**Fulbright Program Information**

**Award Type**: Study/Research Award

**Country**: United Kingdom

**Award**: University of Nottingham Award

**Program:** Additive Manufacturing and 3D Printing MSc

Field of Study

**Engineering**

Project Title

Enter a descriptive Project Title. If awarded a grant, this Project Title will appear in the Grantee Directory.  
90 character limit.

**Additive Manufacturing and 3D Printing**

Abstract/Summary of Proposal

Prepare an executive summary detailing the what, where, and why of your proposed project․ If you are proposing the pursuit of a graduate degree program, summarize the program and relevance to your career/education plans․  
*200 word limit.*

It is rare to play a role in the disruption to the biggest, and even oldest industry in the world, manufacturing. The University of Nottingham, notorious for its world-leading research, hosts the most prestigious masters in additive manufacturing and 3D printing. Not only will the program teach me advanced skills and knowledge in 3D printing, but it will allow me to look forward and play a role in the future of the technology. From learning first-hand, additive manufacturing, which is the process of building up designed computer parts layer by layer, offers a company the ability to manufacture parts otherwise impossible to create outside of a computer screen. The aerospace industry, which is well known for complex parts and mind-bending challenges, has been able to use this tech, although still infantile to its potential, to improve performance and manufacturability of some of the most complex parts in the world including rocket engine nozzles and injectors. The connections between accelerating the path to make humans a multi-planetary species and the opportunity for advanced additive manufacturing to play a role is not only tantalizing but drives me to develop the skills to make a significant difference.

Host Country Engagement

A key purpose of the Fulbright program is to be a cultural ambassador while living abroad.  How will you engage outside of the workplace to fulfill this mission?  In what ways do you plan to share your culture and values in your host community?  Provide specific ideas.  
*200 word limit.*

I had the privilege of starting a local Students for the Exploration and Development of Space (SEDS) chapter at my university, dedicated to allowing students passionate about the aerospace industry work together to support learning, outreach and professional networking. The community that can be built and the cultural exchange and appreciation that a SEDS chapter can foster is a fundamental reason I would like to see the start of a chapter at the University of Nottingham, continuing the naturally supportive and accepting culture that has been the aerospace industry. I also plan to participate in current initiatives at the University, including Code Club, an outreach program instilling the power and future of code and computers to young students in the area. Although I am an engineer, coding is the neckbone to make modern machines function correctly. To get introduced to the language of computers and systems early will let young students be exposed to a blossoming field in the tech industry. The last thing I would like to actively participate and assist in is local makerspaces, as that is what can help so many people in a community imagine, design and build their own work locally.

*The reason for wanting to work with additive manufacturing, and its direct connection to the aerospace sector, is that it progresses the most cosmopolitan future-industries in the world, which is what is directly above you. In fact, it is the only physical location that is the same distance away from everyone, just 100 kilometers above everyone’s head. I plan to bring the exact experiences I had growing up that made me intrigued in space and engineering to the UK, with model rocket design and launching, and tinkering at local makerspaces.*

Plans Upon Return to the U.S.

Describe your career and/or educational plans after completing a Fulbright grant.  
100 word limit.

STATEMENT OF GRANT PURPOSE  
Charlie Nitschelm, United Kingdom, Engineering  
Additive Manufacturing and 3D Printing

Computer aided design has enabled engineers around the world with the ability to create systems that can quite literally increase the standard of living of billions. The problem is that these systems are just computer files, and they need to be made in real life to make a difference. Since the beginning of 20th century manufacturing, engineers have been tied down with manufacturing limitations, like no internal features and part fixturing. But additive manufacturing, which is the process of building up designed computer parts layer by layer, offers the ability to manufacture parts otherwise impossible to create outside of a computer screen. A good way to conceptualize this new field of additive manufacturing is picturing yourself assembling your favorite burger. You start with the bottom bun, then the patty, the cheese, lettuce and so on. Additive is much the same, you build a part one layer at a time. But, if you forget the essential patty and try to place the cheese, it will fall on top of the bottom bun, and the whole meal is ruined! In terms of additive, a build, which can be a superalloy rocket nozzle, or a plastic ring for a toddler, was designed to be placed on a plate one layer at a time in a very specific order and process, so if one setting or sequence is off, the entire burger, I mean part, is ruined. The entire compromise that engineers and machinists have shared for nearly 100 years has fizzled into the ability to create systems that were otherwise an engineer’s dream. I am applying for a Fulbright-funded masters in additive manufacturing and 3D printing from the University of Nottingham to gain deep insights in the future of additive technologies to make an engineer’s dream leave his screen and help the world, one layer at a time.

The University of Nottingham is a strong community that cultivates their work with state-of-the-art research facilities and leading the world in many subject areas, including additive manufacturing and 3D printing. I plan to apply the knowledge and skills I learn from this program to the aerospace industry, the current leader in utilizing additive manufacturing for many flight parts. Much of my experience so far in additive processes has been working with a direct metal laser sintering (DMLS) printer that produces all the Electron’s engine’s thrust chambers, Rocket Lab’s small satellite rocket. The thrust chamber’s nozzle in every modern rocket has been redesigned to improve its performance made directly possible by the introduction of metal additive manufacturing. It was the first industry that could literally bring a propulsion engineers wet dream to life with the implementation of complex internal features that could actively cool the nozzle’s wall, greatly reducing the overall mass of the engine and increasing its overall performance. It can not be understated the impact this process can have in industries around the world, but an immense amount of engineering problems is still out there to be solved to reduce cost, increase print speed, and improve quality of every part coming out of a 3D printing machine. The process of quick prototyping, plastics or metals, has been improved everywhere, specifically the plastics printers that can now be bought as a reasonable birthday present to a very lucky child. I am not only excited to live during a time of such innovation in additive manufacturing but am tantalized by the opportunity to take part in the world-wide movement.

A well-rounded educational background in mechanical engineering, research in Inconel, a common 3D printed superalloy, and hands-on additive and advanced manufacturing work as an intern at Rocket Lab in Los Angeles, California has equipped me with the ability to be successful in pursuit of this specific advanced engineering degree.

I have also had the honor to work with Paul Parkin, the current Director of Production at Rocket Lab and UK native. He could not speak more highly about his upbringing in the UK, and his excitement for me to experience UK culture and community as he has. Just browsing the community outreach that is currently active at the University of Nottingham was inspiring, especially Code Club, an outreach program committed to educating young students on the power and future of coding and computers which I plan to volunteer at.

**NOTES:**

Eight libraries - George Green Library is a new one, looks amazing

Reputation for transformative research, make real impacts in the world

Combining beautiful parkland and countryside, impressive traditional and modern architecture, along with cutting-edge learning and research facilities, our award-winning campuses are inspiring places to live, work and study. A compact, vibrant and cosmopolitan city, Nottingham is a mix of modern and historic, quirky and mainstream, with a thriving cultural scene. Home to the world-class University of Nottingham, it is a culturally diverse and thriving city with a strong sense of community.

Music scene Nottingham’s music venues include something for everyone. The legendary Rock City hosts top rock and indie acts, the Motorpoint Arena attracts nationwide music and comedy tours, while venues such as Rescue Rooms and the Bodega Social Club showcase the latest alternative acts. The Royal Concert Hall at the Theatre Royal also hosts opera and classical concerts.

Entrepreneurial skills development Among Europe’s leading centres for enterprise education, The Haydn Green Institute provides an outstanding programme of education with the aim of developing the innovators and entrepreneurs of the future. Students and alumni are nurtured through The Ingenuity Lab, where members gain access to business mentors and free advice surgeries relating to finance, marketing, sales, intellectual property and legal issues. Student-led enterprise Nottingham Entrepreneurs is one of the University’s most ambitious societies, aiming to provide an inspiring community for students and support those looking to launch their own ventures. The University is also home to student-led organisation Enactus Nottingham, which aims to improve livelihoods by setting up and running enterprises in the UK and abroad. In 2016, the Nottingham team represented the UK at the Enactus World Cup in Toronto, where students from around the world met to showcase the impact of their entrepreneurship.

Code Club – one hour a week, inspire the next gen of kids looking to get into computers! Looks great to start with when I get there

Has an internation footprint, with campuses in china and Malaysia,

Huge student engagement, over 300 clubs, lots of participation

Over 100 volunteering opportunities, website is so descriptive and is inspiring

Personal Statement  
Charlie Nitschelm, United Kingdom, Engineering

I recently was able to have a conversation with Alan, the director of engineering at Rocket Lab that focused on my aspirations and goals. He asked me “Charlie, what do you want to do? Say 10 years from now, where are you? Not just physically, but mentally.” Although I had an answer that is relatively broad, talking about the skills I want to obtain, the projects I want to work on as an engineer, and where I want to live, his thoughts on what it would take to reach my goals were different from what I thought. Everyone I will be privileged to work with through my career will be smart, capable, driven people. That is not what dictates what that person will achieve, because no one will ever be smarter then a team. To work collaboratively, innovate as a unit and produce results together will always be stronger then the lone genius. Understanding your fellow coworkers, not specifically in their likes and dislikes but cultural perspective and upbringing will be the deciding factor on how much you can influence the blue dot we call Earth, and even beyond. Being able to work with others, that is what makes a future cultural leader.

I grew up in a small town about an hour north of Boston, Massachusetts in Portsmouth, New Hampshire. I also chose to attend the University of New Hampshire for my undergraduate degree in mechanical engineering, both for convenience in staying close to home, and the affordability of the degree as it is much cheaper than going far away. Although I felt slightly forced to limit my sights to schools in my state, it quickly became my new home. The most defining moment for me, which also was the primary factor of where I am now in my career, was the viewing of SpaceX’s first booster landing in the ocean after a suborbital flight. Once I saw that, I immediately knew what I wanted to work towards during my studies. I wanted to help the initiative to open the space frontier and make humans a multi-planetary species. I decided during my first year at the university to start a local Students for the Exploration and Development of Space (SEDS) chapter, where we specialize in rockets, hybrid engine design and community outreach. The community I have formed over the past two years with SEDS has given me the opportunity to work with like-minded engineers to learn complex topics in rocket design, but everyone in SEDS (and the clear majority at UNH) are white, New England natives. I had a childhood and now a higher education degree that has not given me the experience that Alan talked so strongly of. I now know it is critical to have that cultural experience to understand the people of the world, not just white New England.