2018-19 Churchill Scholars

Christopher Bambic	University of Maryland	MPhil, Astronomy
Kevin Chen	University of Pennsylvania	MPhil, Chemistry
John Finlay	Princeton University	MPhil, Paediatrics
Namrah Habib	University of Arizona	MPhil, Astronomy
Joseph Kannarkat	University of Pittsburgh	MPhil, Public Policy
Yousuf Khan	University of Maryland	MPhil, Pathology
Aswini Krishnan	UC-San Diego	MPhil, Molecular Biology
Jared Duker Lichtman	Dartmouth College	MASt, Pure Mathematics
Aishwarya Nene	California Institute of Technology	MPhil, Medicine
Scott Neville	University of Utah	MASt, Pure Mathematics
Merrick Pierson Smela	University of Minnesota	MPhil, Physiology
Vikram Sundar	Harvard University	MPhil, Chemistry
Anna Thomas	Stanford University	MPhil, Engineering
Michael Walker	United States Naval Academy	MPhil, Engineering
Matthew Weidner	California Institute of Technology	MPhil, Computer Science
Timothy Welsh	University of Washington	MPhil, Chemistry

The Winston Churchill Foundation of the United States is pleased to announce the largest Churchill Scholarship cohort since we made our first three awards in 1963. Thanks to the generosity of former Scholars and Trustees, we have awarded 15 Churchill Scholarships in science, mathematics, and engineering. We have also awarded the inaugural Kanders Churchill Scholarship in Science Policy, thanks to a gift from Board Member Warren Kanders, raising the number of the cohort to 16 scholarship recipients.

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

The Kanders Churchill Scholarship is awarded from a pool of applicants to the Cambridge Master's in Public Policy. The Foundation is pleased by the high interest in the award, despite a relatively late official announcement of the opportunity.

For the 15 Churchill Scholarships in mathematics, science, and engineering, we received 101 nominations from 69 of our 112 Participating Institutions. Applications came from 12 liberal arts colleges, 22 private universities, and 35 public universities. We had 35 (34%) women and 66 men (66%) apply. Of the Scholarship winners, there are four women and 12 men. The most popular department to which nominees applied, as it is most years, was mathematics, with 19 applicants. The next most popular department was chemistry, with 12.

Christopher Bambic

HOMETOWN
Euclid, Ohio
INSTITUTION
University of Maryland,
College Park
(BS, Astronomy and Physics)
TO STUDY
MPhil, Astronomy
Institute of Astronomy

Chris is fascinated by plasma astrophysics on both observational and theoretical levels. He will work with Professor Andrew Fabian on X-ray reverberation around black holes in Active Galactic Nuclei (AGN) as well as the process of AGN feedback in clusters of galaxies. With Professor Christopher Reynolds (who was also his mentor at Maryland before moving to Cambridge), he will study the role of magnetic fields in driving accretion disk state transitions in black hole accretion disks. He will investigate the connection between microscale plasma physics and macroscale high-energy astrophysical phenomena and hopes that his work will one day help to explain the origin and evolution of the universe and tell the story of where we are in the cosmos.

As an undergraduate, Chris distinguished himself by seeking research opportunities across different academic institutions and government agencies here and abroad. As a freshman and sophomore, he worked on projects involving the High Altitude Water Cherenkov (HAWC) gamma ray observatory in Mexico, and the Laser Interferometer Space Antenna (LISA) Pathfinder mission at NASA Goddard Spaceflight Center. Starting his sophomore year, he began his collaboration with Professor Reynolds, working on the role of magnetic field strength and geometry on AGN feedback in galaxy clusters. This led to a first-author research paper currently under review with *The Astrophysical Journal*. He is currently working on several projects involving different aspects of supermassive black holes and astrophysical plasmas. Some of this research was accomplished at Cambridge's Institute of Astronomy, where he worked with their X-ray group studying turbulence in galaxy clusters. His second first-author paper on this work is under review with *Monthly Notices of the Royal Astronomical Society Letters*.

Upon entering college, Chris was awarded a full scholarship as a Banneker/Key Scholar as well as a Stamps Family Charitable Foundation Scholarship, given to a select group of Banneker/Key Scholars. In addition, he is a Goldwater Scholar and has received multiple prizes and awards for his undergraduate work. He has a 3.96 GPA including 19 A+ grades. Many of his interests outside of school are related to outreach activities involving physics and astronomy. He is a member of the University's Knights of Columbus chapter.

Kevin Chen

HOMETOWN
Fremont, California
INSTITUTION
University of Pennsylvania
(BA, Physics, Biophysics, and Biochemistry)
TO STUDY
MPhil, Chemistry
Department of Chemistry

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 will work under Dr. David Klenerman and chemistry professor Dr. Steve Lee. While there, he will strengthen his foundation in optical and quantitative modeling techniques. Currently, 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. Currently, 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 is a triple major—biophysics, physics and biochemistry and will simultaneously complete 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 has a 4.0 GPA, with six 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

HOMETOWN
St. Louis, Missouri
INSTITUTION
Princeton University
(AB, Molecular Biology, Neuroscience)
TO STUDY
MPhil, Medical Sciences
Department of Paediatrics

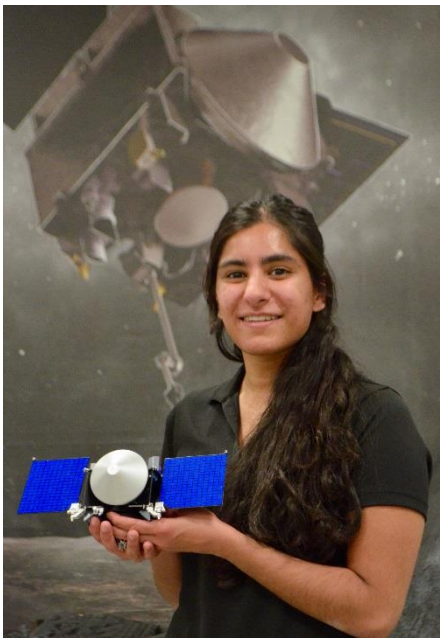
Median survival for patients afflicted with Glioblastoma multiforme (GBM) is 15 months. It is an aggressive brain tumor affecting glial cells and is minimally responsive to even the most aggressive therapies. Recent data suggests that within the tumor itself, a small subset of glioma stem-like cells 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 is currently working 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 Bueno 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. His GPA is 3.97, with no grade below A-. He is 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



HOMETOWN
Tucson, Arizona
INSTITUTION
University of Arizona
(BS, Aerospace Engineering, Chemical Engineering)
TO STUDY
MPhil, Astronomy
Institute of Astronomy

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 will join the research lab of Dr. Mark Wyatt at the Institute of Astronomy. She will study hot debris disks in planetary systems at various points in their life cycle using data from the Large Binocular Telescope Interferometer (LBTI).

Namrah will concentrate on the luminosity function, which will allow 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 has 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 is completing 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 competes 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

HOMETOWN
Chantilly, Virginia
INSTITUTION
University of Pittsburgh
(BS, Neuroscience, Economics)
TO STUDY
MPhil, Public Policy
Department of Politics and International Studies

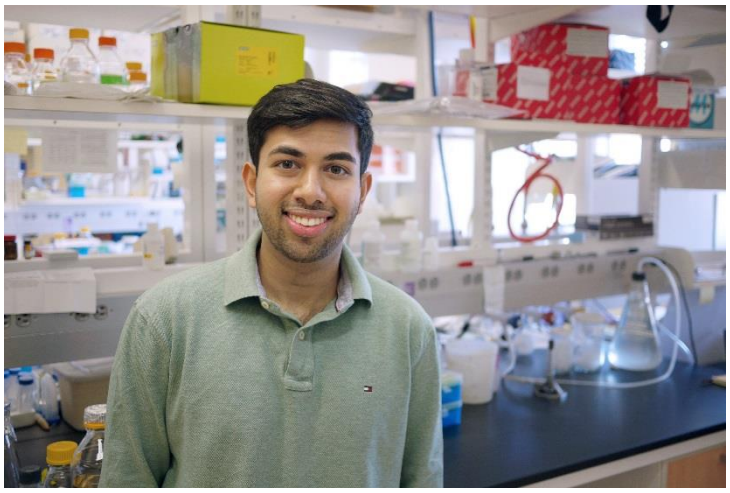
Joseph is the inaugural recipient of the Kanders Churchill Scholarship in Science Policy. As the first holder of this award, which is intended to help bridge the divide between science and policy, Joseph is excited to both learn from others in the cohort and to help spark an interest in public policy among the science, mathematics, and engineering Churchill Scholars. This will build upon the two days of science policy seminars already in the Churchill program.

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 is President of Students Consulting for Nonprofit Organizations and oversees 60 student consultants on ten 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 has accumulated six A+ grades. He is an avid hiker, photographer, and has worked in music production.

Yousuf Khan



HOMETOWN
Potomac, Maryland
INSTITUTION
University of Maryland,
College Park
(BS, Cell Biology, Genetics)
TO STUDY
MPhil, Biological Sciences
Department of Pathology

Yousuf will work in Dr. Andrew Firth's lab, where he will use 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. This work allowed him to collaborate with a Belgian lab which gave him the opportunity to present his work and to meet in London with his future supervisor at Cambridge, Dr. Firth. However, his frameshift marker signal research came to a halt when it was discovered that a tool used to measure frameshifting was faulty. Despite this setback, he is convinced that he can improve the experimental techniques involved to eventually identify "hidden" frameshift genes in humans, in order to benefit human health. He will continue this research at Cambridge. In his final year at the University of Maryland, Yousuf has been working 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 real research projects. He is 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

HOMETOWN
Fremont, California
INSTITUTION
UC-San Diego
(BS, Bioengineering)
TO STUDY
MPhil, Biological Sciences
MRC Laboratory of Molecular Biology

The ribosomal complex is crucial in the synthesis and regulation of proteins. At Cambridge, under the mentorship of Dr. Venki Ramakrishnan, Aswini will study the termination of translation in bacteria, with a focus on the role of release factors (RF's) 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, including novel insights to fuel the development of new antibiotics, or clues in the development of diseases stemming from dysregulation of translation, e.g. cancer and diseases of memory formation and development. Her fascination with the human body began with a childhood visit to the doctor's office and continued through her teenage years as she pursued a cancer science internship through a local biotech company to learn more about topics not covered in school.

In the UCSD lab of Dr. Weg Ongkeko, she has 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. In her research, she has explored piRNA and miRNA (types of non-coding RNA) dysregulation in smoking-induced HNSCC, identifying 13 novel transcripts relevant to malignant transformation with potential diagnostic significance. She has also studied the roles of piRNAs in HPV-induced HNSCC, exploring interactions of altered piRNAs with transposon-like genes. More recently, she has been very excited about her identification of a novel non-coding RNA (lnc-SP9-1:1) with potential implications for earlier detection of HNSCC.

She is a Jacobs Engineering Scholar, Regents Scholar, and Google Generation Scholar, in addition to receiving numerous other merit-based scholarships, including an American Association of Cancer Research Award. She has received an A+ in 14 of her 37 courses in a major which UCSD describes as one of its most difficult. In her free time, she pursues her passion for music as captain of Sitaare, UCSD's South Asian a cappella group, and serves as co-editor-in-chief of UCSD's Undergraduate Research Journal. She also enjoys sharing her love of science with the younger generation and mentors elementary school students.

Jared Duker Lichtman

Russo Churchill Scholar

HOMETOWN
North Bethesda, Maryland
INSTITUTION
Dartmouth College
(AB, AM, Mathematics, Physics)
TO STUDY
MASt, Pure Mathematics
Department of Pure Mathematics
and Mathematical Statistics

Jared is driven by his desire to find connecting concepts in mathematics. For example, a famous unsolved problem from 1932 was recently cracked by combining techniques from number theory, combinatorics, harmonics analysis, and even physics. Jared's interest is in number theory, a field with a web of connections to other fields in mathematics. At Cambridge, with its tradition of excellence in number theory, 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 already 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. In addition, he is on track to receive 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

HOMETOWN
San Jose, California
INSTITUTION
California Institute of Technology
(BS, Chemistry)
TO STUDY
MPhil, Translational Biomedical Research
School of Clinical Medicine

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 will work in the biomedical research lab of Dr. Chris Dobson, where she will attempt 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 and her passion for manipulating biology. While still in high school she learned how to mutate sequences for critical residues involved in the Fanconi Anemia DNA repair pathway among other projects. As an undergraduate, she was invited to work at an early stage biotech company focused on therapies for neurological diseases. While there, 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 among other honors. She has 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

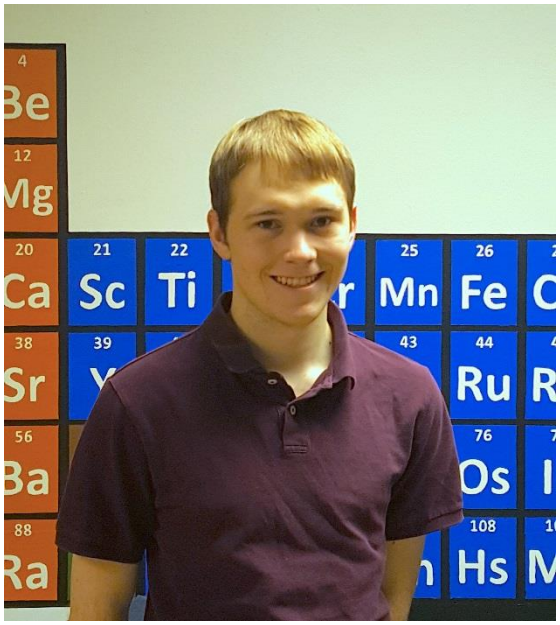
HOMETOWN
Clearfield, Utah
INSTITUTION
University of Utah
(BS, Mathematics, Computer Science)
TO STUDY
MASt, Pure Mathematics
Department of Pure Mathematics
and Mathematical Statistics

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 would love to 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 has a 3.98 GPA and received his BS degrees in both Mathematics and Computer Science. This year, he is working 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



HOMETOWN
Minneapolis, Minnesota
INSTITUTION
University of Minnesota
(BS, Chemistry and Biochemistry, Mathematics)
TO STUDY
MPhil, Biological Sciences
Department of Physiology

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. Next year, he will work in the stem cell biology lab of Professor Azim Surani, where he will study 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 nitrone 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. Currently, he is a member of the University of Minnesota iGEM team, where he along with his team members are developing a strain of *E. coli* to selectively kill invasive zebra mussels in aquatic environments.

Merrick will graduate 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. 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. He also works as a pyrotechnician during school breaks.

Vikram Sundar

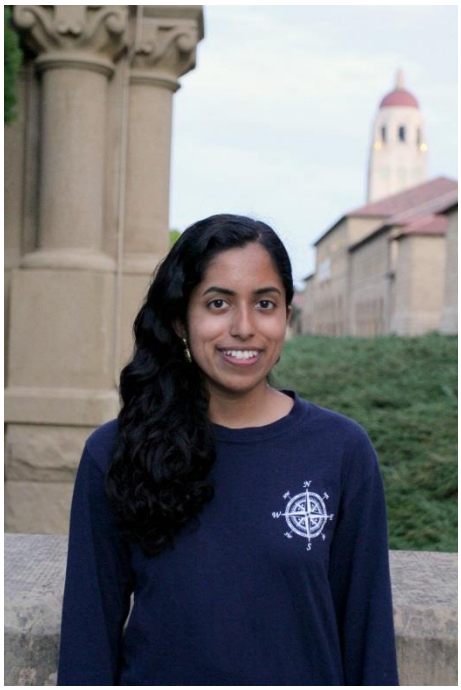
HOMETOWN
Saratoga, California
INSTITUTION
Harvard University
(AB, Mathematics, Chemistry;
AM, Physics)
TO STUDY
MPhil, Chemistry
Department of Chemistry

While taking organic chemistry, Vikram realized that quantum mechanics could be used to computationally model organic molecules and predict reactions. In Dr. Lucy Colwell's lab, Vikram will attempt to use biomolecular simulation methods to determine ligand/protein binding affinity. By doing so, he hopes to introduce more efficiency into the process of drug discovery.

Vikram has interned with D.E. Shaw Research where he gained exposure to state-of-the-art molecular dynamics (MD) and force field development research. Vikram is currently conducting research in a theoretical chemistry group where he is working on using advanced quantum mechanics and computational math to understand the molecular dynamics of neon and water. He has also developed image processing algorithms to study cell division in the roundworm *C. elegans*.

He will be receiving his AB in Mathematics/Chemistry and simultaneously an AM in Physics. He has been named a Goldwater Scholar, a John Harvard Scholar and is the recipient of the Detur Book Prize, among other awards and research fellowships. He also finished in the Top 25 of the Putnam Mathematics Competition and is a lifelong pianist. After the Churchill, he plans to pursue an MD/PhD.

Anna Thomas



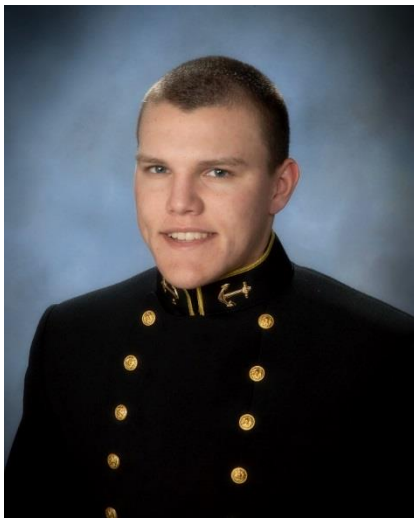
HOMETOWN
San Jose, California
INSTITUTION
Stanford University
(BS, Mathematics)
TO STUDY
MPhil, Information Engineering
Department of Engineering

Cambridge is famous for its work in Bayesian inference and machine learning. At Cambridge, Anna plans to learn more about the Bayesian approach to machine learning and conduct research with the Cambridge Machine Learning Group. Her current areas of interest include adaptive data collection, machine teaching, and learning with resource constraints.

Anna's fascination with machine learning began in high school and developed from earlier interests in neuroscience and psychology. As an undergraduate, she decided to delve more deeply into mathematics and computer science, and she has worked on a variety of computer science research projects. 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, with applications to robotics. In addition to her summer internships, Anna has also pursued research during the school year at Stanford. 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 co-authored papers in *Advances in Neural Information Processing Systems*, *Eurographics*, and the International Conference on Image Processing.

Anna has been involved in a variety of activities at Stanford, including the Stanford Symbolic Systems Society, Women in Computer Science, Splash!, Girls Teaching Girls to Code, and peer tutoring for the Stanford University Mathematical Organization. She also enjoys rock climbing, exploring farmer's markets, and trying out new types of tea.

Michael Walker



HOMETOWN
College Station, Texas
INSTITUTION
United States Naval Academy
(BSc, Mechanical Engineering)
TO STUDY
MPhil, Engineering
Department of Engineering

Michael will join the Energy Research Group, where he will focus on modes of advanced combustion and optimizing air-fuel mixing to improve efficiency and reduce the environmental impact of machines. In the long-term, 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 continues his research on 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 is currently 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

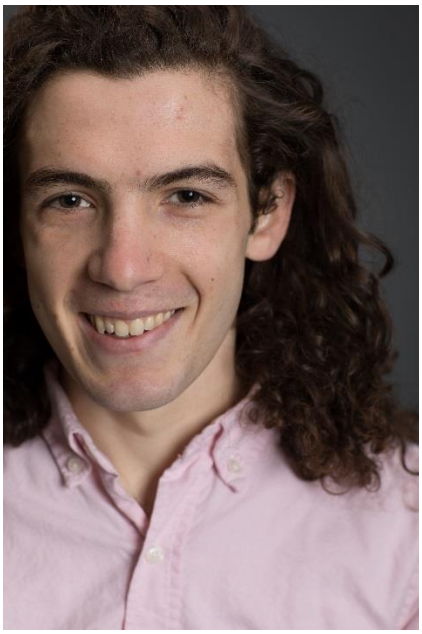
HOMETOWN
Topton, Pennsylvania
INSTITUTION
California Institute of Technology
(BS, Mathematics, Computer Science)
TO STUDY
MPhil, Advanced Computer Science
Computer Laboratory

Matthew plans to do research in 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. As a math major, 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 has 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 and was also named "Head Waiter" in his House (akin to co-ed fraternity).

Timothy Welsh



HOMETOWN
Lake Forest Park, Washington
INSTITUTION
University of Washington
(BS, Chemistry, Biochemistry, Applied and Computational Mathematics)
TO STUDY
MPhil, Chemistry
Department of Chemistry

Professor Tuomas Knowles will host 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 will graduate 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.