Manan Arya

Curriculum Vitæ

Contact Information

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Education

06/2016 **PhD in Space Engineering**
Graduate Aerospace Laboratories
California Institute of Technology, Pasadena, California

06/2012 **Master of Science in Space Engineering**
Graduate Aerospace Laboratories
California Institute of Technology, Pasadena, California

06/2011 **Bachelor of Applied Science in Engineering Science**
Major in Aerospace Engineering
University of Toronto, Ontario, Canada

Experience

08/2016 - present **Technologist**
Jet Propulsion Laboratory
California Institute of Technology

I develop technologies to enable the next generation of deployable spacecraft structures. Currently, I work on both large structures such as starshade and small structures such as antennas for CubeSats.

10/2011 - 06/2016 **Graduate Student**
Supervisor: Professor Sergio Pellegrino
Space Structures Laboratory
California Institute of Technology

I designed novel breakthrough schemes for the packaging and deployment of large, thin space structures such as photovoltaic arrays, solar sails, reflectors, and sunshields. I performed experiments on scale test articles, and developed analytical models to capture observed behavior. I applied these methods for the preliminary design of a large spacecraft for a space solar power station. As a side project, I developed and supervised the fabrication of an engineering model of an optical camera for a mission to demonstrate key technologies for a reconfigurable space telescope.

05/2011 - 08/2011 **Patent Agent's Assistant**
Hill & Schumacher
Toronto

I drafted and prosecuted patents for a variety of clients, both industrial and academic, in the fields of space robotics, polymer chemistry, organometallic chemistry, medical devices, and others. I submitted and prosecuted applications in the United States Patent Office (USPTO), Canadian Intellectual Property Office (CIPO), and the European Patent Office (EPO).

09/2010 - 04/2011 **Undergraduate Thesis**
Supervisor: Professor Chris Damaren
University of Toronto Institute for Aerospace Studies

I examined the dynamics of solar sails, in particular the coupling between the sail membrane dynamics and the attitude control system. I modelled the dynamics of the solar sail, and designed an attitude controller to reduce sail membrane deflections. Numerical simulations demonstrated a fivefold reduction in peak sail deflection during test slew manœuvres.

05/2010 - 09/2010 **Undergraduate Research Student**
Supervisor: Professor Craig A. Steeves
Multifunctional Structures Laboratory
University of Toronto Institute for Aerospace Studies

I analysed the propagation of acoustic waves in three-dimensional periodic lattice structures using finite element methods and Bloch-Floquet principles. I used this analysis to create schemes for the design of lattices with desired acoustic frequency bandgaps. Fur-

ther, I implemented a C++ computer program to perform such analyses for three-dimensional lattices with arbitrary topologies.

05/2009 - 09/2009 **Lab Assistant**
Supervisor: Dr. Reza Emami
University of Toronto Institute for Aerospace Studies

I designed the mechanical system for a mechatronic device intended for patenting and commercialisation. I integrated the mechanical design with the electrical and computer systems of the device. I used CAD tools to model the mechanical system. I also created several working prototypes of the device as proof-of-concepts.

05/2008 - 09/2008 **Research Assistant**
Supervisor: Mr. Steve Engels
Department of Computer Science, University of Toronto

I assisted with the development of a video game design course. I tested software tools for video game design, and evaluated them on the basis of accessibility and usability.

Publications

09/2016 **M. Arya**, N. Lee, and S. Pellegrino, *Crease-free biaxial packaging of thick membranes with slipping folds*, International Journal of Solids and Structures. In Press.

06/2016 **M. Arya**, "Packaging and Deployment of Large Planar Spacecraft Structures", PhD Thesis, California Institute of Technology.

01/2016 **M. Arya**, N. Lee, and S. Pellegrino "Ultralight Structures for Space Solar Power Spacecraft", *3^{rd} AIAA Spacecraft Structures Conference*, January 2016, San Diego CA

01/2015 **M. Arya**, N. Lee, and S. Pellegrino "Wrapping thick membranes with slipping folds", *56^{th} AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, January 2015, Kissimmee FL

01/2014 **M. Arya** and S. Pellegrino "Unfolding mechanics of highly compacted thin membrane structures", *55^{th} AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, January 2014, National Harbor MD

06/2011 **M. Arya** and C.A. Steeves "Bandgaps in octet truss lattices", *23^{rd} Canadian Congress of Applied Mechanics*, June 2011, Vancouver

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Scholarships and Awards

06/2015, 06/2014	Charles D. Babcock Award from GALCIT for contributions in teaching
05/2011	Ontario Graduate Scholarship (declined)
09/2010	John M. Empey Scholarship from the University of Toronto for academic excellence
05/2010	Undergraduate Student Research Award from the National Science and Engineering Research Council
09/2009	Shaw Design Scholarship from the University of Toronto for academic excellence
05/2008 - 05/2011	Dean's Honour List Faculty of Applied Science and Engineering, University of Toronto
09/2007	University of Toronto Scholars Program
09/2007 - 09/2010	Queen Elizabeth II Aiming for the Top Scholarship
05/2007	Governor General's Academic Medal
05/2007	Summa cum laude, International Baccalaureate Program

Teaching Experience

02/2016 - 03/2016 **Instructor**
Space Origami Engineering
Esteban E Torres High School

I developed and taught a five-session course for high school seniors on the mathematics of origami and the application thereof to the engineering of spacecraft structures. Theoretical material was supplemented by hands-on construction of relevant origami and structural models. This activity was sponsored by the Huntington Library.

10/2013 - 06/2015 **Teaching Assistant**
Ae105abc - Aerospace Engineering
California Institute of Technology

I held weekly office hour sessions. I graded homeworks and midterms. I managed the class website. I rectified accidental misunderstandings about course material.

Community Involvement

09/2014 - 06/2016 **Vice President, Secretary**
EXPLiCIT (EXtracurricular PLayers at the California Institute of Technology)
As Vice President, I supported the President. As Secretary, I took notes at meetings and maintained the club Constitution.

07/2012 - 06/2013 **Vice President**
Students for the Exploration and Development of Space (SEDS)
Caltech Chapter

I organized various events relating to space, space exploration and astronomy. The mandate of SEDS is to share our enthusiasm for space with the broader community.

09/2008 - 05/2009 **Secretary, Executive Council**
Innis Residence Council
University of Toronto

I was a member of the executive of the student government of Innis Residence. I was responsible for calling, managing and presiding over council meetings, as well as managing the internal and external communications of the Council.

09/2007 - 05/2008 **Yearbook Editor**
Innis Residence
University of Toronto

I organised and lead a team of 25 individuals to produce a digital yearbook. I was responsible for the overall design, production, marketing and sales of the yearbook.

References

Available upon request

Pasadena, January 23, 2017