

MARSHALL SCHOLARSHIPS 2015

APPLICATION FORM

Before completing the application the candidate is advised to consider the objectives of the Marshall Scholarship Programme (see opening paragraph of the Rules for Candidates) and to be aware that the selection committees are seeking candidates who have the potential to excel as scholars, leaders and as contributors to improved UK-US understanding. All candidates should read the notes for completing the form and the Rules for Candidates 2015.

1 Personal Details

First name/s: Tyler Carter

Last name: Shimko

Contact Address:



Country: United States

Telephone number:

Fax number:

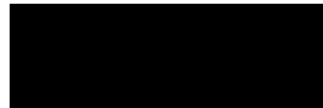
Email address:

Date of Birth (dd/mm/yyyy):

Gender:

☒ Male ☐ Female

Permanent Address:



Country: United States

Telephone number:

Fax number:

Is this your parents' address? Yes

Date of Acquisition of US Citizenship and previous citizenship if applicable:

2 Education

Please give details of your **University/College** education.

If you have not yet obtained the qualification please give GPA to date.

Name of Institution	Degree sought/ Obtained (eg BA, BS, MA)	Major/Minor	Cumulative GPA	Date of Graduation* (*or predicted date)
University of Utah	HBS	Biology/Chemistry	3.89	May 2015

If at present you are working for a degree please list the courses being taken in 2014/2015.
Human Evolutionary Genetics, Independent Research, Drones and Society,
Imagined Communities, Cell Lab, Ecology and Evolution, Microbial Biology,
Honors Thesis, Energy & Sustainability

Have you submitted an application to any graduate school in the US ? Yes: ☒ No: ☐

If yes, please give details of current status of application

In preparation, to be submitted at the beginning of December.

3 Proposed Programme of Study

Please give details of your proposed course of study in Britain and your choices of University.

Year 1

Name of Institution *	Degree Sought (eg MA, MPhil, 2nd BA)	Title of Course / Research	Taught or Research	length of course (1yr or 2yrs)
1. University of Cambridge	MPhil taught	Computational Biology	Taught	1
2. Imperial College London	MSc taught	Bioinformatics and Theoretical Systems Biology	Taught	1

** If your first choice of University of Cambridge, London School of Economics, or Oxford, none of these universities may be given as a second choice.*

Have you submitted an independent application to any British University? Yes: ☒ No: ☐

If yes, please give details including current status of application.

Under review

If you are applying for a creative or performing arts course, have you arranged or had an audition / interview for your chosen institution? Yes: ☐ No: ☒

If yes, please give details.

4 Employment Details

Employment. Please give brief details of employment record to date.

Undergraduate Researcher (Andersen lab, Northwestern University, 40-50 hrs/week) - May 2014 to Aug 2014 - Designed and built software to process data from COPAS large-particle flow cytometers and investigated the genetics of complex traits through the analysis of genetic linkage mapping data from previous summer

Undergraduate Researcher (Andersen lab, Northwestern University, 40-50 hrs/week) - May 2013 to Aug 2013 - Constructed high-throughput phenotyping pipeline for use in genetic linkage mapping studies with *C. elegans*

Undergraduate Research Advisor (Office of Undergraduate Research, University of Utah, 5-10 hrs/week) - Jan 2013 to May 2013 - Helped fellow undergraduates find research opportunities on campus and begin involvement in research projects

Undergraduate Researcher (Kruglyak lab, Princeton University, 40-50 hrs/week) - May 2012 to Aug 2012 - Constructed *C. elegans* strains used to investigate the roles of genomic regions on chemical resistance

Undergraduate Researcher (Jorgensen lab, University of Utah, 10-20 hrs/week) - Jan 2012 to May 2012 - Constructed universal transgene landing sites

Practical Experience other than current employment (including details of any publications with full citations).

Undergraduate Researcher (Stanfield lab, University of Utah, volunteer 20-25 hrs/week) - Sep 2014 to Present - Analyzed genomic sequence data and identified novel genetic variants

Undergraduate Researcher (Stanfield lab, University of Utah, volunteer 20-25 hrs/week) - Sep 2013 to May 2014 - Genetically mapped mutations affecting sperm activation in *C. elegans*

Undergraduate Researcher (Jorgensen lab, University of Utah, volunteer 10-20 hrs/week) - Sep 2012 to May 2013 - Investigated synaptic vesicle recycling

Undergraduate Researcher (Jorgensen lab, University of Utah, volunteer 10-20 hrs/week) - Sep 2011 to Dec 2011 - Constructed universal transgene landing sites

Publications:

T.C. Shimko and E.C. Andersen (2014) COPASutils: an R package for reading, processing, and visualizing data from COPAS large-particle flow cytometers. PLOS ONE. (Accepted)

E.C. Andersen, T.C. Shimko, J.R. Crissman, R. Ghosh, J.P. Gerke, H.S. Seidel, and L. Kruglyak (2014) A powerful new quantitative genetics platform, combining *C. elegans* high-throughput fitness assays with a large collection of recombinant strains. (In preparation)

5 Letters of Recommendation

Preferred Recommender

Name: Dr. Erik Andersen
Position: Assistant Professor
Institution: Northwestern University
Address: [REDACTED]
Evanston
Illinois
United States
Telephone: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]

Second Recommender

Name: Dr. Gillian Stanfield
Position: Assistant Professor
Institution: University of Utah
Address: [REDACTED]
Salt Lake City
Utah
United States
Telephone: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]

Third Recommender

Name: Dr. Leonid Kruglyak
Position: Professor of Human Genetics and
Biological Chemistry
Institution: University of California, Los
Angeles
Address: [REDACTED]
[REDACTED]
Los Angeles
California
United States
Telephone: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]

Fourth Recommender

Name: Dr. Erik Jorgensen
Position: Professor
Institution: University of Utah
Address: [REDACTED]
Salt Lake City
Utah
United States
Telephone: [REDACTED]
Fax: [REDACTED]
Email: [REDACTED]

6 Personal Information

Please give information about personal interests and non-academic activities. In particular please include information on any leadership roles you have undertaken.

Department of Biology Student Advisory Committee Member (Fall 2014-Present) - Reviewed faculty for retention, promotion, and/or tenure based on personal interviews and classroom feedback as well as managed dispersal of department-allocated funds from student government.

Undergraduate Research Ambassador, Undergraduate Research Opportunities Program (August 2012-Present) - Presented on research opportunities to various student groups and classes at the University of Utah as well as to high school students on outreach days.

Intramural Football Team Captain (August 2011-October 2013, 3 fall leagues and 1 spring league) - Responsible for organizing team communications and maintaining orderly and sportsmanlike conduct on the field.

PLoS Student Blog Regular Contributor (February 2013-Present) - Responsible for writing ~2 articles/semester on topics related to science (broad-sense), biology, or the role of science in society.

Data Analyst for Fossil Free U Student Group (August 2012-August 2013) - Assembled and analyzed a survey to determine student sentiment toward the notion of divestment of the school's endowment from the top 200 fossil fuel companies, organized presentation to student government leaders

Please give information about previous foreign travel, if any.

Canada (vacation, various dates)
Bahamas (vacation, 2003)

Please list languages, other than English, in which you have proficiency, if any.

None

7 Other Awards

Please list college or university grants, prizes, medals etc won, including those which would provide funds during the tenure of the Marshall Scholarship now being applied for.

Full Resident/Half Non-Resident Partial Tuition Waiver Scholarship
(Merit-Based) - Fall 2012 to Spring 2015

Barry Goldwater Scholarship (Nationally Competitive, Research-Based) - Fall 2013 to Spring 2015 - Awarded as a sophomore

Myriad Academic Excellence Scholarship (Merit-Based, College of Science) - Fall 2014 to Spring 2015

University of Utah College of Science Dean's Scholarship (Merit-Based, College of Science) - Fall 2013 to Spring 2014

Theodore Verender Hanks Scholarship (Merit-Based, College of Science) - Fall 2013 to Spring 2014

Dean's List - Fall 2011 to Spring 2014

Undergraduate Research Opportunities Program Assistantship (Research-Based) - Spring 2012

Full Resident Partial Tuition Waiver Scholarship (Merit-Based) - Fall 2011 to Spring 2012

List applications made, or intended to be made, for other Scholarships tenable in Britain.

Gates Cambridge Scholarship
Churchill Scholarship

This should be a short statement (NOT MORE THAN 1000 WORDS).
Candidates should describe his/her academic and other interests and pursuits.

Name of Candidate: Tyler Carter Shimko

Though I have pursued research in genetics in great depth, my appetite for discovery is nearly insatiable. Genomic research presents both prodigious opportunities and daunting challenges. Analyses of sequence data and the utilization of sequence-driven experimentation offer a glimpse into a promising future, in which biological research is streamlined, dead ends are minimized, and mechanisms of disease and drug functionality are more rapidly elucidated. I have realized the potential of genomic research in my work mapping complex traits to causal genes in the nematode *Caenorhabditis elegans* (*C. elegans*) and would like to build a career expanding our knowledge of genomics.

Over the past three summers, I have had the opportunity to explore how genetic variation dictates the way in which organisms respond to their environment. In the lab of Dr. Erik Andersen at Northwestern University, I sought to determine the ways in which the genetic variation present in the worldwide population of the model nematode *C. elegans* affects responses to different chemicals, including herbicides, pesticides, chemotherapeutics, and anthelmintics, compounds used to treat infections of parasitic nematodes. In Dr. Andersen's lab, I first recognized the importance of computation and statistics in the future of biological research. While at Northwestern, I helped to construct and optimize a high-throughput screening technique that allows us to measure the effects of the aforementioned compounds in ways indeterminable by eye. I then designed and built statistical software to clean and process the data from our screening experiments and run statistical procedures to correlate the physiological effects with known differences in DNA sequence, a process known as mapping. In addition to deepening our knowledge of the genetic underpinnings of complex traits, the results of this research could have implications for improving how parasitic nematode infections are treated in agriculture and human disease, improving the efficacy or reducing the side-effects of chemotherapy, or transforming the way we judge ecological effects of pesticides and herbicides.

As a scientist, I plan to make fundamental contributions to the academic practice of science and translate my research to medically relevant applications in industry. Statistical and computational techniques will advance our understanding of genomics, specifically with respect the interplay between our genes and the environment. In the future, I hope to found a company to apply this understanding of genomics to the diagnosis and treatment of human disease. The natural genetic variation present in the human population influences the degree to which each individual is susceptible to specific diseases or responds to medical treatment, like *C. elegans*. Further training and collaboration with individuals in the medical and pharmaceutical sciences will allow me to make strides in personalized genomic medicine backed by the most rigorous, open, and transparent science. Founding an independent company will afford me greater freedom than the traditional academic, whose work is strongly tied to the fluctuations in government funding. I look forward to demonstrating that independent science can be as valid as academic science and produce results that can be translated from model organisms to new treatments and diagnostic tools at a more rapid pace than previously thought. Through this endeavor, I will maintain my commitment to openness, releasing manuscripts, software, and data under licenses which not only permit but also encourage their free reuse and modification. My experience in the Computational Biology degree program at the University of Cambridge will be integral to achieving these goals.

At the University of Cambridge I will take courses in the most advanced statistical and computational techniques in modern genomic research. I am

eager to learn how to gather and utilize genomic data, at scale, to recognize genetic patterns such as those associated with disease. During the internship component of the degree, I hope to work closely with both academic and industry scientists to apply what I have learned to a project that will incorporate my research interests into potential medical applications without sacrificing accuracy, transparency, or high scientific standards.

Given recent advancements in sequencing technologies and interpretation of genomic data, it is clear that in the future our genetic material will play a role in the treatment of disease. Understandably, there will be those who fear the potential for these data to be used prejudicially. It is my responsibility as a scientist to translate my knowledge to the general public, facilitating the incorporation of genomics into medicine while considering its related social implications. It is important that as a society we consider the impacts, good and bad, of genomic information carefully before implementing regulations governing its role. Recently, I have taken to writing about science in a public forum to help open a dialog between the scientific community and the greater public. I encourage my fellow students and researches to partake in similar outreach activities, as I have found writing for a general audience to be immensely rewarding, opening my eyes to issues and concerns that I had never given much thought.

In the spring of 2013, I joined the writing team at The Student Blog of the Public Library of Science (PLOS) and found that my values as a budding researcher aligned well with those of the team at PLOS, an organization that prioritizes open and easy access to scientific research for both researchers and the public. In my writing for the blog, I make use of my expertise in the field of biology to explain the fundamental workings of the scientific method to a general audience. The feedback I have received on my writing has been tremendously helpful in sculpting my view of science as avenue to help people and better understand the world around us. I plan to continue developing my scientific communication skills so as to have an impact on the improvement of scientific literacy, a goal that will assuredly benefit not only scientists but also the general public. Through research, collaboration, and communication, scientists can drive the world in a positive direction. My work will be a part of that force.

Signature

Date

MARSHALL SCHOLARSHIPS 2015

PROPOSED ACADEMIC PROGRAMME

Candidates should describe below their proposed academic programme, giving reasons for their choice of course and preferred university. Those hoping to read for a research degree should give an outline proposal of the research they wish to undertake.

Name of Candidate: Tyler Carter Shimko

I plan to pursue an MPhil in Computational Biology at the University of Cambridge. The Computational Biology degree is an intense one-year program that will strengthen my budding skills in the computational and statistical aspects of modern biology. The coursework that I have completed in biology thus far has been grounded in the more classical approach to the subject, focusing mainly on the its theoretical and mechanical features and less on the role of statistics and computation. At Cambridge, my peers and I will receive direct instruction on the theory and practice of biology from a computational standpoint. Since students in Computational Biology matriculate through the taught portion of the program in unison, they have the opportunity to learn from each other's strengths. This opportunity is important because of the inherently collaborative nature of computational fields of study. By proceeding through the program as a cohort, students involved in the program stand the greatest chance of mastering the material and creating tools that are useful to the larger research community. The Computational Biology program at the University of Cambridge will help me fully develop my computational skills before undertaking a PhD.

The internship component of the Computational Biology program will allow me to apply my computational skill set in real-world research, working closely with academic and industry scientists. My research thus far has only given me sporadic opportunities to utilize my computational skills. At Cambridge, I will have access to scientists and projects not only at the university, but also at the Wellcome Trust's Sanger Institute and in Cambridge's blossoming biotech community. During my internship I will seek out a project with interest both to the university and to local industry. For instance, the University of Cambridge has an entire institute devoted to studying the biology of stem cells. Moreover, the Cambridge-based research and development branch of the pharmaceutical company Pfizer recently launched the company's first clinical trial for the use of stem cells in the treatment of ulcerative colitis. By identifying research opportunities in fields with a great deal of translational interest, I will be able work closely with scientists in academia and in industry to make my research both scientifically rigorous and medically applicable.

If I should not be able to take part in the Computational Biology Program at the University of Cambridge, I believe that the MSc in Bioinformatics and Theoretical Systems Biology at Imperial College London would provide me with an equally valuable opportunity to develop computational skills. Like the Computational Biology program at Cambridge, the MSc at Imperial College London provides a period of intense classroom preparation in the development of computational tools and the theory of mathematical and statistical biology. Students in the program then participate in three independent research projects which develop their practical skills as programmers, statisticians, and biologists. The program at Imperial College would also allow me to develop the skills necessary not only in theory in the classroom, but in reality when solving practical problems in the laboratory.

Signature

Date

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AMBASSADORIAL POTENTIAL

Candidates should describe what "the USA-UK special relationship means. They should also describe how they might strengthen ties between the USA and the UK in their field of study and through their extra-curricular activities, whilst in the UK and upon their return to the US.

Name of Candidate: Tyler Carter Shimko

The field of genetics draws many of its seminal figures from the US and the UK. For instance, the race to define the structure of deoxyribonucleic acid (DNA) took place between two research groups: a group at the California Institute of Technology and a group at the University of Cambridge. Ultimately, the Cambridge team, consisting of James Watson, an American, and Francis Crick, an Englishman, succeeded in publishing the molecular structure of DNA. Through my studies and extracurricular activities in the UK, I hope to add to the legacy of collaboration and friendly competition that has defined the USA-UK relationship.

My time in the UK will define and solidify many of my long-term goals and relationships as both a scientist and a person. On a daily basis, I will be interacting with leaders in the fields of genetics, bioinformatics, statistics, and computer programming, allowing me to forge lifelong relationships that will be as strong as they are fruitful. In my career as a scientist, I will be able to draw upon these relationships to initiate scientific collaborations. In addition, the nascent biotech startup scenes of Cambridge and London, with only a short train ride between the two, will provide me with a connection to applied research that may be otherwise difficult to obtain. The classroom instruction and internship components of my programs of interest will provide the opportunity to learn the skills necessary to be a truly exceptional biologist. Moreover, my experience interacting with individuals involved in the industrial applications of biological research will give me the training to make my research medically applicable.

While my focus will be primarily academic, I will also take advantage of the extracurricular activities that the UK has to offer. As an avid fan of and participant in American football, I have always been intrigued by the sport of rugby, given its resemblance to the game that I know and love. In my time in the UK, I plan to participate in the sport of rugby, learning its rules and understanding its nuances, both as a fan and as a player. Unfortunately, I have not had the opportunity to participate to any extent in rugby while in the US, given the sport's low, albeit rising popularity. In the UK, I will get to experience the sport on a professional level by attending Aviva Premiership games in London and on an amateur level competing in intramural rugby at the university. In the UK I will build meaningful relationships through both science and sport that will endure well past my tenure there. These relationships will undoubtedly progress the fields of genetics and bioinformatics through new-found collaborations and promote a sense of camaraderie and friendly competition between individuals on both sides of the Atlantic.

Signature

Date

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POST SCHOLARSHIP PLAN

Candidates should describe their immediate plans upon completion of their Marshall Scholarship and why one year spent undertaking a degree in the UK would enhance these plans. As well as describing plans for employment or further study, candidates should indicate how they would develop ongoing connections with the UK, through their UK institution or some other contacts they propose to make while in the UK. In addition they should demonstrate how they intend to fulfil the Marshall Scholarships' objective of becoming ambassadors/representatives for the USA in the UK and vice versa thus strengthening British American understanding.

Name of Candidate: Tyler Carter Shimko

Following the completion of the Marshall Scholarship, I intend to directly enter a PhD program in genetics. A PhD largely focused on understanding genetics and genomics from a computational perspective will provide me with the training and experience necessary to make an impact on the problems facing our understanding of heredity and disease. During the PhD program, I will take what I have learned in my experience at Cambridge and apply it to a much longer independent research project. Whereas my experience completing an MPhil will provide me with an extensive introduction to the techniques and tools available to tackle problems in genetics, a PhD will afford me the opportunity to conduct in-depth research that will translate exceptionally well to either academic or industrial applications. Due to both its depth and speed, the Computational Biology program at the University of Cambridge is unlike any other program in the world. Over the relatively short time period of one year, I will be able to develop and strengthen skills that would otherwise be gathered piecemeal over the course of a five to seven year long PhD program. While long-term independent research is my ultimate goal, I believe the skills I develop while in the UK will allow me to make an impact more rapidly than would otherwise have been possible.

I anticipate that the internship component of the MPhil program will act as a springboard into my future education. During this period, I hope to work on a project that is computationally intensive as well as medically relevant. My participation in the internship component of the course will help me identify and participate in meaningful projects as a PhD student. I will already have overcome many of the challenges facing intermediate programmers during this time and, because of this, will be able to overcome obstacles more easily during my doctoral studies. My research will benefit greatly from this increased efficiency.

During my PhD program and beyond, I plan to attend major research conferences that take place each year in the US and the UK. These gatherings will allow me to keep in touch with individuals with whom I work and study in the UK as well as introduce my American colleagues to the best researchers and techniques from the UK. As the sciences become more specialized, these connections will prove to be more fruitful. In the past, focusing one's research on the broad area of "genetics" would sufficiently contribute to the greater scientific community. However, recent specialization has made connections and scientific networks ever more important. By having colleagues on both sides of the Atlantic, my research and the research of my colleagues will benefit from scientists in very specialized fields serving as collaborators. My experience in the UK combined with my participation in international events within the scientific community will help to forge a stronger union between scientists of the two nations.

Signature

Date

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FUTURE CAREER AIMS

Candidates should briefly comment on their future career aims

Name of Candidate: Tyler Carter Shimko

I plan to complete a PhD program in genetics with a strong focus on computation and statistics. Following the completion of my PhD, I plan to first pursue a position as an academic scientist. An academic position will both afford me a close-knit yet open scientific community as well as immerse me in an environment where scientific rigor is paramount. I will then seek to form a startup company to translate my research to medically relevant applications. In the long run, I envision that my career will span the realms of academic and industrial science.

Signature

Date
