

NOTES FROM DOWN UNDER: SOME THOUGHTS FROM A FULBRIGHT DISTINGUISHED CHAIR IN AUSTRALIA

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ABSTRACT

As part of the Australian Department of Defense, the Defense Science and Technology Group provides science and technology support to safeguard Australia and its national interests. In this paper, I hope to share not only my thoughts on those experiences and how they affected my professional career, but also to impart some insights regarding the overall experience for the benefit of future Fulbright Scholars. This paper is an extended version of the reflection article appearing on the Fulbright Australia website at <https://www.fulbright.org.au/news-and-events/2020/02/>

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ON TO AUSTRALIA

When I first learned of my acceptance into the Fulbright program as a Distinguished Chair I was thrilled! Amazed! Astounded even! And in Australia! Wow! Of course, eventually the reality of all that was required to make The Move set in. However, throughout those hectic few months leading up to the beginning of my program with the Defense and Science Group (DST) in Melbourne, Australia, there was always a pretty steady level of excitement simmering below the surface. Not only will I have the opportunity to work on an important technical project, but also, as a Distinguished Chair, there will be the opportunity to travel in Australia and visit with colleagues and meet with members of the general public to discuss my research project as well as other contemporary scientific and technical issues.

As part of the Australian Department of Defense, the DST provides science and technology support to safeguard Australia and its national interests. It is Australia's second largest government-funded science organization, with establishments in all Australian states and the Capital Territory. Members of DST collaborate with science and technology colleagues around the world to strengthen each other's defense technology base and also work closely with Australian industry and universities to enhance that country's defense capability.

Beginning in 2013, DST's organizational structure consisted of three Corporate Divisions (the Science Strategy and Program Division, the Science Partnerships and Engagement Division, and the Research Services Division) and seven Research Divisions (Maritime Division, Land Division, Aerospace Division, Joint and Operations Analysis Division, National Security and Intelligence, Surveillance and Reconnaissance Division, Cyber and Electronic Warfare Division, and Weapons and Combat Systems Division). In that regard, DST is quite different from U.S. defense research organizations. In the U.S. there is, in effect, a DST for every military branch. The Office of Naval Research, for example, is focused on maritime research; the Army Research Lab and the Air Force Office of Scientific Research on matters that their names imply. Having all experts in all defense-related areas under one umbrella organization can work to create any number of synergistic opportunities – maritime researchers can easily call on the help of land domain scientists, who are either just one or two floors away, or sometimes just down the hallway.

And so, having learned in February 2018 of my appointment as a Distinguished Chair at DST, my wife and I spent the next ten months preparing for what we were sure was going to be the adventure of a lifetime. Needless to say, we were not disappointed.

THE RESEARCH COMPONENT

My original research proposal targeted the development of mathematical models to more accurately predict how structures and other systems (e.g. armored vehicles, medical supply trucks, etc.) can withstand a physical attack. Following my arrival in Melbourne, the focus of my work soon zeroed in on attacks against land vehicles by small caliber arms fire. The results of my work will now allow DST researchers to better predict the response of different kinds of armored vehicles to various types of physical attack.

My time at DST also allowed me to branch out and use my expertise in spacecraft protective system design from the previous 30 years of my professional career in a different area, which was a lot of fun. It allowed me to flex my intellectual muscles a bit! The question in my mind was, "Could the research people did in years past be applied to Land Division's problems of interest?" My thinking was that it would be great to be able to use equations and engineering models of structural impact that already exist, without having to spend a lot of time and money developing an entirely new response predictor model.

The answer I eventually arrived at was, YES! ... well, maybe ... well, maybe at least to some extent. Taking established, sometimes decades-old scientific models of how certain types of structures respond to impact, I had to figure out which of them were applicable to land vehicle configurations today. In the end, after just a little bit of tweaking, I was able to find a handful of extant models whose predictions matched pretty well with the test data. I

thought that was pretty cool because many of the materials we use now didn't exist when these models were developed. As it turned out, these models are sufficiently robust so that with a just a few simple modifications we can use them today. To me, that's exciting!

Because you cannot test all materials and all projectiles under all configurations and all impact conditions, the ultimate goal of my work was to hopefully find some models that would be general enough so that they could be continually updated and made applicable to the widest possible set of materials, configurations, impact conditions, etc. The defense scientists and engineers at DST would then hopefully be able to take those models and insert them into their vulnerability and lethality assessments to render those assessments more general and comprehensive.

THE PUBLIC OUTREACH COMPONENT

As a Fulbright Distinguished Chair, I was expected to actively engage my host institutions, as well as other institutions and organizations, promote mutual understanding and share knowledge. As I visited different universities and organizations around Australia, I was surprised and pleased to find that just about all of the Australian people I met continue to hold the U.S. in high regard with respect to its leadership in science, technology, and engineering. It also happened that it was the 50th anniversary of the moon landing while I was in Australia. I was really impressed by the number and variety of commemorative events taking place! Many people told me how proud they were that Australia was a partner with the United States, and was so instrumental in helping to realize that achievement.

Over the six-month-appointment as Distinguished Chair, I was able to give 11 technical and general audience seminars at 10 different locations, including a Black Box Lecture at DST Group, Special Fulbright Lectures at the University of Tasmania, the Australian Maritime College, the Australian Youth Aerospace Association, the RAAF Air Power Development Center, an Open House lecture at Mt. Stromlo Observatory, and seminars at the Swinburne Institute of Technology, Monash University, the University of Melbourne, and University of New South Wales, Canberra.

I also had the opportunity to participate in a live, on-air interview at ABC Radio Hobart in advance of my seminar in Hobart the following day – that was a first for me! I was invited to join a podcast on space debris that was hosted by faculty from Monash University, attended the 7th Annual Australian Space Forum in Adelaide where I met with representatives from the newly formed Australian Space Agency, the CSIRO, and the ANU Space Environments Research Center (SERC). As a result of these outreach efforts,

I significantly expanded my network of professional colleagues in the aerospace industry. I am pleased to report that since my tenure with DST I have stayed in contact with many of them, exploring new ways of collaborating on projects of mutual interest.

GLOBAL INTERACTIONS

All in all, my Fulbright experience left me with a renewed excitement for international collaboration to solve problems of mutual interest. More so than ever before, because of technology, the lives of everyone on this planet are incredibly interconnected. Sometimes this is a good thing – for example, knowledge can be shared almost instantaneously across the globe. If you have a question about something, chances are, someone else has either had the same question or may even have an answer out there for you!

Unfortunately, sometimes this global interconnectivity can lead to unintended consequences – and we end up creating incredibly complex, global problems for ourselves and for our children who, more likely than not, will be the ones having to solve them. These interconnected, global problems cannot be solved by a single group of people or a single country on its own. To be successful at solving these problems, we need to be able to work across borders, across oceans, and across cultures. And, as we work with each other to solve these problems (or perhaps to prevent them from occurring in the first place?), we must remain cognizant that despite these challenges to cooperation, working with cultural differences is vital in developing useful problem solutions. To put it simply, people from different walks of life see problems from different points of view – interdisciplinary teamwork is key to developing innovative solutions to technical problems!

LESSONS LEARNED

My experiences as a Fulbright Distinguished Chair showed me that we all, whether engineers, scientists, faculty, or the citizenry in general, have similar concerns, problems, needs, wants and desires for ourselves, our families, our careers, and our lives. There's a lot of commonality among us.

My experiences as a Fulbright Distinguished Chair showed me that we all, whether engineers, scientists, faculty, or the citizenry in general, have similar concerns, problems, needs, wants and desires for ourselves, our families, our careers, and our lives. There's a lot of commonality among us. We all want to feel secure, warm, fed, and at least content in what we do and where we do it. I think that many of the solutions to the challenges faced by people around the world revolve around realizing that this commonality exists among the people of different nations, especially those that

don't talk so much to each other. I have been lucky enough to experience an incredibly warm and healthy U.S.-Australia relationship, and I can't help but feel it'd be nice if relationships between other countries were just as good.

I am deeply grateful to everyone who worked so hard to get me to Australia, and to everyone at DST and the Australia Fulbright Commission for making me feel so at home.. It was great to be able to walk right into an environment that was as welcoming and friendly as DST and as Melbourne. The only real difficulty I encountered was the delay in getting the right security clearance, which would have increased my ease of travel within the facility. Not having a clearance in place upon my arrival led to the awkward situation of having to be escorted in and out of my building when I arrived, when I wanted to go to the cantina, and when it was time to go home. This was certainly an imposition on my host, even though he was very accommodating and gracious about the whole thing.

I am not sure if it is possible to do so, but in the advertisement for the DST-located Distinguished Chair in Advanced Science and Technology, those topical areas where work would be performed in a facility that would require a clearance of some sort should be identified, and a statement regarding the need for a clearance should be included. This would alert potential U.S. applicants of the need to either already have in place a security clearance that could be transferred to Australia, or to be in a position where a transferable clearance is about to be confirmed. There is simply not enough time to file for and receive a security clearance between notification of acceptance from Fulbright and the start of a Fulbright appointment. To not inform a recipient who does not have a clearance that having one would make the visit logistics work a lot smoother is fair to neither to the scholar nor to the host (who now has to scramble to make alternative plans to provide for the scholar's access).

CONTINUING COLLABORATIONS

Approximately three months into my tenure at DST Group, I was invited to contribute a public lecture and a book chapter to a volume on space debris edited by a Deputy Director in the Air and Space Power Centre (known then as Air Power Development Centre) of the Australian Air Force. Additionally, I was invited to conduct a private tour and deliver a public lecture at the Mount Stromlo Observatory, the headquarters of the Research School of Astronomy and Astrophysics at the Australian National University. Thus began one of several continuing collaborations with Australia., leading to several seminars via Zoom, including the Space Law Council - Australia & New Zealand (known then as Australia & New Zealand Space Law Interest Group), and the Sydney Section of the American Institute of Aeronautics and Astronautics. This continuing collaboration led to a presentation on space debris as part of the Space Law Conference sponsored by the University of Waikato, Hamilton, New Zealand in the Fall of 2021.

Following completion of my Distinguished Chair appointment, I was also lucky enough to be engaged in a follow-on project with my DST host. This project continued to improve the models that I developed, ultimately finding ways to adjust the models so that their correlation with experimental data was even higher. This work resulted in three refereed journal publications and numerous seminars and presentations to interested parties in Australia as well as back home.

Although my Fulbright host left DST for a university appointment, he and I are now planning another project together. This new project will involve machine learning applications to the problem of developing improved protection systems for earth-orbiting spacecraft against the hazards posed by the meteoroid and space debris environment. I am enjoying my continuing collaborations with my new colleagues and friends from Australia and New Zealand, and I am looking forward to further collaborative efforts that will undoubtedly arise as a result of my time and activities Down Under!

NOTES

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Dr. Schonberg at the NASA/CSIRO Deep Space Network Dish Just Outside Canberra, Australia.

BIOGRAPHY

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