Manan Arya

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Employment

2022- Assistant Professor
Department of Aeronautics and Astronautics, Stanford University

2016-2022 Technologist
Jet Propulsion Laboratory, California Institute of Technology

Education

2016 PhD in Space Engineering, California Institute of Technology
Advisor: Professor Sergio Pellegrino

2012 MS in Space Engineering, California Institute of Technology

2011 BASc in Engineering Science, University of Toronto
Major in Aerospace Engineering

Publications

Journal articles

2024 M Kreider, and **M Arya**, "Origami-wrapped structures with corrugated unfolded forms", *AIAA Journal*, (accepted)

2024 D Pisanti, A Goel, G Gupta, **M Arya**, N Chahat, J Lazio, P Goldsmith, and S Bandyopadhyay, "Modeling Science Return from the Lunar Crater Radio Telescope on the Far Side of the Moon", *Philosophical Transactions of the Royal Society A*, (accepted)

2024 BY Dharmadasa, J Mejia-Ariza, J Sauder, P Focardi, SC Bradford, **M Arya**, and F López Jiménez, "Free Vibration of a Panel Supported by a Shear Compliant Two-Flexure Hinge", *AIAA Journal*, (accepted)

2021 **M Arya**, FS Mechentel, DR Webb, J Steeves, PD Lisman, SB Shaklan, SC Bradford, E Kelso, K Neff, A Swain, A Iskra, N Beidleman, JD Stienmier, G Freebury, A Tomchek, T Thomas, C Hazelton, K Butler, K Medina, M Pulford, L Adams, D Hepper, and D Turse, "Demonstration of deployment repeatability of key subsystems of a furled starshade architecture", *Journal of Astronomical Telescopes, Instruments, and Systems*, vol 7, no 2, pp 021202

2020 NA Pehrson, DC Ames, SP Smith, SP Magleby, and **M Arya**, "Self-Deployable, Self-Stiffening, and Retractable Origami-Based Arrays for Spacecraft", *AIAA Journal*, vol 58, no 7, pp 3221-3228

2017 **M Arya**, N Lee, and S Pellegrino, "Crease-free biaxial packaging of thick membranes with slipping folds", *International Journal of Solids and Structures*, vol 108, pp 24-39

Conference papers

2024 ME Ochalek, and **M Arya**, "Design and Modeling of Pre-stressed, Flat-Folding, Modular Origami Tube Structures", *Spacecraft Structures Conference, AIAA SciTech Forum*, Orlando FL

2024 JE Park, GC Brown, **M Arya**, D Hoppe, D Hofmann, and R Hodges, "Multilayer Tensioned Membrane Structures for Radio-Frequency Lenses", *Spacecraft Structures Conference, AIAA SciTech Forum*, Orlando FL

2024 BY Dharmadasa, S Blesinger, J Mejia-Ariza, J Sauder, P Focardi, SC Bradford, **M Arya**, and F López Jiménez, "A Closed-Form Formulation to Estimate the Natural Frequency of Tape Spring Hinges", *Spacecraft Structures Conference, AIAA SciTech Forum*, Orlando FL

2024 G Antoun, S Ferraro, R McDonell, SC Bradford, and **M Arya**, "A Validated Numerical Model of Deployment Accuracy and Repeatability of the Starshade Inner Disk Subsystem", *Spacecraft Structures Conference, AIAA SciTech Forum*, Orlando FL

2023 **M Arya**, GC Brown, A Goel, S Bandyopadhyay, and Z Hasnain, "Shape Error Budgets for Precision In-Space-Assembled Structures", *AIAA ASCEND*, Las Vegas NV

2023 **M Arya**, JT Herrscher, D Pisanti, A Verniani, M Delapierre, G Gupta, A Goel, J Lazio, P Goldsmith, and S Bandyopadhyay, "Kilometer-Scale Parabolic Reflector for a Radio Telescope in a Lunar Crater", *Spacecraft Structures Conference, AIAA SciTech Forum*, National Harbor MD

2023 BY Dharmadasa, F Lopez Jimenez, **M Arya**, J Mejia-Ariza, JF Sauder, P Focardi, and SC Bradford, "Design and Fabrication of a High Strain Composite Flexure for CubeSat Reflectarrays", *Spacecraft Structures Conference, AIAA SciTech Forum*, National Harbor MD

2022 A Haraszti, and **M Arya**, "Origami-Inspired Closeouts for Starshade Inner Disk Optical Shields", *ASME IDETC-CIE*, St Louis MO

2022 G Gupta, **M Arya**, A Goel, S Bandyopadhyay, P Goldsmith, P Mcgarey, J Lazio, and N Chahat, "Detector Development for the Lunar Crater Radio Telescope", *IEEE Wireless Antenna and Microwave Symposium (WAMS)*, Rourkela, India

2022 **M Arya**, R Hodges, JF Sauder, S Horst, M Mobrem, A Pedivellano, A Wen, A Truong, and S Pellegrino, "Lightweight composite reflectarray that can be flattened, folded, and coiled for compact stowage", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2022 BY Dharmadasa, JM Mejia-Ariza, **M Arya**, JF Sauder, P Focardi, SC Bradford, and F Lopez Jimenez, "Design of Flexures for Deployable Reflectarrays using High Strain Composites", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2021 S Bandyopadhyay, P McGarey, A Goel, R Rafizadeh, M Delapierre, **M Arya**, J Lazio, P Goldsmith, N Chahat, A Stoica, M Quadrelli, I Nesnas, K Jenks, and G Hallinan, "Conceptual Design of the Lunar Crater Radio Telescope (LCRT) on the Far Side of the Moon", *IEEE Aerospace Conference*

2021 **M Arya**, DR Webb, SC Bradford, L Adams, V Cormarkovic, G Wang, M Mobrem, K Neff, N Beidleman, JD Stienmier, G Freebury, KA Medina, D Hepper, DE Turse, G Antoun, C Rupp, and L Hoffman, "Origami-Inspired Optical Shield for a Starshade Inner Disk Testbed: Design, Fabrication, and Analysis", *Spacecraft Structures Conference, AIAA SciTech Forum*

2021 JF Sauder, CA Gebara, and **M Arya**, "A Survey of CubeSat Deployable Structures: The First Decade", *Spacecraft Structures Conference, AIAA SciTech Forum*

2020 P McGarey, S Bandyopadhyay, R Rafizadeh, A Goel, **M Arya**, I Nesnas, J Lazio, P Goldsmith, A Stoica, M Quadrelli, and G Hallinan, "A Concept for the Deployment of a Large Lunar Crater Radio Telescope using Teams of Tethered Robots", *International Symposium on Artificial Intelligence, Robotics, and Automation (ISAIRAS)*

2020 **M Arya**, D Webb, J Steeves, PD Lisman, PA Willems, SC Bradford, E Kelso, K Neff, N Beidleman, JD Stienmier, G Freebury, A Tomchek, T Thomas, C Hazelton, K Butler, K Medina, M Pulford, L Adams, D Hepper, and D Turse, "Demonstration of Deployment Accuracy of the Starshade Inner Disk Subsystem", *Spacecraft Structures Conference, AIAA SciTech Forum*, Orlando FL

2019 **M Arya**, JF Sauder, R Hodges, and S Pellegrino, "Large-Area Deployable Reflectarray Antenna for CubeSats", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2019 JF Sauder, **M Arya**, N Chahat, E Thiel, S Dunphy, M Shi, G Agnes, and T Cwik, "Deployment Mechanisms for High Packing Efficiency One-Meter Reflectarray Antenna (OMERA)", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2019 NA Pehrson, SP Smith, DC Ames, SP Magleby, and **M Arya**, "Self-Deployable, Self-Stiffening, and Retractable Origami-Based Arrays for Spacecraft", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2019 N Chahat, E Thiel, J Sauder, **M Arya**, and T Cwik, "Deployable One-Meter Reflectarray for 6U-Class CubeSats", *13th European Conference on Antennas and Propagation (EuCAP)*, Krakow, Poland

2017 **M Arya**, D Webb, J McGown, PD Lisman, S Shaklan, SC Bradford, J Steeves, E Hilgemann, B Trease, M Thomson, S Warwick, G Freebury, and J Gull, "Starshade mechanical design for the Habitable Exoplanet Imaging Mission Concept (HabEx)", *Proc. SPIE 10400, Techniques and Instrumentation for Detection of Exoplanets VIII*, San Diego CA

2016 **M Arya**, N Lee, and S Pellegrino, "Ultralight structures for space solar power satellites", *Spacecraft Structures Conference, AIAA SciTech Forum*, San Diego CA

2015 **M Arya**, N Lee, and S Pellegrino, "Wrapping thick membranes with slipping folds", *Spacecraft Structures Conference, AIAA SciTech Forum*, Kissimmee FL

2014 **M Arya**, and S Pellegrino, "Deployment mechanics of highly compacted thin membrane structures", *Spacecraft Structures Conference, AIAA SciTech Forum*, National Harbor MD

2013 C Underwood, S Pellegrino, V Lappas, C Bridges, B Taylor, S Chhaniyara, T Theodorou, P Shaw, **M Arya**, J Breckinridge, K Hogstrom, K Patterson, J Steeves, L Wilson, and N Horri, "Autonomous Assembly of a Reconfiguarble Space Telescope (AAReST) – A CubeSat/Microsatellite Based Technology Demonstrator", *AIAA/USU Small Satellite Conference*, Logan UT

2011 **M Arya**, and CA Steeves, "Bandgaps in octet truss lattices", *23rd Canadian Congress of Applied Mechanics*, Vancouver, Canada

Book chapters

2020 N Chahat, **M Arya**, JF Sauder, E Thiel, M Zhou, and T Cwik, "One Meter Reflectarray Antenna: OMERA" in *CubeSat Antenna Design*, N Chahat, Ed. Piscataway, New Jersey: IEEE Press

2017 CA Steeves, GD Hibbard, **M Arya**, and AT Lausic, "Dynamics of Nanolattices: Polymer-Nanometal Lattices" in *Dynamics of Lattice Materials*, AS Phani and MI Hussein, Eds. Chichester, United Kingdom: John Wiley *&* Sons, Inc.

2014 PC Liewer, AT Klesh, MW Lo, N Murphy, RL Staehle, V Angelopoulos, BD Anderson, **M Arya**, S Pellegrino, JW Cutler, EG Lightsey, and A Vourlidas, "A Fractionated Space Weather Base at L5 using CubeSats and Solar Sails" in *Advances in Solar Sailing*, M Macdonald, Ed. Berlin: Springer Praxis Books.

Theses

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

2011 **M Arya**, "Solar sail attitude control systems that reduce sail deflections during slew manoeuvres", Undergraduate Thesis, University of Toronto

Patents

2021 **M Arya**, JF Sauder, RE Hodges, and S Pellegrino, "Large aperture deployable reflectarray antenna", US Patent No. 11,063,356 B2

2020 S Pellegrino, HA Atwater, SA Hajimiri, **M Arya**, C Leclerc, and N Lee, "Large-area structures for compact packaging", US Patent No. 10,696,428 B2

2019 S Pellegrino, HA Atwater, SA Hajimiri, **M Arya**, N Lee, and M Delapierre, "Large-scale space-based solar power station: packaging, deployment and stabilization of lightweight structures", US Patent No. 10,340,698

2019 TA Cwik, NE Chahat, J Sauder, **M Arya**, and E Thiel, "Deployable reflectarray antenna", US Patent No. 10,276,926 B2

2018 HA Atwater, SA Hajimiri, S Pellegrino, B Abiri, F Bohn, JP Bosco, D Callahan, EC Warmann, **M Arya**, N Lee, and M Delapierre, "Large-scale space-based solar power station: multi-scale modular space power", US Patent No. 10,144,533 B2

Conference presentations

2023 N Jatusripitak and **M Arya**, "Regular and Semi-Regular Tessellations of Origami Flashers", *Society of Engineering Science (SES) Annual Technical Meeting*, Minneapolis MN

2023 ME Ochalek and **M Arya**, "Cable-Actuated Prestressed Origami Tubes", *ASCE Engineering Mechanics Institute (EMI) Conference*, Atlanta GA

2022 A Haraszti, **M Arya**, and S Hovsepian, "Modular Architecture for Origami-Inspired Flat-Folding Robots", *ASCE Engineering Mechanics Institute (EMI) Conference*, Baltimore MD

2019 **M Arya**, "Origami wrapping patterns for non-planar unfolded forms", *ASCE Engineering Mechanics Institute (EMI) Conference*, Pasadena CA

Honors & awards

2023 AIAA Spacecraft Structures Best Paper Award
for "Kilometer-Scale Parabolic Reflector for a Radio Telescope in a Lunar Crater"

2022 David Morgenthaler II Fellowship
in the School of Engineering at Stanford University

2019 JPL Astronomy and Physics Team Award
for leadership in a study to select a starshade mechanical architecture

2018, 2017 JPL Section 355 Science-Enabling Technology Award
for developing creative methods for packaging spacecraft sturctures

2015, 2014 Charles D. Babcock Award
from GALCIT for contributions in teaching

2011 Ontario Graduate Scholarship (declined)

2010 John M. Empey Scholarship
from the University of Toronto for academic excellence

2010 Undergraduate Student Research Award
from the Canadian National Science and Engineering Research Council

2009 Shaw Design Scholarship
from the University of Toronto for academic excellence

2007 University of Toronto Scholars Program

2010-2007 Queen Elizabeth II Aiming for the Top Scholarship

2007 Governor General's Academic Medal

Invited talks

2023 I.I. Glass Lecture, *University of Toronto Institute for Aerospace Studies*
"Origami, Kirigami, and In-Situ Assembly: Novel Structural Concepts for Space Applications"

2023 Panelist, *Space Tech Expo USA*

2022 SystemX Alliance Fall Conference, *Stanford University*
"Modular Architecture for Origami Inspired Flat Folding Robots"

2022 AAPI Month Lecture, *NASA Langley Research Center*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2021 Department of Aeronautics Seminar, *Imperial College London*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2021 Distinctive Voices Lecture, *National Academies of Sciences, Engineering, and Medicine*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2021 Global Engineering Engineering Engagement Series, *University of Pittsburgh*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2021 Von Kàrmàn Lecture, *Jet Propulsion Laboratory*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2020 Fermilab Colloquia Series,
"Origami and Spacecraft Structures: Current Work and a Brief History"

2020 Keck Institute for Space Studies Lecture, *California Institute of Technology*
"Origami and Spacecraft Structures: Current Work and a Brief History"

2018 The Knowledge Society Summit

Outreach

2022 Exhibitor, *Halloween Art and Nature Festival*, Atelier de la Nature
2019 Workshop Lead, *Atlas Obscura/The New York Times LA Science Weekend*
2018 Exhibitor, *Science for March*, California Institute of Technology
2018 Artist and Exhibitor, *San Diego Festival of Science and Engineering*

Teaching

Instructor

AA 245 Stability of Structures, *Stanford University*, 2023
AA 236A Spacecraft Design, *Stanford University*, 2022, 2023
AA 151 Lightweight Structures, *Stanford University*, 2022
AA 100 Introduction to Aerospace Engineering, *Stanford University*, 2023
Space Origami Engineering, *Esteban E Torres High School, for The Huntington Library*, 2016

Teaching assistant

Ae105abc Aerospace Engineering, *California Institute of Technology*, 2013, 2014, 2015

Service

2022- Member, *Stanford Aeronautics and Astronautics DEI Committe*
2022- Vice-Chair, *AIAA Spacecraft Structures Technical Committee*
2021-2022 Secretary, *AIAA Spacecraft Structures Technical Committee*

Journal reviews

AIAA Journal
Acta Astronautica
Journal of Spacecraft and Rockets
Advances in Space Research
International Journal of Solids and Structures

Conference reviews

ASME IDTEC-CIE, 2022, 2023
AIAA SciTech Forum, 2023