THE WINSTON CHURCHILL FOUNDATION OF THE UNITED STATES

THE CHURCHILL SCHOLARS 2015-2016

Churchill Scholarship provides funding for a one-year Master's degree in science, engineering, or mathematics at the University of Cambridge. A professor of nuclear physics at a top-tier US university called it "the most academically challenging of the prestigious UK scholarships." Because the award goes to recent American graduates, it is striking that the Churchill Scholars are already making meaningful contributions to knowledge. A generation ago, this would have been unheard of, the stuff of Hollywood fantasy. Today, it is what makes a Churchill Scholar. Among this year's Churchill Scholars are individuals who:

- will graduate college with a research output similar to that of successful PhD students
- made a breakthrough leading to a successful mathematical proof, beyond what his professor could achieve
- conducted research that was central to a multi-institution bid to the NIH
- wrote an algorithm that made a meaningful contribution to the search for the Higgs boson
- solved an open conjecture in mathematics even before college

In the short profiles below, one can find similar stories from each of them, in their research and academic performance. While extra-curricular activities do not play a significant part of the selection process, it is remarkable how many of the Churchill Scholars are accomplished in music, sports, and other pursuits and have taken on leadership roles. How is this possible? In two words: opportunity and motivation. Thanks to competitive research funding for undergraduates like the Goldwater Scholarship (won by 11 of this year's 14 Churchill Scholars), students can join a lab or study advanced mathematics at an early stage.

Churchill Scholars find this opportunity in a range of different US institutions, large and small, public and private, liberal arts colleges and research universities. It is a relatively level playing field, since each of our Participating Institutions can nominate up to two students each year. This year's 14 winning universities are listed here, along with the total number of Churchill Scholars they have produced since the first awards were made in 1963:

Carnegie Mellon (10)
University of Chicago (13)
Cornell (23)
Harvard (40)
Johns Hopkins (16)
MIT (12)
Michigan State (18)
University of Minnesota (10)
Northwestern (11)
Ohio State (5)
Pomona College (5)
Purdue (12)
Stanford (12)
Williams College (3)

All of Pomona's five Churchill Scholars have come since 2007, when Pomona was invited to join the Churchill Scholarship Program. Johns Hopkins has had five Scholars in that same time. Northwestern has had six in the past six years. Williams, too, is on a mini hot streak, with two mathematicians in the last two years.

What kinds of subjects do they study? It is no exaggeration to say that each of this year's Scholars is working on a scientific problem that will probably, in time, directly affect every person reading these words. They are fighting viruses, cancer, mental illness, and developmental disorders. They are creating better pills, lighter engine parts, and cleaner energy. They are unlocking the secrets of the universe. The mathematicians, of course, are making discoveries whose applications have the potential to lead to new technologies that may change our world. Remember that your mobile phone would not work if it were not for advances in mathematics that were made decades before the technology was feasible.

This is the true excitement of the Churchill Scholarship. These fourteen young men and women have already proven that they are capable of driving science forward. At Churchill College, they will be part of one of the greatest gatherings of top-level mathematicians, scientists, and engineers, in all of higher education. And, in their Cambridge departments, they will have a level of independence far beyond what they would find at a US university at this stage. The Churchill Scholarship is simply their next great opportunity, a fitting extension of the many great opportunities they have already taken.

These scholars are certainly capable of anything. For them to choose to study science and technology, and to choose an intellectual exchange with the United Kingdom, is the fulfilment of Winston Churchill's vision for our future common prosperity. While they have won the Churchill Scholarship for 2015-2016, we are all be the beneficiaries of this award.

James Eaglesham

Hometown: Ithaca, New York
Institution: Cornell (BS, Biological Sciences)
To study: MPhil, Virology, Department of Pathology

The human norovirus is a leading cause of viral gastroenteritis, which poses significant global health challenges. James will work in the laboratory of Professor Ian Goodfellow to test antiviral drugs and to develop antiviral therapies targeting this pathogen. Professor Goodfellow's laboratory has recently shown that the drug favipiravir can be effective against forms of the norovirus on mouse models. James looks forward to exploring ways that favipiravir, in combination with other therapies, might inhibit the spread of the human disease.

James became interested in viruses when he read *The Hot Zone* (1995), on the origins of Ebola. He took full advantage of growing up in a university town and gained his first lab experience the summer after his freshman year in high school. He worked in the Boyce Thompson Institute for Plant Research at Cornell, where he learned polymerase chain reactions (PCR). This work with DNA helped prepare him for when he arrived at Cornell as an undergraduate. James worked in the Department of Microbiology on viruses associated with plankton; his supervisor gave him two days to write up results of his research for publication, and that report soon found a home in the *Marine Ecology Progress Series*. This was the first of four scientific papers for which he is a co-author. James went on to work over the course of two summers on the bacterial causes of Legionnaires' Disease and whooping cough at the NIH.

Comments by professors and mentors:

"James is the single most promising undergraduate researcher I have worked with during my academic career, which spans 3 institutions."

"I have mentored dozens of students in my 30 years at NIH. James is outstanding. I rank him in the top 1% of students at his stage."

"James Eaglesham is the real deal… It is not often that one encounters someone that you just know will be a huge success in life. James is one of those individuals."

James is the recipient of the Hunter R. Rawlins III Presidential Scholarship. He is co-principal cellist in the Cornell Chamber Orchestra, with which he has toured Ireland and Puerto Rico. He plans to return to the US for a PhD and to pursue a career in molecular virology.

Emily Erickson

Hometown: Clarks Hill, Indiana
Institution: Purdue (BS, Biochemistry)
To study: MPhil, Breast Cancer, Department of Pathology

Breast cancer is the most common form of cancer affecting women. Emily will work with Professor Christine Watson to study the roots of the disease in mammary stem cells and progenitor cells. By understanding the cell signaling pathways that lead to breast cancer, Emily hopes that her research will eventually contribute to the development of therapies.

Emily traces her interest in medicine to her work on her family goat farm when she saved the life of a goat suffering anaphylactic shock. She found it hard to leave the animals behind when she matriculated at Purdue, so she founded the Purdue Goat Club, which manages a herd of goats and has an emphasis on outreach and education. During her undergraduate years, she won a Goldwater Scholarship, *two* Astronaut Scholarships, and several other awards and scholarships for agricultural science, including awards for top student in the College of Agriculture (out of 600 peers) and also in the Department of Biochemistry for each of her first three years. During an NIH NCI Undergraduate Research Internship, she turned her attention to human disease, specifically breast cancer. Her transcript includes nine A+ grades.

Comments by professors and mentors:

"In one word, Ms. Erickson is simply a superstar. She is far and away one of the keenest young minds I have had the pleasure of mentoring."

"While the summer undergraduate research fellow (SURF) program is usually not advised for a freshman, Emily had already established herself as a researcher… Emily developed a poster of her research for the ADSA-ASAS Joint Annual Meeting… and was awarded the Outstanding Student Poster at the meeting. This meeting is attended by approximately 4,000 scientists and graduate students. Emily now has two peer reviewed publications with one as first author."

"By now, I have mentored hundreds of students and Emily is the most talented student I have worked with."

"Emily distinguishes herself in so many ways that it is difficult to enumerate them all here."

Emily is principal violist in the Purdue Philharmonic Orchestra. She is also interested in Irish music, an interest which she cultivated during a semester abroad at University College-Dublin. After Cambridge she intends to get a PhD and to continue working on breast cancer.

Jesse Freeman

Hometown: Bethesda, Maryland
Institution: Williams (BA, Mathematics)
To study: MASt, Pure Mathematics

Jesse is drawn to Part III pure mathematics because of his interest in algebraic topology and its connection to representation theory. It is also an opportunity to explore topics such as category theory, analytic and birational geometry, and complex manifolds.

Jesse came to mathematics from his experience in high school debating tournaments. It was not the content of debate but the methods that turned his attention to the beauty of a mathematical proof. A semester abroad in Oxford gave him the chance to delve more deeply onto math, and it confirmed his passion. Jesse has won a Goldwater Scholarship, an NSF grant for a SMALL Undergraduate Research Project, and was inducted into Phi Beta Kappa as a Junior. He has earned five A+ grades.

Comments by professors and mentors:

"I have never taught a student who was so motivated, hard-working, and talented."

Following a summer internship in the Office of General Counsel at the US National Archives and Records Administration (which resulted in a publication and a chapter of forthcoming book), his supervisor wrote, "I believe Jesse to be one of the most extraordinary individuals I have encountered in 34 years of practicing law."

During his Freshman year, he took an upper-level course in Knot Theory and ranked in the top five of 40 students. The professor then invited him to join him for independent research, and Jesse contributed to two publications. He went on to describe one particularly thorny problem that led to a publication, saying that Jesse "ultimately came up with the key idea to prove one direction of the main proof of the much harder of the two papers. This was the strongest result of the summer. I can honestly say that I would not have come up with that proof, even after working on it for months."

"… in the past six years, four of my students have won Churchill Scholarships. In this incredibly strong group of students, Jesse would rank near the top."

Jesse is the co-principal trumpet in the Berkshire Symphony Orchestra (a semi-professional orchestra), a competitive squash player, and he has represented Williams at the World Debate Championships. He plans to do a PhD and pursue a career in mathematics.

Catherine Groschner

Hometown: Corinth, Vermont
Institution: Carnegie Mellon (BS, Materials Science and Engineering)
To study: MPhil, Energy Technology, Department of Materials Science

Kate will study with Professor Judith Driscoll, working on functional oxides for solar cells. Her previous study of titanomagnetites (minerals found on Mars) has prepared her for this work. Her goal is to develop a less energy-intensive way to manufacture solar cell technology, helping make solar energy economically viable.

Kate came to her interest in photovoltaics from a childhood interest in climate change, combined with an inspirational chemistry class that taught her that science can help solve intractable problems. At Carnegie Mellon, her work on Martian minerals led to her first conference presentation and academic publication. She has participated in two NSF REU's (one at MIT and the other at the University of Vermont), was inducted into Tau Beta Pi as a Junior, and has an unblemished 4.0 GPA. She is a Boeing Scholar, an award that recognizes her combination of academic achievement and leadership ability.

Comments by professors and mentors:

"Kate was truly exceptional and her efforts contributed greatly to developing new research directions" and she was "easily in the top 1-2 undergraduate students I have ever had… She is going to be a real catch for any department or faculty member lucky enough to get her."

"If Kate continues her trajectory she has the potential to be among the best students I have educated at CMU."

For two years, Kate has been photo editor of *The Tartan*, the student newspaper, as well as a Contributing Editor and a member of the Executive Committee and Editorial Board. After her PhD, she looks forward to a career that turns scientific discoveries into marketable technologies.

Daniel Kang

Hometown: Fairfax, Virginia
Institution: MIT (BSc, Computer Science and Mathematics; MEng, Computer Science)
To study: MASt, Mathematical Statistics

Daniel is drawn to the Part III course because of the enormous impact that data analysis can have on issues such as fMRI and high-throughput DNA sequencing and its application to identifying genetic diseases. He is eager to deepen his understanding of statistics in topics such as advanced probability, Brownian motion, and stochastic calculus and applications. He finds the broad range of courses in Part III vital to his future career in computational biology and machine learning.

Daniel's talents as a computer programmer came to prominence when he worked on open-source video processing projects (x264 and FFmpeg). Google took note and invited him to two internships, where he outperformed many experienced Google employees while still in high school. In 2011, he was Grand Prize Winner of the Google Code-In contest. Back at MIT, he helped organize a 36-hour programming challenge (HackMIT). These experiences turned his attention to the incredible power of data processing in biology and the extraordinary potential of big data to address scientific and medical questions. Daniel's work on statistical modeling of cellular function has already been published in *Nature Biotechnology*, and more recent results have been submitted to *Nature*. Daniel won a Goldwater Scholarship and is on schedule to finish a Master's degree in addition to his Bachelor's in four years.

Comments by professors and mentors:

Daniel "is one of the most exceptional – if not the most exceptional – undergraduate I have had the pleasure of working with in my 30 years at MIT. Daniel is the rare individual that comes along every great once in a while that is both extraordinarily motivated and capable, and is able to find solutions to problems that require true creative insight… He is able to conceptualize, formalize, and implement mathematical solutions that are beyond the capability of most of my MIT graduate students."

Though only an undergraduate, Daniels' work is central to an NIH proposal submitted by a consortium of MIT and other scientists, which his professor says "has not happened to me before in my entire career… These abilities coupled with his strong positive motivation make him a true world changer."

"… he will be an extraordinary researcher with the potential to unlock the secrets of human disease."

Daniel is an avid runner and is fluent in Japanese. He plans to do a PhD in machine learning and computational biology.

Anne Marsden

Hometown: Salt Lake City, Utah
Institution: University of Chicago (BS, Mathematics and Chemistry)
To study: MPhil, Scientific Computing, Department of Physics

Annie is fascinated by the size boundary where classical thermodynamic principles shift from the micro to the macro. She has already spent eight weeks in the Cambridge lab of Professor David Wales, where she will work to refine the Modified Embedded Atom Method (MEAM) to help her explore the attributes of smaller systems. She has been researching Gallium atoms in a size range of between 13 and a few thousand atoms. For such small systems, it is not possible to assume statistical averages under classical physical chemistry laws, while at the same time it is not small enough to compute behavior using quantum mechanics.

Elected Phi Beta Kappa as a Junior, Annie has won a Goldwater Scholarship. As a double-major, Annie is the highest ranking student in chemistry and the second-highest ranking student in mathematics at the University of Chicago. She has won a number of academic awards and research scholarships. The only blemish on Annie's transcript is a single A-, which she attributes to a bicycle accident that caused her to miss two weeks of lectures!

Comments by professors and mentors:

Annie "is one of the best students in mathematics I have seen in nearly forty years as a professor… I am confident… that she will be an important part of the nation's scientific leaders."

"Marsden is simply remarkable in her originality, versatility, depth and amazing efficiency in getting significant results for difficult challenges."

She performed so well in a notoriously difficult quantum mechanics course that the instructor felt she could not make the exams hard enough to challenge Annie "without crushing the rest of the class."

Annie runs for the cross country and track and field teams at Chicago. She enjoys teaching and tutoring youngsters in science and mathematics, which she has done since high school. Her work involves chemistry, physics, mathematics, and scientific computing, and she plans is to pursue a PhD in chemistry.

Sophie Miller

Hometown: Greenwich, Connecticut
Institution: Stanford (BS, Chemical Engineering)
To study: MPhil, Biochemical Engineering, Department of Chemical Engineering and Biotechnology

Novel drug delivery systems are going to be crucial to addressing key global health challenges such as cancer. Nanocarriers for cancer therapeutics can achieve efficient loading of a drug, controlled release, and other effects that improve drug effectiveness. Sophie will work with Dr. David Fairen-Jimenez on metal-organic frameworks (MOFs), a promising new drug delivery agent that can be tuned for biocompatibility and localized release.

Sophie first worked with nanoparticles at the Weizmann Institute in Israel before her matriculation at Stanford. At Stanford, she worked on superconducting polymers and won internal funding for an honors thesis on optimizing capacitive pressure sensors. She won a Goldwater Scholarship, was admitted to a Summer Undergraduate Research Fellowship at CalTech, and is a member of Tau Beta Pi as a Junior. She has earned 14 A+ grades and is considered the top student in her class. She won first prize among undergraduate poster presentations at the American Institute of Chemical Engineers National Meeting.

Comments by professors and mentors:

"Simply put, Sophie is one of the very best students that I have seen at Stanford in the 7 years that I have been a faculty member here."

Another professor with 45 years of teaching experience appointed Sophie to be a teaching assistant in one of his classes – the first time he had ever selected an undergraduate to do that. "Her performance as a teaching assistant surpassed even the highest expectations I could have had for a graduate student acting in the same capacity."

Sophie plays baritone and alto saxophone for the Stanford Jazz Orchestra, of which she has been President since the start of her sophomore year. She enjoys tutoring children in math and science, and she is a long-distance runner. She looks forward to a PhD in chemical engineering and a career either in industry or academia.

Evan O'Dorney

Hometown: Danville, California
Institution: Harvard (BS, Mathematics and Music)
To study: MASt, Pure Mathematics

Evan will use the Part III mathematics course to solidify his foundations before pursuing a PhD in arithmetic geometry. He is particularly interested in representation theory and analysis.

Evan considers himself a miner of data and seeker of patterns. A mathematical prodigy, he had read books on number theory by the fourth grade. He proved a conjecture in the seventh grade and solved an open conjecture in the tenth grade. He achieved a clean sweep of ten A+ grades in mathematics at Berkeley starting when he was in the eighth grade and in high school. He is most proud of the work he did on square roots that earned him first prize in the Intel Science Talent Search in 2011. He has since expanded that work for publication. He inducted into Phi Beta Kappa as a Junior, has done two NSF REU's, won numerous academic prizes at Harvard, the Putnam Mathematical Competition three years in a row, and is a four-time medalist in the International Math Olympiad. He first came to national prominence in 2007 when he won the Scripps National Spelling Bee.

Comments by professors and mentors:

"I think that Evan is going to be a mathematical leader in his generation."

"… a once-in-a-century talent."

From a professor of a graduate-level class that Evan took his Freshman year: "He was by far the best student in the class, but even saying that doesn't do him justice: the fact is, at many turns it was clear he knew the material better than I did."

Evan enjoys composing and performing music as a pianist and singer. He is part of a choir that specializes in Renaissance music. Many times a champion, he now grades the USA Mathematical Olympiad and trains young mathematicians for competition. He looks forward to a career teaching and researching mathematics.

Edward Pang

Hometown: Copley, Ohio
Institution: Northwestern (BS, Materials Science and Engineering)
To study: MPhil, Department of Materials Science and Metallurgy

Edward will work with Dr. Howard Stone to study a novel class of shape-memory alloys (SMAs) that show promise for efficiency improvements in aviation. The applicability of SMA's is related to their transformation temperatures. The higher this temperature, the more useful the alloy will be. Edward will look at how to increase temperature thresholds, which could lead to new applications of SMAs, for example in gas turbine engines.

Airplanes have been an obsession of Edward since he made a detailed sketch of a Boeing 747 at age six. His childhood dream was realized when he spent a summer at Boeing, certifying components of the 787 Dreamliner, which is by far the most fuel efficient commercial aircraft. Increasing efficiency has always been a driving force for Edward. His interest in energy-efficient materials drew him to the lab of Professor David Dunand at Northwestern, and Edward became one of the first employees of Professor Dunand's startup company, NanoAl. Edward won the Goldwater Scholarship, is a member of Tau Beta Pi, and has won numerous awards and competitions at Northwestern including the Outstanding Sophomore and Junior MAtSci Award, which is based on leadership, scholarship, service, and research.

Comments by professors and mentors:

"I have taught this class for many years, and I have never had a student who was so off-scale on the high end of the grading spectrum."

"His work this summer was spectacular… A few weeks into his stay he was producing publishable results."

"Edward is the best student that I have had in my undergraduate classes in the last decade and is one of the two most productive undergraduate researchers in my 30-year career."

"Of the ten or more hand-picked, remarkable students I have mentored over the last decade, I can emphatically say that he was the best of the best."

"I can state that, in my almost 25 years of advising students at the Massachusetts Institute of Technology (MIT) and Northwestern University (with departments of materials science and engineering ranked in the top three), I have not seen an undergraduate student with more excellence and versatility, both in breadth and depth, than Edward."

Edward plays classical piano and clarinet. He is first clarinet in the Northwestern Concert Band. He is part of the college formula racing team, where he was in charge of all structural composite research, design, and fabrication. In the future, he plans to do a PhD and hopes for a career creating technology that improves energy efficiency for a more sustainable future.

Maxwell Shinn

Hometown: Chaska, Minnesota
Institution: University of Minnesota (BS, Mathematics and Neuroscience)
To study: MPhil, Department of Psychiatry

Max seeks to understand mental illness. An estimated one in six people worldwide suffers from some type of psychiatric disorder, making this one of the world's most pressing medical challenges. At Cambridge, he will work with Professor Ed Bullmore, who has pioneered a graph-theoretical method for interpreting fMRI data. The U-Change project at Cambridge has produced an enormous amount of fMRI data, and Max will see if he can use it to identify developmental correlates of different psychiatric disorders.

By the time he finished high school, Max had taught himself computer programming (using textbooks he bought at garage sales), started a programming company, written one of the most popular chat scripts on the Internet, and wrote software to help children with learning disabilities (a project that won him an AXA Scholarship). It was then that he turned his interest to the brain. He started working in psychology labs even before he matriculated at Minnesota. He has participated in two NSF REU's, and a DAAD RISE summer lab experience in Chemnitz, Germany. He has won numerous academic awards at Minnesota, a Goldwater Scholarship, and an Astronaut Scholarship.

Comments by professors and mentors:

"He worked to bring the other students up to speed on concepts of network structure and created programs that the other students could then use to study the questions we were investigating."

"In terms of talent and intellectual potential, Max ranks among the best even among graduate students I have advised."

"Maxwell was one of the most motivated undergraduate students I have ever had work in my lab… Maxwell's talent is remarkable."

"Rather than being a neuroscientist who uses math or a mathematician who models neuroscience data, he is both."

Max is also a composer. He has composed three musicals and various works for band, orchestra, choir, and chamber ensembles. His works have been performed by some of the top ensembles in Minneapolis-St. Paul. Max practices mindfulness and is president of his university's meditation student group. He will pursue a PhD and looks forward to a research career understanding mental illness.

Sandya Subramanian

Hometown: Grand Rapids, Michigan
Institution: Johns Hopkins (BS, Biomedical Engineering, Applied Mathematics and Statistics)
To study: MPhil, Department of Clinical Neurosciences

Sandya's interest is in extracting meaningful information from large neuroscience datasets for direct application in a clinical setting for a diagnostic or therapeutic purpose. In Clinical Neurosciences at Cambridge, students must choose two possible research projects. Sandya will either work with Dr. Emmanuel Stamatakis in looking at fMRI data to study the default-mode network (DMN) or she will work with Dr. Peter Smielewski on using multimodal data from critically ill patients to assist in real-time decision-making.

In high school, Sandya worked on a Science Olympiad team on a project to provide safe drinking water in rural Ghana. When she matriculated at Johns Hopkins, she was immediately drawn to computational neuroscience. A member of Tau Beta Pi, she has won a Goldwater Scholarship and won first place in the Collegiate Inventor's Competition (for the best undergraduate invention in the country). She has worked in research laboratories at Hopkins, MIT, and NIH. Her transcript includes 16 A+ grades.

Comments by professors and mentors:

"… of all the undergraduate students I have supervised in research, Sandya is by far the most precocious, talented, hardworking, and diligent student."

"She was able to make extraordinary progress on her project in a short period of time and contribute valuable insights into several lines of research… She has repeatedly shown great insights, and a strong passion to understand the underlying biology behind the problems she takes on, which is a key ingredient in any successful researcher, and very rare so early in her career."

Even though her primary major is Biomedical Engineering, she is also considered "in the very top tier of the primary majors in Applied Mathematics and Statistics… I think that she would also be a top student in any applied mathematics doctoral program, if that were her direction… There was one day that I had to miss a lecture, and she filled in for me. The class has 130 students, which might be daunting to an undergraduate student, but it was reported to me that she delivered the lecture very successfully and with poise."

Sandy sings in a South Asian fusion a cappella group and has served in various leadership roles including co-president. She is a certified Emergency Medical Responder and has a weekly shift on campus. She looks forward to pursuing a PhD in computational neuroscience.

Jonathan Timcheck

Hometown: Pittsburgh, Pennsylvania
Institution: Ohio State (BS, Engineering Physics)
To study: MASt, Applied Mathematics

Jon's career goal is to apply state-of-the-art machine learning techniques to experimental high energy physics. In Part III Applied Mathematics, he hopes to deepen his understanding of high energy theory. He will take courses in quantum field theory, symmetries, fields and particles, and the Standard Model. He also looks forward to classes in statistics and quantum information theory.

Jon's interest in the smallest building blocks of the universe led him to the search for top quarks from high energy proton-proton collisions at the Large Hadron Collider (LHC). This work, in turn, led to his first scientific publication and a Goldwater Scholarship. He then earned a DAAD RISE research internship at Forschungszentrum Jülich in Germany, where he helped design the Anti-Proton Annihilation at Darmstadt Experiment (known as PANDA). He has won several academic achievement and research awards at Ohio State, including top student in his department for each of his three years so far, and his GPA is a perfect 4.0.

Comments by professors and mentors:

He has passion for doing physics "more so than any other undergraduate I have ever worked with… He came up with an extremely clever technique… Amazing! This work from his Freshman and Sophomore years was published in 2012 in the *Journal of High Energy Physics* – he was the only undergraduate author on any CMS [Compact Muon Solenoid, one of the key Higgs detectors at CERN] publication that year, and one of very very few undergraduates on any CMS publication ever."

Jon's research "has the potential to revolutionize high energy physics analysis… This result is exciting, and the potential impact is enormous, and I can honestly say that I could not imagine any of my previous undergraduates being capable of achieving such a result."

Jon is "making true intellectual contributions… his communication skills are superior to many graduate students."

"Jonathan is one of the best, probably the best… I have never had a student perform this well, and the sample includes students who have gone to the strongest graduate programs in the country… And Jonathan was one of the youngest students I have ever had in this course… He is a natural leader, not desiring the role but commanding respect and injecting seemingly inexhaustible enthusiasm."

Jon is actively engaged in tutoring and encouraging children, particularly underserved communities and girls, to study science and engineering. Among his hobbies is calligraphy. He looks forward to a PhD in experimental physics and seeks to use machine learning to help high energy physics experiments.

Hannah Wayment-Steele

Hometown: Flagstaff, Arizona
Institution: Pomona (BA, Chemistry and Applied Mathematics)
To study: MPhil, Theoretical Chemistry, Department of Chemistry

Hannah will work with Dr. Daan Frenkel to create computer simulations in order to understand better the self-assembly process in novel DNA nanostructures. This technology has tremendous potential for targeted drug delivery, nanoscale measurements, and scaffolds for nanoelectronics. It is fitting that at Cambridge where Watson and Crick first discovered the double helix structure of DNA, Hannah will continue to probe the secrets of the molecule, albeit as it applies to self-assembling nanomaterials.

In Hannah's first year at Pomona College, she learned an important lesson about how nanomaterials can improve human life when she researched sensitized solar cells that imitate natural pathways, which can contribute to the development of cleaner solar technology. Her interests then led her to write to a research team in Gothenburg, Sweden, that promptly invited her to join them. A Goldwater Scholar and a Beckman Scholar, Hannah has won awards for her performance in physics, for her poster at the American Chemical Society National Meeting, and became a member of Sigma Xi as a Junior.

Comments by professors and mentors:

"Starting out as a first year student… she quickly moved into being the 'go-to' person in the lab. In fact, in talking to some of the other student researchers in that lab, their progress was often stymied until they could discuss it with Hannah to determine the next steps to take. They would try to contact her while she was in Sweden!"

"Hannah has also been a consistent leader in the lab, in coursework, and in departmental service. She has helped train several younger students… Most notably, she has assisted in hosting several visitors… Faculty typically host these seminars, and Hannah was the first undergraduate who I have seen host one."

"Hannah tops it with respect to research productivity, innovation, and dedication… By the time she leaves Pomona College, she will likely have produced close to what a typical PhD student produces with respect to the volume of research and the number of publications."

With a minor in music, Hannah has performed on the piano in the United States and in Europe. In addition, she plays on the volleyball team and is co-president of the Food Science Club. Hannah intends to pursue a PhD in theoretical chemistry or chemical physics and would like to be on the forefront of research in computational biological nanomaterials.

David Zoltowski

Hometown: West Lafayette, Indiana
Institution: Michigan State (BS, Electrical Engineering)
To study: MPhil, Information Engineering, Department of Engineering

Many of this year's Churchill Scholars have interests in machine learning, but David is the only one who will join the Machine Learning Group. His main interest is the brain, and he will look at EEG and fMRI data using machine learning tools in order to gain insight into brain organization and function. He hopes to apply this analytical technique to better understand autism, and he looks forward to working with specialists in neuroscience and autism from other departments in Cambridge through the Autism Research Centre.

David finds machine learning to be a promising tool to explore dynamic functional connectivity networks in typical brains and autistic brains. He is a Goldwater Scholar and was elected Tau Beta Pi as a Junior. He took part in an NSF REU in the Department of Computer and Electrical Engineering at the University of Minnesota and has a number of first-author scientific publications. He has a perfect 4.0 GPA.

Comments by professors and mentors:

"David is possibly the most capable, dedicated, and focused student I have known in my 14 years as a professor."

"I recruited David to serve as the grader for [a senior-level course]… despite the fact that he had never taken the course and was only a 2nd-year student."

"I have been submitting recommendations for years and waiting for that special student that I could, with all confidence, mark in the 'Truly Exceptional', best of the best, category. This is the guy!"

"I decided to present him with a research challenge that is usually reserved for advanced graduate students. David embraced the challenge! … He developed state-of-the-art algorithms."

"David Zoltowski is the most impressive student – undergraduate or graduate – that I have encountered in my 12 years on the faculty… David accomplishes more in a day than many of his peers do before they even wake up."

David is the captain of the Michigan State Swimming and Diving Team, twice named an Academic All-Big Ten, and a Big Ten Distinguished Scholar. He is a youth mentor and volunteers for local charities and for children with disabilities. He intends to pursue a PhD in engineering while continuing his focus on the brain.