THE REMAINERS

After a life-changing year, typically thought of as the best year of their lives, most Churchill Scholars return to the US for a PhD. Some try to introduce tea-drinking to their American labs. Others retain collaborations with their Cambridge colleagues. A select few, however, devise a way to remain in Cambridge. When the Churchill Scholarship started in 1963, it could fund a 1-year degree or a 3-year PhD, similar to what our much younger sister program, the Gates Cambridge Scholarship, does today. In the 1980s, however, the Churchill Foundation chose to focus its resources on the 1-year degree, and now all of our Scholars study for an MPhil, MASt, or, in rare cases, an MRes.

“One year in Cambridge leaves you wanting more,” says Kent Griffith (2013–14, Chemistry). Griffith chose to stay mainly because of his research group. “The combination of research and lab culture was a great fit.”

Griffith’s research has been in the news recently for potentially revolutionizing electric batteries. He is first author of a Nature paper describing how the use of niobium tungsten oxides can lead to charging lithium ion batteries hundreds of times faster than they currently charge through ceramic electrode materials.

While Griffith is now headed back to the US—to Northwestern where he will work in the same lab as Ramya Gurunathan (2016–17, Scientific Computing)—Angela Harper (2017–18, Physics) has just decided to stay in Cambridge to continue her work, also on lithium-ion batteries. Harper pointed first to quality of life as her reason for staying. Her lab, like most in Cambridge, provides a good balance between hard, high-caliber work and personal time.

continues on page 3
The highlight of every year is when I visit the Churchill Scholars in the late spring, as they are either finishing their courses or getting to a crucial stage of their research. Their excitement is infectious as they look back on what they achieved, while looking forward and seeing how their research, and their lives, will change from the experience.

I also visit the Scholars early in their year and bring them to the Churchill War Rooms in London. This year, as has happened roughly every other year, my fall visit included a reconnection with one or more Churchill Scholars who have just finished. These are the “remainders” (with apologies to the anti-Brexiteers whose term we borrowed), who have found a way to stay in Cambridge.

The perspective of these former-Churchill-Scholars-still-in-Cambridge has been invaluable in helping me understand just what it is we are accomplishing with this Scholarship. For example, Jarrod Shilts (2017–18, Biological Sciences) works at the Wellcome Trust Sanger Institute, where he used his one-year MPhil to do something risky and is now staying for a PhD. He used his engineering skills to develop a technique to systematically and rapidly test all the possible ways by which two cells can interact.

This is the kind of work that Shilts would be reluctant to try for a PhD, since there seemed little chance it would work well: “With the independence the scholarship provided me, I could pursue ambitious research plans without the fear of my entire PhD project being on the line. As it happened, in my case the chance to take that ambitious risk paid off more than I could have hoped.”

Before talking to Shilts about this ground-breaking work, I had not fully appreciated how the Churchill Scholarship provides a unique opportunity for high-risk, high-reward research.

After talking with Shilts, I visited Yousuf Khan (2018–19, Pathology), one of the newly arrived cohort. While still at the beginning of his work, he echoed Shilts in explaining why he finds the Churchill so valuable: “I’m in a unique situation where I can take on a very risky project. If it doesn’t work out for me, then I can change my field of study when I pursue my PhD. However, if the work does yield a high reward, I can continue my work at Stanford next year while maintaining a collaboration with my lab back at Cambridge.”

Up to now, I had thought that what makes the Churchill Scholarship so special is the degree of research independence it provides, the links it facilitates with scholars from all over the world, and the work-life balance that is characteristic of Cambridge. Now I see that we also give the very best US graduates a chance to take risks at a very early stage of their careers, and this may be the most exciting aspect of what we do.
The Remainers continued from page 1

Also, for Harper, “Cambridge is a heart of intellectual thought and academia,” attracting people from all over the world, which makes it the ideal place to tackle a global issue such as meeting the demand for efficient, clean energy.

Mike Gormally (2011–12, Chemistry) echoes Harper’s views of Cambridge. “That’s an ideal environment for a student and a truly singular situation that I haven’t encountered anywhere else.” Gormally enjoyed working on understanding the structure and function of DNA “walking in the same halls as Watson and Crick.” His PhD focused on unique structures that form in the DNA of cancer cells that could potentially be exploited as drug targets in oncology. Soon, he will finish his MD at Yale.

Eszter Zavodszky (2009–10, Medical Genetics) has remained in Cambridge through her PhD and is on to a post-doc. “I now find myself more at home in Cambridge than anywhere else,” she says. She studies protein degradation in the MRC Laboratory of Molecular Biology, which is so well-equipped that it is understandably hard to leave. She also cites Cambridge’s “multicultural, cosmopolitan feel while simultaneously being a small town where one inevitably runs into acquaintances on the street.”

Having these “remainers” in Cambridge is a tremendous asset to the Scholarship. PhD students such as Matt Biancalana (2008–09, Biochemistry) have hosted get-togethers (funded through annual donations to the Churchill Foundation) for arriving cohorts. More recently Griffith and his wife Alisha Kasam (2014–15, Engineering) played a formal mentor role for the Scholars. As they have now moved back to the US, Harper is the current Scholars’ main point of contact, along with Jarrod Shilts (2017–18, Biological Sciences).

The Churchill Foundation does not fund Cambridge PhDs anymore. So, how do the Churchill Scholars find funding to stay? The five most common sources are:

1. The Gates Cambridge Scholarship started funding students in the 2001–02 academic year, thanks to a gift of $210 million from the Bill and Melinda Gates Foundation. (The Gates Foundation also donated $23,000 per year to the Churchill Foundation in the years 2000–02, perhaps as a consolation prize and so we would not feel excluded from their largess.) Gates Cambridge funds 90 scholars per year, and there are separate competitions for those living in and out of the US. When Churchill Scholars apply, they find themselves in the out-of-the-US pool.

2. The Herchel Smith Fund was established by a bequest in 2001 from an organic chemist whose research led to the invention of oral contraceptives. Since 2008, the Fund has supported Cambridge’s most prestigious and some of its most generous PhD studentships. It is so prestigious that one does not actually apply for it. Cambridge just picks from among its PhD applicants.

3. The Wellcome Trust, like the Herchel Smith Fund, got its money from the pill. Whereas Herchel Smith helped invent “the pill,” Henry Wellcome was a pioneer of pills generally as a way to deliver medicine. He put the profits of his pharmaceutical company, Burroughs Wellcome (which has since been subsumed by GlaxoSmithKline), in a charitable trust. It is now the world’s second-largest charitable foundation (after Gates) and is one of Britain’s largest funders of biomedical research.

4. The National Institutes of Health Oxford-Cambridge Scholars Program (funded by the NIH and private donors) taps into the best of the British system, so that US biomedical researchers can graduate earlier than in the US and with mentors on both sides of the Atlantic, fostering international collaboration. It is a good fit for Churchill Scholars pursuing an MD/PhD.

5. The Cambridge Trust (formally the Cambridge Commonwealth, European & International Trust) acts as Cambridge’s main internal student funding body and awards some 500 new scholarships each year. It is the largest funder of international students.
Kevin will combine the skills he has developed in physical and mathematical modeling with techniques in experimental biophysics to understand how molecular components collaborate to produce complex cell behaviors. Eventually his goal is to understand basic mechanisms of disease and reveal new targets for treatment by studying cytoskeleton function and regulation. At Cambridge he works under Dr. David Klenerman and chemistry professor Dr. Steve Lee. Dr. Klenerman’s single molecule lab is the only one in the world equipped for the experiments that Kevin would like to run. He plans to use super-resolution imaging to study how T-cell receptors are triggered at cell to cell contacts.

As a freshman, Kevin was interested in working with cutting-edge imaging techniques to visualize biology on the nanoscale. He worked on single molecule measurement of the distance changes between tRNA molecules and an enzyme that catalyzes movement of tRNA through the ribosome. When he hit against limitations of current state-of-the-art single molecule microscopy, he developed a new method to study the enzymatic process, using apertures in a thin metal film called zero mode waveguides (ZMWs) based on classical principles of electromagnetism. Using techniques from the semiconductor industry and numerical techniques from physics, he created the waveguides from scratch, using polystyrene bead templates which allowed him to image individual ribosomes. His interest has shifted to questions of how cells move and sense force. He has co-authored a paper on thermal treatment in crystal films and is also second author on an upcoming paper on zero mode waveguide research. He was a triple major—biophysics, physics and biochemistry and simultaneously completed his MA in physics.

In addition to the Goldwater, he has been awarded the highly prestigious Vagelos Challenge Grant as well as being named Dean’s Scholar at Penn. He finished with a 4.0 GPA, with 10 A+ grades. Among other extracurricular activities, he has been instrumental in bringing physics instruction and physics labs to some Philly area high schools, one of which had no physics curriculum.
JOHN FINLAY
Gabelli Churchill Scholar

Glioblastoma multiforme (GBM) is an aggressive brain tumor affecting glial cells and is minimally responsive to even the most aggressive therapies. Recent data suggests that within the tumor itself, a small subset of glioma stem-like cells may be responsible for the abnormal growth and resistance to treatment. The Olig2 transcription factor may be a reliable marker for these stem-like cells. Jack will work with neural stem cell biologist Dr. David Rowitch to discover what combination of transcription factors may cause a normal glial cell to become an abnormal stem-like cell. He will also assess the possibility of whether the Zika virus can deliver a targeted therapy for GBM.

Jack’s interest in molecular biology and neuroscience went beyond the purely academic. A family member was diagnosed with a glial tumor. Witnessing the progression of the disease in an intimate way has been a powerful motivator. During the summers, he worked under two different research oncologists at Washington University’s School of Medicine. One of his projects resulted in the design of a barcode system for glioblastoma cell lines in order to create more targeted therapies for brain cancer patients. This work has led to a publication in a neurosurgery research text as chapter co-author. At Princeton, he worked on research topics beyond oncology and neurology. Jack has come up with a new way to use RNA-sequencing to research how elevated glucose conditions stimulate the accumulation of extracellular matrix (ECM) by kidney cells, a symptom of diabetes.

Jack was also the recipient of a Princeton International Internship Grant, which gave him exposure to the clinical practice of neurological medicine in Buenos Aires, Argentina, as well as the opportunity to practice clinical research within a foreign public hospital. He was elected early Phi Beta Kappa and is a recipient of the Shapiro Prize for Academic Excellence at Princeton. He was a counselor and founding Board Member of Camp Kesem Princeton, a free week-long summer camp for children with parents affected by cancer. He also plays the clarinet.

NAMRAH HABIB
Gerschel Churchill Scholar

Namrah aspires to be a mission specialist astronaut who will contribute to our understanding of deep space systems like the moons of Saturn and Jupiter, planetary and star formation, and of course our home planet. At Cambridge, she joins the research lab of Dr. Mark Wyatt at the Institute of Astronomy. She studies hot debris disks in planetary systems at various points in their life cycle using data from the Large Binocular Telescope Interferometer (LBTI).

Namrah concentrates on the luminosity function, which allows her to characterize the relationship between age and stellar mass and answer questions about the existence of other planets that are suitable for alien life. As an undergraduate, she participated in planetary science and engineering research experiences at MIT Lincoln Laboratory, NASA, and the University of Arizona. She served as the leader for the University of Arizona’s entry into the first SpaceX Hyperloop Pod competition. Much of her research experience comes from her involvement with NASA’s OSIRIS-REx project, where she worked as an Image Processing Intern. She helped to establish a stereo-imagery lab for the mission and later went on to develop digital terrain models as well as developing stereo imagery projects for different areas of geological interest on Mercury. In addition to her continuing work with OSIRIS-REx, she completed an internship with NASA’s Glenn Research Center.

Namrah is a recipient of an Astronaut Scholarship as well as multiple merit-based scholarships and academic awards from the University of Arizona’s College of Chemical and Environmental Engineering, and Aerospace and Mechanical Engineering. She practices kickboxing and holds a blue belt in Brazilian jiu-jitsu and has competed at local and national levels. She is passionate about introducing STEM to girls and the wider Tucson community, through her work with UA’s Women in Engineering Board and Tau Beta Pi Engineering Honors Society.
JOSEPH KANNARKAT  
Kanders Churchill Scholar

Joseph is the inaugural recipient of the Kanders Churchill Scholarship in Science Policy. Joseph became interested in the Cambridge Master’s in Public Policy because of the opportunity it offers for him to acquire a broad understanding of different national healthcare models, including the National Health Service in Great Britain. From his summer work at the Amelia Heart and Vascular Center in Springfield, VA, he came to appreciate the bureaucratic challenges of providing lifesaving care to patients who cannot afford it. His career goal is to obtain an MD and become a practicing physician—one who understands and helps resolve the complex policy challenges of maximizing healthcare delivery while controlling costs.

As a dual major in Neuroscience and Economics, Joseph is already well positioned to address these issues. At the University of Pittsburgh, he was President of Students Consulting for Nonprofit Organizations and oversaw 60 student consultants on 10 projects each semester, providing services such as database management and grant-writing. At the Amelia Clinic, he has worked on a number of software and management projects to increase efficiency in record-keeping, billing, and improve patient flow.

In addition, Joseph has conducted research on schizophrenia at the University of Pittsburgh, on transcranial direct-current stimulation at George Mason University, and on protein blockers at the Catholic University of America. He has won numerous academic awards, including a full tuition scholarship. Joseph graduated with seven A+ grades. He is an avid hiker, photographer, and has worked in music production.

YOUSUF KHAN

Yousuf works in Dr. Andrew Firth’s lab, where he uses bioinformatics and wet lab techniques to study the phenomenon whereby ribosomes are stimulated to slip backwards on mRNA by one nucleotide (programmed -1 ribosomal frameshifting). This forces the ribosome to translate an entirely different polypeptide sequence. For example, where the original mRNA from an HIV-virus might have coded for a viral capsid, the ribosome after the frameshift may translate a protein with enzymatic functions like a protease or integrase. Yousuf will attempt to establish the extent to which frameshifting occurs in eukaryotic cells. Successful manipulation of frameshifting has the potential to displace splicing or RNA editing and more broadly, to determine whether dysregulation of -1 PRF can account for diseases with as-yet unknown etiology.

Yousuf began his research career in high school, performing classic genetics experiments at the University of Maryland. As an undergraduate, he studied the frameshift phenomenon in viruses like West Nile and Venezuelan equine encephalitis. He was then invited to join a group that had discovered a frameshift marker (-1 PRF signal) in the more advanced prokaryotes. He had a series of breakthroughs involving the signal in a human gene that was a key regulator in immune response. For the last three years, he has worked to characterize the -1 PRF signal’s structure and function. In his final year at the University of Maryland, Yousuf worked in the laboratory of Dr. Norma Andrews to see how Leishmania, an intracellular eukaryotic parasite, differentiates into its infectious form.

Yousuf has been a teaching/lecturing assistant across multiple disciplines. He helped to redesign the entire curriculum for a genetics class and was also chosen as the first teaching assistant for Maryland’s FIRE program, a three-semester sequence that introduces freshmen to research projects. He was a Goldwater Scholar as well as a Banneker/Key Scholar and has been awarded a Howard Hughes Research Fellowship among other merit awards. He has a 4.0 GPA with an A+ grade in more than half of his classes. He has currently published six co-authored publications and is in the process of submitting a first-author publication.

ASWINI KRISHNAN

Epstein Churchill Scholar

The ribosomal complex is crucial in the synthesis and regulation of proteins. At Cambridge, under the mentorship of Nobel Laureate Professor Sir Venki Ramakrishnan, Aswini will study the termination of translation in bacteria, with a focus on the role of release factors (RFs) involved in the disassembly of the ribosomal unit. She will use cryo-electron microscopy (cryo-EM) to capture the various transient states of the ribosomal complex under varying RF bindings, thereby allowing her to create a more detailed picture of translation termination.

Aswini is an aspiring physician-scientist who hopes that her research will yield practical applications. In the UCSD lab of Dr. Weg Ongkeko, she progressed from learning wet-lab techniques to publishing three first-author papers on the roles of non-coding transcripts in head and neck squamous cell carcinoma (HNSCC) pathogenesis and progression. She has explored piRNA and miRNA (types of
Jared Duker Lichtman

Jared's interest is in number theory, a field with a web of connections to other fields in mathematics. At Cambridge, Jared looks forward to strengthening his existing number theoretic knowledge, as well as broadening his understanding of the mathematical landscape.

Working with his advisor at Dartmouth on problems in primality testing and smooth numbers, he has produced two publications which appeared in Mathematics of Computation and Journal of Number Theory. He has submitted a third paper that is united with the first two by their method of proof, allowing him to solve a broader range of problems. In addition, Jared participated in the Number Theory and Probability group at SMALL REU at Williams College, where he collaborated on three research projects from number theory to analysis. That summer, they had four proposals accepted by the premiere Young Mathematicians Conference at Ohio State. Jared was also the sole undergraduate invited speaker at the AMS Special Session on Computational Combinatorics & Number Theory at the 2018 Joint Mathematics Meeting. He received his AB and AM in four years, the first mathematician at Dartmouth to do so.

In addition to the Goldwater, Jared has received multiple scholarships, prizes and awards at Dartmouth, for his research and independent study. His grades are perfect, but for a single A-. He was among 22 Dartmouth seniors to be inducted early to Phi Beta Kappa. Outside of the classroom, Jared was a counselor at the Ross Mathematics Program for advanced teens and has also volunteered over 500 hours at the Hebrew Home of Greater Washington. He has always found joy in competitive athletics as well as in the spiritual side of chanting Torah.

Aishwarya Nene

Past experiments of protein folding have suggested that an aggregation of incorrectly folded proteins (beta-amyloid peptide or tau) can damage brain cells and lead to Alzheimer’s disease. Aishwarya works in the biomedical research lab of Dr. Chris Dobson, where she attempts to identify peptides that could potentially inhibit aggregation of beta-amyloid proteins. She will synthesize a library of these inhibitor peptides and study their potential effect on the kinetics of toxic protein aggregation.

She will combine her knowledge of biophysics and protein chemistry with the Cambridge lab’s theoretical and computational models of aggregation to help answer the question of whether these peptides can inhibit or prevent further tangles from developing into neurodegenerative diseases.

Aishwarya began her research career as a high school sophomore when she discovered protein chemistry. While still in high school she learned how to mutate sequences for critical residues involved in the Fanconi Anemia DNA repair pathway. As an undergraduate, she worked at an early stage biotech company focused on therapies for neurological diseases. She developed a computational protocol which the company uses to quality control batches of their neuronal cell therapeutic candidates. In addition, she pioneered a new technology which allowed for the detection of single transcripts expressed at the single cell level (RNA FISH assay). At Caltech, she also performed basic research in biophysical membrane studies and translational studies in the cell treatment of epilepsy. She has co-authored three publications with one first-author paper.

This will be her second time studying at Cambridge. She was previously selected as a Caltech Cambridge Scholar and completed six Chemistry Part III courses during her junior year. She received a SURF fellowship award and, at her commencement ceremony, was presented with the Mabel Beckman Prize for student leadership. She had a 4.1 GPA with no grade below an A-. She is a dancer and choreographer on a Bollywood dance team, an emergency medical responder, and a volunteer in the community.
SCOTT NEVILLE

Scott is looking forward to writing his essay on the representation theory behind the Kostka numbers and deepening his understanding of mathematics, particularly in Algebra and Number Theory. At Cambridge he will take classes like Computability and Logic taught from a mathematician’s perspective and also Local Fields, which explores topics in number theory in great depth. Another topic which interests him is representation theory, which will be covered in the Lie Algebras and their Representations class. The Part III program at Cambridge will help give him the exposure he needs to identify the specific branch of mathematics he will pursue for his PhD.

In the 11th grade, while waiting for a friend, Scott realized that he had come up with a result for the Collatz Conjecture. Of course, it was a known result, but he was still ecstatic. He has worked on an open math problem every day since then. As an undergrad, his curiosity drove him to solve research problems across multiple disciplines. In anthropology, he worked on the problem of infeasible years in carbon dating and designed computer software to show that even perfect measurements of samples from certain year ranges would not yield acceptable date estimates. In computer science, he worked on the question of why neural networks are so effective and challenged the prevailing theory on this topic. His work was accepted for submission at the Algorithmic Learning Theory 2017 Conference in Kyoto, Japan. In math, he has completed an REU on the subject of Kostka numbers and has a paper in preparation as well.

Scott had a 3.98 GPA and received his BS degree in both Mathematics and Computer Science. Last year, he worked as a research aide to Professor Aditya Bhaskara investigating theoretical guarantees for robust tensor decomposition. He has been awarded multiple merit scholarships and is also an amateur archer.

MERRICK PIERSON SMELA

In 7th grade, Merrick set up a lab in the basement of his house, and by the end of the year, had taught himself enough chemistry to earn a 5 on the AP Chemistry exam. At Cambridge, he works in the stem cell biology lab of Professor Azim Surani, where he studies the genes and pathways needed to induce follicular development in human stem cells. Progress on this front could eventually lead to the ability to produce human oocytes as a therapy for fertility issues and other stem cell diseases. Merrick feels that developing a successful technique for

in vitro oogenesis will broadly advance multiple areas of science and medicine.

One of his earlier projects as an undergrad resulted in a co-patent application involving a chemical reaction to synthesize novel fluorophores for potential use in organic LEDs. He has since realized the wider implications of this reaction, and a journal article is in preparation. As a Harvard Amgen Scholar, he studied bacterial choline metabolism in the lab of Emily Balskus (Churchill Scholar 2004), where Merrick independently proposed and successfully tested the use of a nitrene radical trap as an inhibitor of choline metabolism. He has also performed research on the effect of silver nanoparticles on the zebrafish gut microbiota and has also collaborated with a professor from the University of Karachi to computationally predict the properties of fabric dyes. He was a member of the University of Minnesota iGEM team, where he developed a strain of E. coli to selectively kill invasive zebra mussels in aquatic environments.

Merrick graduated with enough credits to earn a BS in Chemistry in the College of Science and Engineering as well as a BS in Biochemistry in the College of Biological Sciences (with a minor in Math), all while graduating one year early. His college transcript contained nothing but A grades, with the exception of a programming course he took in the eighth grade. He has received awards and scholarships for outstanding academic achievement as well as research fellowships and the Astronaut Scholarship. This past spring, he created a series of workshops that brought in nearly 200 Boy Scouts from around the region to learn chemistry basics and earn merit badges.

VIKRAM SUNDAR

Drug discovery today relies on identifying small-molecule ligands that can bind tightly to specific proteins. Dr. Lucy Colwell’s lab has previously used machine learning approaches to predict tight ligand binders to proteins with high accuracy. In his year in Cambridge, Vikram intends to combine these machine learning approaches with biomolecular simulation methods to better understand ligand/protein binding energy. He hopes to computationally determine optimal drug targets that bind to particular proteins, improving the efficiency of the drug discovery process.

Vikram’s research interest in computational chemistry began in his sophomore year. His organic chemistry instructor helped him understand the material by teaching him how quantum mechanics could be used to computationally model organic
molecules and predict their reactions; he soon realized that similar methods could have profound implications in understanding disease mechanisms and treating them. Vikram gained research exposure in the field by interning with D.E. Shaw Research; there, he worked on state-of-the-art molecular dynamics (MD) and force field development research. Vikram conducted research under Prof. Aspuru-Guzik to develop a new, efficient way of accounting for nuclear quantum effects in MD simulations that will significantly improve the accuracy and speed of simulations involving hydrogen bonds. This work resulted in a first-author publication in the *Journal of Physical Chemistry Letters*.

Vikram graduated with an AB in Mathematics/Chemistry and an AM in Physics. He has been named a Goldwater Scholar, a member of Phi Beta Kappa and is the recipient of the Detur Book Prize. He also finished in the Top 25 of the Putnam Mathematics Competition. Outside of academics and research, he is passionate about diversity issues; he co-founded Gender Inclusivity in Mathematics, a group dedicated to reducing the gender gap in Harvard’s math department. He enjoys teaching and is a lifelong pianist.

**ANNA THOMAS**

In 2014, she interned at NASA Ames Research Center’s Intelligent Robotics Group, where she worked on rover localization for planetary exploration. She has also held internships at the Machine Intelligence and Perception Group at Microsoft Research Cambridge, where she worked on real-time hand gesture recognition. Most recently, she interned at Google Brain, where she developed methods for automated curriculum learning for reinforcement learning agents.

At Stanford’s Computation and Cognition Lab, Anna applied machine learning to accelerate inference via sequential Monte Carlo for probabilistic programs. She also worked on learning probabilistic programs from user-provided examples, with applications in computer graphics. During her undergraduate career, Anna has coauthored papers in *Advances in Neural Information Processing Systems*, *Eurographics*, and the International Conference on Image Processing. As a Part III student at Cambridge, Anna plans to learn more about the mathematical foundations of machine learning as well as broaden her knowledge of other areas of mathematics.

Anna has been involved in a variety of activities at Stanford, including the Stanford Symbolic Systems Society, Women in Computer Science, Girls Teaching Girls to Code, and peer tutoring for the Stanford University Mathematical Organization.

**MICHAEL WALKER**

*Dyer Churchill Scholar*

Michael joined the Energy Research Group, where he focuses on modes of advanced combustion and optimizing air-fuel mixing to improve efficiency and reduce the environmental impact of machines. He hopes that his concentrated research at Cambridge will help him to develop the advanced biofuels necessary to create clean and efficient power for the Navy and beyond.

Michael has done research at Sandia National Labs and Lawrence Livermore National Laboratory (LLNL). While at LLNL, he developed chemical reaction models for blending renewable hydrocarbon fuels with diesel to increase fuel efficiency and also developed a novel method for modeling an alternative combustion approach. At Sandia, he researched potential diesel surrogate fuels using cameras and laser sheet imaging to understand what happens inside of a combustion chamber during engine operation. As a Trident Scholar at the Naval Academy, he researched diesel engine power in the military setting, using an advanced compression ignition strategy which will lower soot in the exhaust.

Michael has co-authored five articles on fuel and energy, two of them as first-author. He graduated ranked #1 in his class. In addition, he has been awarded funding for research applicable to submarine warfare and has been recognized for his essay writing. He has been on the Superintendent’s List (Dean’s list equivalent) every semester and has received the George H.W. Bush Public Service Scholarship. He is a Navy Master SCUBA diver, has trained in primitive survival techniques in the Sierra Nevada mountains, trained in the Chugach mountain range and also enjoys diving and spearfishing in the Chesapeake Bay.
MATTHEW WEIDNER

Matthew joined Dr. Timothy Griffin’s Internet Routing group. He will attempt to develop an algebraic theory of multicast routing, thereby developing faster and better computational tools to improve business operations, consumer products and scientific research in other fields. Algebraic Internet Routing is unique to Dr. Griffin’s lab and Matthew is excited to apply abstract algebra to the development of practical algorithms and develop his understanding of the entire computer science field.

Matthew started college as a math major but came to computer science because he realized that he could use his math skills to benefit others. He began to explore theoretical computer science and came upon the use of algebraic number theory to improve existing error-correcting codes. Matthew plans to expand on this work in graduate school to make it more practical, having already made a novel discovery with his professor, in the area of fast coding algorithms. He has extensive background in algebraic structures and other features of algorithms. He is an author of four papers, one published and the other three in various stages of publication.

Matthew has completed three Summer Undergraduate Research Fellowships at Caltech. He had a 4.1 GPA and has twice received Honorable Mention in the Putnam Math Competition. He also won the Eric Temple Bell Undergraduate Research Prize for the best original math paper written by a Caltech junior or senior. Matthew plays the tenor sax.

TIMOTHY WELSH

Professor Tuomas Knowles hosts Tim as he tries to understand the role of protein self-assembly in health and disease. Tim has developed an innovative research project plan where he proposes to study the dynamics and function of ribonucleoprotein (RNP) granules. He will use microfluidic techniques to study these organelle-like structures which are used by our cells to respond to cellular stress, among other functions. The hope is eventually to apply this work to engineering specific RNP to carry out functions in biological systems and be able to combat diseases caused by improper RNP function.

While in high school Tim learned to produce and purify proteins in a chemical biology lab. As an undergrad, he focused on synthesizing drug targets to combat parasitic diseases. In addition, he has conducted computational research on nuclear collision reactions (which resulted in a first-author publication in Physics Letters B) and more recently, began studying the electronic structure of Tryptophan radicals to better understand the conversion of electrical energy into chemical energy to be utilized as biological fuels. In the spring of 2017, he won a ThinkSwiss research scholarship to ETH Zurich where he once again applied his computational and biochemical laboratory skills to investigate the structure and dynamics of a specific protein-RNA structure.

Tim graduated as a triple major in Biochemistry, Chemistry, and Applied and Computational Mathematical Sciences. He received the Mary Gates Research Scholarship for excellence in research and multiple merit-based scholarships for academic excellence from the University of Washington. He is also a Husky 100 for exemplifying the University’s community ideals. He is a serious road cyclist, competing at the national level, and cycled across the USA in the weeks before traveling to Cambridge.

FALL CAMPAIGN

Since 2015, more than 150 former Churchill Scholars per year, through donations big and small, have funded a 15th Churchill Scholarship, along with other aspects of our program that makes the Churchill Scholarship so enriching. Please join us in providing the opportunity for high risk, high reward research for the best and brightest US graduates.

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 donated appreciated securities, please contact the Executive Director for details.

Thank you!
Double Trouble

The Churchill Scholarship equivalent of pitching a perfect game is when an institution places both of its allotted nominees. Since 1963, when there were just three Scholars drawn from a small list of US colleges and universities, to last year, when 114 institutions contended for 15 Churchill Scholarships, only 19 institutions have done this. In 2018, two schools (Cal Tech and University of Maryland/College Park) did it—the eighth time there has been a “double double.”

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<th>Institution</th>
<th>Year of winning the Scholarship twice</th>
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<td>Harvard University</td>
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<td>Northwestern University</td>
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<td>Yale University</td>
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<td>Cornell University</td>
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<td>Harvey Mudd College</td>
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<td>California Institute of Technology</td>
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<td>Duke University</td>
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<td>Johns Hopkins University</td>
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<td>University of Rochester</td>
<td>1984</td>
</tr>
</tbody>
</table>

As the saying goes, you have to be in it to win it. In order to place two Churchill Scholars in a single year, it’s obvious that institutions must nominate two students. Surprisingly, most schools that nominate will only nominate a single candidate. Only 10 institutions have nominated the full allotment of two candidates in each of the last three years. Of the schools on this list, all of them have placed at least one Churchill Scholar since 2015, and we have not even finished this year’s selections!
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Founding Director of the Churchill Museum, Phil Reed (right), provides a tour to this year’s Churchill Scholars, including Anna Thomas (left) and Aishwarya Nene (center).