly to the Churchill Scholarship. They must be nominated from a select list of what we call Participating Institutions. This system made sense in the 1960s, when we had a tiny budget and only a handful of scholarships to award. So, why do we keep it now?

The nomination system encourages colleges and universities to recruit their very best students. Institutions of higher education now typically have a scholarship office. This means that on a given campus, it is someone’s job to make sure that their students win prestigious awards. We find that institutions that win the Churchill Scholarship a lot tend to have a well-staffed and proactive scholarship office.

In other words, the nomination system means that we probably get better students applying than if we had an open competition. It guarantees that we have Churchill recruiters embedded on every campus.

So, how did we create this list? It probably started informally, with the first Executive Director phoning around to find students. In the 1970s, the second permanent Director, Harold Epstein, created a formal list, which he built up over the years to around 70 colleges and universities. His successor, Peter Patrikis, traveled the country to meet with scholarship advisers, and he increased the list to just over 100.

Since I started in 2015, I have worked to increase the list to as many states as feasible. We have added schools in Alabama, Arkansas, Delaware, Kentucky, Mississippi, New Mexico, and Oklahoma. And we have an application process whereby prospective institutions can make the case that they will be able to nominate competitive students on a regular basis. We receive two or three of these per year, and most are very strong. Sometimes, schools win in their first or second year of nominating (for example, Baylor University, Boston University, University of New Mexico, and University of Utah have all done this).

With now 127 institutions on the list, we have had to break the selection process into two stages, so that none of the former Churchill Scholar volunteers on the committee need to read more than around 40 applications each. We can handle the increase in applications.

There are 82 colleges and universities with at least one Churchill Scholarship winner – more than the total number of eligible institutions when Harold Epstein retired. It is exciting to see the quality of research being done by scientists, mathematicians, and engineers all across the country in such a variety of schools.
In Memoriam

Jenny Hampton (1972-2021)
Professor of physics and departmental chair at Hope College, Jenny Hampton (Physics, 1995-96) was tragically killed in a car crash in Holland, MI, in March, 2021. Known by her family, friends, and colleagues as “always smiling” and “relentlessly positive,” Jenny cared deeply about mentorship. Hope College is remembering her through the establishment of a summer research scholarship in her name. A graduate of Oberlin College and with a PhD from Cornell University, Jenny’s expertise was in electrochemistry, nanoscale science, scanning probe microscopy, and batteries and fuel cells.

Larissa Lee (1977-2021)
Director of the Gynecologic Radiation Oncology Service at the Brigham and Dana-Farber Cancer Institute, Larissa Lee (Biochemistry, 1999-2000) died of colon cancer this past summer. Her cohort raised $1,999 (representing their matriculation year) to donate to the Foundation in her memory. They remember her as “unrelentingly kind and curious, the kind of person who always made the room more fun to be in.” Lee graduated the University of Kansas and went on to an MD from Harvard Medical School after the Churchill. She was a pioneer in the treatment of gynecologic cancers with expertise in brachytherapy.

Joseph Swierzbinski, Jr. (1953-2020)
The Churchill Scholarship gave Joseph Swierzbinski (Statistics, 1975-76) a taste for life in Britain that he did not want to relinquish. His Churchill year came between studying physics at Princeton and applied math at Harvard. He returned to the UK in 1994, first at University College London and then the University of Aberdeen where he was professor of economics. At Aberdeen he established the Experimental Economics Laboratory. An expert in game theory and auctions, he passed away in Aberdeen in May, 2020. His department has established a fund in his name.

Prince Philip, Duke of Edinburgh (1921-2021)
HRH Prince Philip, the Duke of Edinburgh, was associated with the Winston Churchill Foundation of the United States for 50 years. He became an Honorary Trustee in May, 1971, as part of his role as Visitor to Churchill College. In May, 1989, he presented the Winston Churchill Award to President Ronald Reagan, during a fundraising dinner in Beverly Hills, CA, that raised some $800,000 for the Foundation. And in June, 2007, he hosted the Trustees at Buckingham Palace. According to a stack of letters held by the Foundation, Prince Philip enjoyed reading the Foundation’s newsletters every year and was always interested in reading about each new cohort of Scholars. He passed away in April, 2021, at Windsor Castle.

The Winston Churchill Foundation of the United States is pleased to announce the selection of 17 Churchill Scholars, including one Kanders Churchill Scholar in Science Policy, for the 2021-22 academic year.

Thanks to a combination of donations and investment performance, we have added one new scholarship this year, making this the largest cohort in our history. The Churchill Scholarship is 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.

Many Churchill Scholars describe their year in Cambridge as the best year of their lives. What makes the experience so exceptional is the unique opportunity to focus on independent research, the welcoming and non-hierarchical culture of Cambridge labs, the emphasis on work-life balance, and the rich environment for personal growth that Cambridge provides.

This program was established at the request of Sir Winston Churchill as part of the founding of Churchill College, Cambridge. It fulfils his vision of deepening the US-Uk partnership in order to advance science and technology on both sides of the Atlantic, ensuring our future prosperity and security. Churchill College was established in 1960 as a predominantly science and technology college and the National and Commonwealth memorial to Sir Winston Churchill. The Churchill Scholarship dates to 1963.

2021–22 Churchill Scholars

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Shion Andrew

HOMETOWN
Walnut Creek, California

INSTITUTION
Harvey Mudd College
BS, Physics

TO STUDY
MPhil, Astronomy

Shion will consider fundamental questions about the evolution of the universe using perspectives from mathematics and computer science. At Cambridge, she will work with Professor Vasily Belokurov and Professor Wyn Evans to understand the evolution of neutron stars and black holes using the large datasets released by the recent space mission, Gaia.

Shion's foray into research began with a geophysics project that evolved into an interest in applying the study of seismology and plate tectonics to solve astrophysics problems by using computational algorithms and mathematical methods like finite element modeling. Her next project involved T Tauri stars, where she investigated the feasibility of disk-locking theory, an explanation that helps to explain one of the least understood phases of the stellar life cycle. Her enthusiasm for designing math models and implementing numerical techniques to solve for the rotational evolution of stars led her to another project studying other stages of stellar evolution by applying statistical techniques. She procured a REU at Michigan State University where she developed an algorithm to identify high magnitude variable stars using Gaia Data Release 2. Her work resulted in a first-author paper that will help astronomers calculate the ages of the oldest stars. She followed-up with another REU at Caltech where she worked on a project which measured chemical abundances of metal-poor stars to understand the evolution of galaxies.

Shion has a perfect 4.0 GPA and among other honors, is the recipient of the John and Ellen Townsend Award presented to the top senior in quantum mechanics at HMC, as well as the Thomas B. Brown Memorial Award for exceptional senior research in physics. She also worked on sending a sugar rocket above the Karman line (where outer space begins) as a member of the Harvey Mudd Rocketry Club. After Cambridge, she will pursue a PhD in astrophysics at MIT.

Alec Cao

HOMETOWN
Fremont, California

INSTITUTION
UC-Santa Barbara
BS, Physics

TO STUDY
MPhil, Physics

Alec will join Professor Zoran Hadzibabic’s experimental research group, which focuses on using ultracold gases to study quantum mechanical effects. Because these ultracold gases can be manipulated in the lab, their behaviors can be studied and even extrapolated to other physical systems like neutron stars. Alec plans to use ultracold atoms to describe the exponential expansion of space in the early universe using the theory of false vacuum decay. His long-term ambition is to work as a research professor leading a group in using ultracold atoms for condensed matter quantum projects and to develop new tools in quantum control.

Alec developed his technical skills in the field of ultracold atomic physics, where he worked on the complex optical and electronic systems which comprise a quantum degenerate gas machine. He was the lead during his undergrad years on the ultracold lithium team and learned how to produce Bose condensates of lithium. He is lead author on two papers, one for his contributions to data-taking on quantum degenerate gas machines, published in Physical Review X, and another in an invitation-only issue of the journal Zeitschrift für Naturforschung A, on realizing non-exponential decay processes. He also led a third project in the lab for an experimental publication on dynamical many-body localization. Many of these projects were guided by his leadership in collaboration with other groups such as the Joint Quantum Institute at the University of Maryland. Completely unrelated to quantum gases, Alec led the push to design a new collaborative project between two groups in physics and engineering on the topic of controlled quantum interfaces at a diamond surface.

During lockdown he participated in a two-week summer school through the Perimeter Institute for Theoretical Physics and developed his programming skills for numerical simulations. He is a Barry Goldwater Scholar and is the recipient of two competitive fellowships from the UCSB physics faculty. He was also a UCSB Regents Scholar. He has received offers from IBM and Princeton for undergraduate research opportunities in quantum. He plays piano as a hobby and served as a personal mentor for freshman on how to navigate college life. He graduated with a perfect 4.0 with 17 A+ grades.
Zoë Dietrich
Gerschel Churchill Scholar

**HOMETOWN**
Bellingham, WA

**INSTITUTION**
Bowdoin College
BA, Biochemistry, Earth and Oceanographic Sciences

**TO STUDY**
MPhil, Earth Sciences

Methane is a carbon-based greenhouse gas with a global warming potential greater than that of carbon dioxide. It is hypothesized that rising sea levels will impact the production and release of methane from coastal ecosystems. Zoë will use the local Medway estuary to understand the many factors involved in the storage and release of methane. Dr. Alexandra Turchyn’s lab in the department of earth sciences will allow her to integrate field, laboratory and computer analysis skills to explore questions about greenhouse gas cycling and its effect on climate.

As a first-year, Zoë received an NIH fellowship to study mRNA transport in pathogenic yeast *Candida albicans* and with a colleague, developed a new protocol for fluorescence *in situ* hybridization (FISH) in *C. albicans*. Her experience with yeast cells and a later ocean science course encouraged her to think about how tiny organisms like bacteria and archaea could facilitate global chemical cycles. As part of a Georgia Tech REU in Aquatic Chemical Ecology, she studied microbial samples from a Gulf of Mexico blue hole (undersea cavern) and was then recruited for a second field expedition in Sarasota, FL, to study blue hole microbial genetics. Her research applying bioinformatics analysis to the data shed light on the role of blue holes in the formation of harmful algal blooms. Her results became the basis for a recently published manuscript where she is the second author. Through

As a UGA CURO honors scholar, Landon had the opportunity to research the CRISPR-cas system in *Pyrococcus furiosus* as it acquires immunity against viruses and other foreign genetic material by the process of gene capture. The ability to understand how the host organism acquires the foreign DNA is a holy grail in this field. By using gene knockout analysis to surgically delete one candidate protein, he tested the impact of the deletion on the process of CRISPR DNA uptake. His research on DNA uptake has resulted in four co-authored manuscripts as well numerous conference presentations in the US and abroad. Landon has also worked on developing gene therapy techniques and protein replacement treatments in the treatment of hemophagocytic lymphohistiocytosis (HLH) and hemophilia at the AFLAC Cancer and Blood Disorders Center in Atlanta. Specifically, he was instrumental in the cloning of novel lentiviral vectors and his data has been incorporated into several grant applications including to the FDA. In addition, he has helped graduate students with their work on developing chimeric antigen receptors for cancers like T-cell leukemia and neuroblastoma.

Landon is a Goldwater Scholar and Phi Beta Kappa honoree among numerous other UGA honors, including the UGA Life Sciences Best Paper Award. Landon also received the Crane Leadership Scholarship for outstanding campus and community involvement. As a member of undergraduate student government, he assisted faculty in establishing a new neuroscience major. He also served as a lead exam writer in the UGA Science Olympiad for high school students across Georgia.
Jacob is interested in applying data science and machine learning to current investigations into the field of renewable energy development. Currently, he is interested in predicting new catalysts that will help to reduce carbon emissions. At Cambridge, he will work in Professor Jacqui Cole’s group to investigate how catalyst morphology can affect the photocatalytic CO2 reduction reaction using software that will allow him to draw conclusions about the most promising morphology for potential catalysts.

During his freshman year, Jacob joined a computational catalysis and materials lab where he investigated the different possible conformations of neutral gold nanoclusters using Replica Exchange Molecular Dynamics. His research using molecular dynamics simulations to predict the stability of neutral gold cluster structures and their IR Spectra was published in Physical Review Materials. In the same lab he worked on another project studying the reduction-oxidation reactions for Vanadium Redox Flow Batteries (VRFB) to investigate the kinetics of VRFBs using quantum mechanics/molecular mechanics and the predicted UV-Vis spectra of vanadium complexes in aqueous solution. His work resulted in a publication in ACS Energy Letters and another one under review at Joule. Jacob was selected for a USC NSF-REU with 2013 Nobel Laureate in Chemistry, Arieh Warshel, where he studied protein-ligand interactions using computational methods. The following summer, he was named an Amgen Scholar at Harvard in the Energy Frontier Research Center. His work there focused on the fabrication of catalytic 2D films and the development of a set of practical procedures for fabricating high quality 2-D films. Jacob is co-author on four peer-reviewed papers with one in preparation.

He has been active in the preparation of materials for undergraduate research and tutoring and has been the team leader of the battery group for the Chem E car team. In 2019 Jacob developed and made the batteries for the car which placed top 10 in the AIChE National Meeting. He is a named Astronaut Scholar, Goldwater Scholar, and Amgen Scholar. At the University of Michigan, he was awarded the Henry Ford II Prize for the top junior in engineering among other awards for academic scholarship. He is also a member of the engineering honor society Tau Beta Pi.

“Cambridge and Churchill feel as alive and active as I would have imagined them before the pandemic, with too many in-person events to possibly go to them all!”

Zoë Dietrich
Daniel Gochenaur

**HOMETOWN**
Centerville, OH

**INSTITUTION**
Purdue University
BS, Aeronautical and Astronautical Engineering

**TO STUDY**
MPhil, Engineering

Hypersonic flight—typically thought of as flight greater than five times the speed of sound, where aerothermodynamic heating becomes the dominant design constraint—is considered one of the last remaining challenges in atmospheric flight. Daniel believes that we are on the cusp of a breakthrough in hypersonics. At Cambridge, he will conduct fundamental research using Cambridge’s world-class facilities to better understand the effects of shock-wave boundary layer interactions in wind tunnels and scramjet inlets. He aspires to serve as Chief Scientist of the United States Air Force and hopes to support hypersonic research which will ultimately benefit national defense efforts.

While at Purdue, Daniel spent three summers interning on a hypersonic design team with the Air Force Research Laboratory’s (AFRL) High Speed Systems Division. He presented his research, which focused on developing methods for hypersonic computational design, at the American Institute of Aeronautics and Astronautics’ SciTech 2020 Forum, where he received the “Best in Session” award in the Aerospace Design Tools and Processes session. In addition to his work with AFRL, Daniel participated in undergraduate research with Purdue’s System of Systems Laboratory, where he researched topics in hypersonic trajectory optimization and space systems sizing. Following his junior year at Purdue, Daniel worked as a Simulation and Analysis intern with Boeing’s Phantom Works Virtual Warfare Center in St. Louis. While at Boeing he developed models to analyze the effectiveness of a subsurface vessel in warfighting scenarios. This past summer, Daniel also worked as an Aerospace Design Engineer at the Johns Hopkins University Applied Physics Laboratory.

Daniel graduated with a 4.0 GPA and 22 A+ grades. In 2020, he received the Ammon S. Andes award, presented to the top undergraduate in Sigma Gamma Tau (the American national honor society for aerospace engineering). He also is the recipient of multiple Purdue honors and was selected as part of Aviation Week Network’s Twenty 20s Class of 2021 for individuals who are on course “to change the face of the aerospace and defense industry.” He is an Eagle Scout and is passionate about “pushing the envelope” in flight. In his free time, Daniel enjoys playing volleyball and wine tasting.

Adam Konkol

**Gabelli Churchill Scholar**

**HOMETOWN**
Union Beach, NJ

**INSTITUTION**
University of Pennsylvania
BA, MS, Biochemistry, Biophysics, Physics, and Math

**TO STUDY**
MPhil, Physics

Adam is interested in using math and physics to uncover hidden principles of nature that are common across all living systems. He proposes that even seemingly unrelated topics like brain vasculature and river delta topology can be explained by applying fundamental principles of physics and math methods. At Cambridge, Adam will study the fluid dynamics of sponges to understand how physical principles guide growth when bounded by energy efficiency. He will combine experimental techniques in microfluidic imaging with theoretical network flow modeling to better describe the development of sponges and then hopes to extrapolate this research to other living organisms.

Adam researched flower genetic cues and morphogenesis in the Penn biology department where his project focused on a transcription factor, LFY. He analyzed evolutionary conservation of regions in the LFY protein and predicted two additional regions of interest as well as implementing a protocol for LFY purification. His contributions to the group’s project earned him a co-authorship on a paper published in *Nature Communications*. He next ventured into the theory of biological flow networks in Penn’s physics department. While there, he modeled brain vascular development in response to fluctuating circulation. This model contributed to a collaboration led by Adam with a professor in the University of Arkansas geosciences department, in which he applied his understanding of fluctuating flow to tidal deltas to produce the first explanation for loopy coastal channel network topology. His lead-author work on river delta morphodynamics and sedimentology is in submission. Currently, he is analyzing COVID-19 data by county to find signatures of spatial population mobility in the pandemic’s spread and to compare available data to continuum models of disease spread.

Adam graduated as a Dean’s Scholar with four majors (physics, biophysics, biochemistry, and math) and an MS in physics with a GPA of 3.99 and 22 A+ grades. He entered Penn as a recognized Vagelos Molecular Life Scholar and as a sophomore, received a full-tuition Vagelos Challenge Award. He is a Goldwater Scholar, NSF Graduate Research Fellow, Phi Beta Kappa inductee, and recipient of several school/departmental awards. Adam proudly taught several courses at Penn and led his own exploratory science class at a Philadelphia high school. He is an Eagle Scout and has watched the Lord of the Rings trilogy many times.
**Isaac Martin**  
**Gabelli Churchill Scholar**

**HOMETOWN**  
Salt Lake City, UT

**INSTITUTION**  
University of Utah  
BS, Mathematics and Physics

**TO STUDY**  
MASt, Pure Mathematics

As a child, Isaac was consumed with questions of why and how; as he grew older, he found that quantitative frameworks could help him discover truths in nature. He is especially interested in algebraic geometry but his competing interest in theoretical physics happily led him to the Part III program, which allows him to take courses in both theoretical physics and in pure math. In addition to courses on algebraic geometry and quantum physics, he is excited to further explore topics in number theory and to tiptoe into some area of the Langlands program, which has been described as a “grand unified theory of mathematics.”

After Cambridge, Isaac hopes to obtain his PhD studying mirror symmetry, a branch of algebraic geometry born from string theory.

Isaac completed all requirements for both the math and physics majors at a community college in lieu of his final year in high school. In addition, he completed original research on the detection of small space debris in low earth orbit at the community college. He was selected for an REU at UCSB where he studied a special class of Lie groups used in cosmology and crystallography. His experience working on that project fueled his desire to work on the type of pure math that could one day benefit physicists; his research efforts are incorporated in a paper currently under preparation. During his junior year at the University of Utah, he authored a research paper on positive characteristic commutative algebra. He also participated in an online REU at the University of Chicago and wrote a paper on algebraic de Rham cohomology. His honors thesis is an extension of the commutative algebra research from the previous summer. Isaac has also assisted in an experimental condensate matter research group working on topological insulators and in a computational cosmology group studying dark photons.

Isaac was the recipient of an Eccles Scholarship upon entry to the University of Utah and the Honors College. He is a Goldwater Scholar, inductee to Pi Mu Epsilon and recipient of several departmental awards in physics and mathematics. During the summer, Isaac can be found either in the slot canyons of southern Utah or on the sides of walls in Yosemite Valley. When forced to stay inside he enjoys programming video games.

**Nikhil Milind**

**HOMETOWN**  
Raleigh, NC

**INSTITUTION**  
North Carolina State University  
BS, Genetics and Computer Science

**TO STUDY**  
MPhil, Biological Science  
(Sanger Institute)

Working under the direction of Dr. Emma Davenport at the Wellcome Sanger Institute, Nikhil will continue to research his primary interest—understanding how genetics contributes to variation across patient groups in the areas of disease severity and treatment response. Specifically, he will analyze data from the Genomic Advances in Sepsis study which consists of data from a cohort of over 1,300 admitted ICU patients with a sepsis diagnosis to uncover possible genetic mechanisms that underlie the observed variation in patient immune response. He hopes that this experience will further prepare him to make breakthroughs in precision medicine and complex trait genomics.

According to Nikhil, the field of genomics relies increasingly on team science, and to that end, he has been active in promoting collaborations between different scientific groups. He completed two consecutive summer internships at the Jackson Laboratory where he made contributions to an ongoing research project focused on understanding the genetics of Alzheimer’s disease. He developed a clever analysis which allowed him to identify disease subtypes based on gene expression patterns and the novel genetic variants that drive them. He is first-author on this work which has been published in PLoS Genetics, and upon request, he presented this paper to members of the Alzheimer’s Disease consortium. At NC State, he worked in a lab focused on bioinformatics and epigenetics. He developed an independent project to perform meta-analysis of a vast amount of data on gene expression signatures in recombinant inbred mouse strains. He has held summer internships with UNC’s Allergy and Immunology Clinic and at the National institute of Environmental Health Sciences.

Nikhil double majored in Genetics and Computer Science with a minor in math and graduated with over 36A+ grades. He was a named Park Scholar, Phi Beta Kappa honoree and the recipient of a Goldwater Scholarship while receiving recognition for multiple commitments to community service. He played violin for Raleigh Civic Symphony as well as its chamber orchestra and taught violin to children though a non-profit organization. He has won national and international awards for mathematical modeling.
Abrah Nadroo
Kanders Churchill Scholar
in Science Policy

HOMETOWN
Syosset, New York

INSTITUTION
Columbia University
BA, Statistics and Political Science

TO STUDY
MPhil, Public Policy

Inspired by his experiences growing up and working in immigrant-rich communities around New York City, Abrar is interested in exploring the intersection of minority health and digital governance. At Cambridge he intends to focus on developing community-centered models for managing health and social care, as well as investigate how data and technology policies shape social service- and healthcare-seeking behaviors among migrants, gender minorities, and aging populations.

Abrah has worked across New York City to promote health through data science. His work experience includes projects with organizations like the New York State Office of Addiction Services and Supports, the South Asian Council for Social Services, HeatSeek NYC, and the NYC Housing Data Coalition. Abrar has also demonstrated his commitment to global health. In 2017, Abrar took a sabbatical and was a Siemens Foundation Global Health Research Fellow at research non-profit PATH, where he developed a novel diagnostic tool to detect G6PD enzyme deficiency in malaria elimination contexts. In 2019, he collaborated on a research framework for addressing men’s reproductive health issues in emerging health systems at the Population Council.

Abrah graduated in May of 2020 with a GPA over 4.0 as a dual major in statistics and political science with additional coursework in biochemistry and public health. For his senior thesis, he investigated the distribution of utility subsidies in 1,670 electoral districts across 27 states to determine whether irregularities in distribution behavior could be explained by discrimination or voter targeting. He received the 2020 Alan J. Willen Memorial Prize for the best thesis at Columbia on contemporary American politics. As a student, he was also a 2016 Program for Education, Global, and Population Health Fellow and a 2020 Columbia Data Science Institute Data for Good Scholar. Abrar is also an alumnus of the Columbia Regenerative Engineering Lab at Columbia, where he co-authored a paper on meniscal tissue regeneration. On campus, Abrar served as the president of the Columbia Social Entrepreneurship Group and was a competitive debater, most notably finishing as a quarterfinalist in the 2019 US Universities Debate Eastern Championships. Among his other interests, Abrar is also an amateur rock climber and distance runner and enjoys recipe development, illustration, and speculative fiction.

Guowei Qi

HOMETOWN
West Des Moines, IA

INSTITUTION
University of Iowa
BS, Biochemistry, Mathematics, and Computer Science

TO STUDY
MPhil, Chemistry

Guowei has the ambitious goal of designing drug compounds that can induce conformational corrections in misfolding proteins. Diseases of misfolded proteins (proteopathies) include cystic fibrosis, Alzheimer’s, and Parkinson’s. As a computational chemist, he hopes to use the laws of theoretical physics and the power of data-driven computation to better understand the complex processes underlying protein folding. Guowei will work in Professor David Wales’s theoretical chemistry group to develop augmented machine learning models for next-level protein folding prediction.

As a first-year, Guowei joined a computational biophysics group where he worked on increasing accuracy of molecular dynamics (MD) simulations for protein structures. He helped design a structure refinement algorithm that improved low-resolution protein models, which he then developed into a user-friendly software package. Guowei used this software automation tool in Java (self-taught) to study protein misfolding events that can cause hearing loss. Excited by this experience, he continued to gain expertise in merging aspects of computational chemistry—from molecular mechanics, to statistical thermodynamics to continuum electrostatics, in order to elucidate undiscovered biomolecular pathways for insights on diagnosis and treatment of proteopathies. His results have been published in Biophys J with two additional manuscripts in preparation. During the summers, Guowei worked as a computational intern for a biotech firm focused on a novel MD software approach for precision drug discovery and at D.E. Shaw Research (DESRES), where he delivered two tools to identify incorrect protein loop structures as well as possible corrections; he has already received a full-time job offer from DESRES.

Guowei majored in biochemistry, mathematics, and computer science with a minor in chemistry, having exceeded his graduation requirements by 20% by fall of senior year. He is a Coca-Cola Scholar, Presidential Scholar and was selected as a Goldwater Scholar during his sophomore year. He has received numerous research fellowships and awards. His non-academic interests include rock-climbing, student governance and the promotion of science research opportunities for undergraduates. He has a perfect GPA with 19 A+ grades.
**Pavan Ravindra**

**HOMETOWN**
Clarksville, MD

**INSTITUTION**
University of Maryland/College Park
BS, Biochemistry and Computer Science

**TO STUDY**
MPhil, Chemistry

Metadynamics is a computer simulation method used to explore complex free-energy landscapes and is usually applied in molecular dynamics simulations to study protein folding, chemical reactions, and phase transitions, among other topics. Pavan will study the ice nucleation process, whereby a nucleus of ice forms as the first step in the freezing of water. He will use a metadynamics approach to shed light on the effectiveness of different nucleating agents to understand the thermodynamics involved in the phase transition of water. He hopes to apply insights from this research to open problems in biochemistry, engineering, and applications in drug development.

![Image of Pavan Ravindra]

**Emily Schultz**

**HOMETOWN**
Plano, TX

**INSTITUTION**
Baylor University
BS, Biology

**TO STUDY**
MPhil, Pathology

Emily is excited about research in emerging viral pathogens. At Cambridge, she will be hosted by Dr. Nerea Irigoyen in the department of pathology. Her lab studies the molecular mechanism of viral gene expression with a focus on how RNA viruses replicate. Emily will join the team to investigate coronavirus gene expression, replication, and pathogenesis. Her ultimate career goal is to combine her expertise in molecular virology with her interest in the cultural factors that affect populations to find practical solutions that best reduce the burden of human suffering on affected communities.

![Image of Emily Schultz]

Shaw has already expressed interest in working with Pavan. He has previously spent two summers with the National Institutes of Health where he built simulations of neural networks to make predictions about changes in the dynamics of the neuronal system and has beta-tested software used to construct 3D images of proteins using cryo-electron microscopy micrographs.

Pavan is a Goldwater Scholar and entered UMD as a member of the Honors College Integrated Life Sciences program. He was selected for UMD’s Banneker-Key Scholarship, the most prestigious merit award for entering undergrads. He oversaw more than 30 teaching assistants in one of UMD’s most subscribed upper-division computer science courses. He achieved an A+ in over 1/3 of his courses with a GPA of 3.99 and holds a first-degree black belt in karate and is a world-ranked Rubik’s Cube speed solver.

**Emily Schultz**

**HOMETOWN**
Plano, TX

**INSTITUTION**
Baylor University
BS, Biology

**TO STUDY**
MPhil, Pathology

Emily’s undergraduate research focused on the pathogenic effects of arboviruses (arthropod-borne viruses like Chikungunya, West Nile, Zika, etc.) on different types of tissue. She was crucial in developing novel model systems for studying the impact of maternal exposures to such viruses on the developing fetus. She was able to modify a trans-well assay used by bioengineers to measure the impact of viral exposure by including data on embryoid bodies derived from stem cells. Utilization of this model resulted in two first-author publications in *Virus and Vaccines*. She presented her data to the American Society for Tropical Medicine and Hygiene in Washington D.C. and has since been approached for recruitment from many research organizations. She has also been critical in completing a study comparing the impact of Chikungunya virus on brain organoids derived from Parkinson’s patients and healthy individuals. Her findings resulted in another first-author paper that helps promote the organoid model system for investigating the neurodegenerative impacts of arboviruses on the brain. As a first-year, she was selected by Baylor for the SEA-PHAGE research program where she conducted both bench-side and bioinformatics research on bacteriophages.

Emily has a perfect 4.0 GPA with a minor in anthropology. She is a Goldwater Scholar, Phi Beta Kappa inductee, and entered Baylor as a Presidential Gold Scholar. She has presented at multiple research symposia and has received recognition for her poster presentations from Baylor and from the University of Nebraska-Lincoln through a SURF virology program. She is a past president of the service organization, Alpha Phi Omega, and has been helping patients at Waco’s Family Health Center overcome conditions such as blood pressure and anxiety through different types of exercises, among other public service commitments. She is a former Girl Scout.
Ana Sofia hopes to develop increasingly sophisticated iterations of computational tools for applications in astrophysics research. She foresees the potential in applying neural networks to simulation data to analyze planet formation and in the ability of machine intelligence to predict the probability that a planet could support life. At Cambridge she will delve deeply into the theory behind machine learning algorithms so that she can create her own astronomical data analysis pipelines to revolutionize the study of exoplanets.

Abigail has an appreciation for how mathematics can reveal powerful insights into physical effects. She plans to pursue a career in theoretical condensed matter research concentrating on topics involving topological quantum condensed matter. At Cambridge, she will work with Dr. Robert-Jan Slager’s group focusing on topological classification of states of quantum matter; she will study twisted bilayer graphene to discover exotic electronic properties that may one day be used to improve materials and electronic design.

As a freshman, Ana Sofia began research in a lab that focused on examining how biological function emerges from force mechanics. She found a way to automate the tracking of mitotic spindle length over time in fission yeast cells; her image processing and data analysis toolkit is available for public use on GitHub and her work has been published in the Journal of Microscopy. After her freshman year, she completed a REU at the University of Chicago through the Leadership Alliance program, where she worked on charac-terizing ultra-short period exoplanets—planets that orbit their stars in less than one day. Her analysis on radius and mass distribution for these planets has been accepted by the Astrophysical Journal. Through an internship at NASA-Langley, she created a machine learning pipeline for use by the SAGE III observatory on the International Space Station to identify cloud interference on measurements of stratospheric aerosol. She also interned with Google on their data science and machine learning teams.

Abby graduated with a BA and MS in physics with a GPA of 3.98 and 4.0, respectively. She is a Dean’s Scholar and received the Lawrence Award for the highest GPA achieved by a physics student, in addition to numerous awards for research promise. Abby is an accomplished classical guitarist, violinist, and a volunteer bell ringer for church services and weddings. She served as a board member for a women’s-centered physics group.

Abigail Timmel
Simpson Churchill Scholar

Abigail Timmel
Epstein Churchill Scholar

Ana Sofia Uzsoy
Simpson Churchill Scholar

Ana Sofia Uzsoy
HOMETOWN
Cary, NC

INSTITUTION
North Carolina State University
BS, Physics and Computer Science

TO STUDY
MPhil, Machine Learning and Machine Intelligence

Abigail Timmel
HOMETOWN
Baltimore, MD

INSTITUTION
University Pennsylvania
BA, MS, Physics

TO STUDY
MPhil, Machine Learning and Machine Intelligence

Abigail Timmel

At UPenn, she worked as a theoretical research assistant performing calculations to uncover interesting physical phenomena based on geometric properties of the system. Her research on one-dimensional Moire superlattices with Professor Eugene Mele, one of the pioneers in the discovery of topological insulators, has been accepted by Phys. Rev Lett. Her work developed a new theoretical route to understand low energy electronic phenomena of “twisted” graphene bilayers. In addition, she has two other manuscripts in preparation relating to this burgeoning field of few-layer graphenes. Over three summers she worked on problems in probabilistic computing, tensor methods and new approaches to optical multiplication. Her work on optics simulation was accepted at the 2018 Institute of Electrical and Electronics Engineers Symposium on Computer Arithmetic and will be used to build and test a novel nano-photonic processing architecture. She has worked on plasma physics at Los Alamos National Lab and at Northeastern University, where she worked on another aspect of computational quantum-many body physics.

Ana Sofia entered NC State as a Park Scholar and completed majors in both physics and computer science and double-minored in mathematics and oboe performance. She has a 4.0 GPA and is a Goldwater Scholar and Phi Beta Kappa inductee. She has won many awards for outstanding academic achievement and research from her institution. She is an accomplished oboist, performing in both chamber and orchestral ensembles. She was a peer leader at NC State for women interested in physics and computer science; she is a competitive bowler.
Jacob Watts
Russo Churchill Scholar

HOMETOWN
North East, PA

INSTITUTION
Colgate University
BA, Biology

TO STUDY
MPhil, Plant Sciences

Jacob states that tropical regions are being deforested at an alarming rate, thereby threatening the thousands of still unidentified species within these habitats. In addition, little is known about how these regions will fare in the era of climate change. Jacob would like to complete a PhD in tropical plant evolutionary ecophysiology to close this knowledge gap and to orient research toward conserving the incredible biodiversity that is contained within these landscapes. At Cambridge, Jacob will work with specimens from the Cambridge Botanical Garden to understand how fire has affected the evolution of plant traits and to answer fundamental questions about plant evolution and physiological disturbances.

Jacob is fascinated by the fern's ability to balance two distinct life stages (gametophyte and sporophyte), while housed within the same genome. He believes that analyzing all the stages of a plant's origination and development, rather than focusing on the mature plant can lead to more accurate predictions of the plant's future distribution when faced with climate disturbances. Moreover, he is focused on the study of these plants as they grow on trees (epiphytes). Jacob published an editor's choice paper in the *Annals of Botany* for the discovery of a rare hemiepiphyte in the spleenwort family of ferns and presented his poster at the Annual Meeting of the Botanical Society of America. He proposed a study with important implications for understanding the evolution of epiphytic plants. For this he received a Beckman Scholar award, a nationally competitive fully funded research proposal for which he began his fieldwork in Australia before lockdown. He also completed an NSF REU at Macalester College where he studied the climate history of Glacier National Park by studying pollen content of glacial lake sediment cores. Jacob has also published in the *International Journal of Plant Sciences* with several other manuscripts in preparation for his study on physiological responses and stress physiology in epiphytes.

Jacob is a Goldwater Scholar and received the Phi Beta Kappa Saracino Prize for the top sophomore in the natural sciences at Colgate; the Udall Honorable Mention for outstanding efforts to promote sustainability; and multiple other research travel grants and fellowships. He is an avid biker and has led immersive outdoor education. He also interned with Colgate's sustainability office and has published nature-inspired articles and poems.

Andrew Zhou

HOMETOWN
San Diego, CA

INSTITUTION
California Institute of Technology
BS, Chemistry

TO STUDY
MPhil, Biochemistry

Andrew has an intellectual interest in the chemistry of proteins and hopes to engineer biomolecules that can contribute practically to the eradication of disease. At Caltech, he will work in Professor Jason Chin's lab, where they are pioneering the development of novel methods for reprogramming the genetic code of living organisms by incorporating designer amino acids into their proteins. Specifically, Andrew will attempt to engineer a novel tRNA synthetase to assemble tRNAs that bear amino acids that are linked to sugars, a challenge that Andrew thinks he can overcome. Doing so will lead to insights into the process of protein glycosylation (linking sugars to proteins), a step found in many critical cellular processes.

As a first-year at Caltech, he joined the lab of 2018 Nobel Laureate Professor Frances Arnold, where he became fascinated by directed evolution, the process of engineering proteins using a method that mimics natural selection. The project resulted in an enzyme variant that could insert a pharmacologically relevant and bioactive lactone in a selected bond. Andrew was co-author on the subsequent paper which was published by *Synlett* while he was just a sophomore. He took the lead on another project to develop an engineered enzyme to insert a bioactive lactone motif into a relatively inert C-H bond, forming a new C-C bond. His work was published by *ACS Catalysis* as first-author and his methods were highlighted in *SYNFACCTS*; a provisional patent for his work has been filed by Caltech with Andrew as co-inventor. He was scheduled to intern at MIT to conduct directed evolution research to engineer a novel Cas-based RNA editing platform, but this was canceled due to the pandemic, and he instead found two part-time summer jobs in 2020—at ADARx Pharma working on RNA editing technologies and at UC-San Diego, working on computational approaches to understand the epigenetics of leukemia development.

Andrew received Caltech's Schuster Memorial Prize of the Division of Chemistry and Chemical Engineering awarded to one undergraduate each year. He had a GPA of 3.98 with 22 A+ grades and no grade below an A-. He served as president of the Caltech Chemistry Club and is a scholar-athlete, having played tennis for Caltech's NCAA Intercollegiate Team. He is excited about engaging in student life at Churchill College and is interested in joining the Orchestra on the Hill as a cellist and playing tennis for Churchill College.
Churchill Scholar Entrepreneurs

Continued from page 1

Warner co-founded Ribometrix, a company focused on developing small molecule drugs that target RNA directly, along with Kevin Weeks, her undergraduate research supervisor. It has since grown to over 40 employees.

William Feehery (Chemical Engineering, 1992-93) had a similar experience. For him, the idea of leaving academia occurred to him during the horizon-enlarging Churchill year. He finished his PhD at MIT but went immediately to MIT’s business school. From there, he went into venture capital and then to DuPont. He is now CEO of Certara, a drug development company that recently went public.

Feehery contrasts universities, where labs are mainly staffed by students and post-docs, with companies, which can pursue research at a much higher scale and employ larger teams of experienced scientists. Warner also talks of the benefits of being on a big team of highly experienced scientists. “I love being in a room with people who are smarter and more experienced than me. It’s an amazing way to learn. In a university setting, you don’t typically have the ability to hire people with the backgrounds that we are able to. We have people who have been in drug discovery longer than I have been alive.”

For Chris Finch (Plant Sciences, 2014-15), who works at CRISPR Therapeutics, the excitement of innovative companies is that they are focused on quickly turning discoveries into things that help people. “In academia, exciting new findings have value in and of themselves; in biotech start-ups, exciting new findings only have value if they ultimately lead to new medicines (or products).”

Liz O’Day (Chemistry, 2006-07), was in the middle of a PhD in biological chemistry at Harvard, thinking about ways to defeat cancer, when she found herself drawn to the business school. She went on to found Olaris, a company that develops metabolite-based precision medicine tools. She was invited to be part of then-Vice President Joe Biden’s Cancer Moonshot Summit.

Churchill Scholars have found different routes into the entrepreneurial space. Some found their own companies right out of their PhD programs. Others, like Finch, go to work for startups. Savitskaya and Feehery went straight into venture capital from graduate school. Churchill Foundation Board Member Nick Naclerio (Metallurgy and Materials Science, 1983-84) had a combination of these experiences. He founded a number of life science companies and is now Founding Partner of Illumina Ventures, which invests in companies that apply technology to human health.

Despite the benefits of the entrepreneurial path, it can be scary. “Nothing focuses the mind like not knowing if you will have funding beyond the next 6 or 12 months,” says Warner. Nevertheless, her advice to would-be entrepreneurs is “Don’t be deterred by failure. And don’t be afraid to take a chance.” Churchill Scholars should be able to find a soft landing back in academia if their business comes crashing back to earth.
One of the invisible forces that drives the Churchill Scholarship is summer research programs. Not only do students have the chance to gain invaluable experience on their own projects, but this is where many Churchill Scholars learn about the opportunity to study in Cambridge.

In the third year of the Churchill Adviser Award, the Foundation honors Steven J. Miller, Professor of Mathematics at Williams College. Through his role directing the SMALL Undergraduate Research Project at Williams each summer, Miller has mentored no fewer than eight Churchill Scholars over a 10-year period. While this award recognizes such an unprecedented number of Scholars he has taught, it is mainly for the time and care he has put into his support for his students. In his recommendations, Professor Miller clearly explains an applicant’s research contributions in a way that can be appreciated by expert and non-expert readers.

The Churchill Adviser Award is given annually to Campus Representatives, Churchill nominating committee members, or recommendation writers who have consistently distinguished themselves through their sustained efforts to recognize, recommend, or nominate exceptional STEM students. It is a way for the Foundation to thank members of the adviser community for their efforts in recruiting nominees on our behalf, in support of the Foundation’s mission to advance science and technology for our greater security and prosperity.

Alumni News

Byron Walden (1986-87) celebrated his 100th crossword puzzle byline in The New York Times

Jesse Bloom (2001-02) has been in the news this year for his work tracing the origins of SARS-Cov-2

Emily Balskus (2002-03) was named 2021 Howard Hughes Medical Institute Investigator

Noël Bakhtian (2005-06) was appointed inaugural director of the Berkeley Lab Energy Storage Center

Jamie Tucker-Foltz (2019-20) won Best Student Paper at the 2021 Annual Symposium on Logic in Computer Science

EliseAnn Koskelo (2020-21) won the 2020 LeRoy Apker Award by the American Physical Society

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Alisha Kasam-Griffith (Engineering, 2014-15), pictured left, and Kent Griffith (Chemistry, 2013-14) are pleased to introduce Rohan (right).
2021-22 Churchill Scholars (left-to-right) Guowei Qi, Adam Konkol, Nikhil Milind (above), Zoë Dietrich (below), Ana Sofia Uzsoy, and Jacob Florian at the top of Beinn Narnain, Scotland.