

MOOGEGA COOPER

- EDUCATION:** **Doctorate of Philosophy, Mechanical Engineering & Mechanics, Dec 2009**
Drexel University, Philadelphia, PA Advisor: Dr. Alexander Fridman
Dissertation: Surface Disinfection of Spacecraft Materials from Extremophile Microorganisms by Non-Thermal Atmospheric Pressure Plasmas
- Master of Science, Mechanical Engineering, April 2008**
Drexel University, Philadelphia, PA
- Bachelor of Science, Physics and minor in Space, Earth, and Atmospheric Sciences, May 2006**
Hampton University, Honors College, Hampton, VA Summa Cum Laude
- EXPERIENCE:** **Planetary Protection Engineer, Jet Propulsion Laboratory, Pasadena, CA, Aug 2011 – Present**
Biotechnology and Planetary Protection Group
- *Group Supervisor, Biotechnology and Planetary Protection Group, April 2021-present*
 - Oversees technology and personnel development within the Biotechnology and Planetary Protection Group.
 - Communicates to the PPO and other NASA HQ stakeholders.
 - *Planetary Protection Lead, Europa Lander Project, August 2020-present*
 - Develop the planetary protection compliance strategy for the Europa lander project in preparation for Phase A.
 - Communicates planetary protection compliance to the PPO and other NASA HQ stakeholders.
 - Cost account manager to subtasks related to Europa Lander technology development.
 - *Planetary Protection Lead, Mars 2020 Mission*
 - Specifies project or customer unique requirements with concurrence from NASA HQ for planetary protection (PP), and implements means to meet these requirements and any other materials/contamination or planetary protection control related requirements.
 - Communicates with engineers and works together with project management to develop an implementation strategy that is achievable within cost, schedule, and engineering feasibility.
 - Performs or commissions analytical chemistry work, materials evaluation, composites engineering/fabrication and provides consulting support for various service center customers in areas of chemistry, materials and planetary protection.
 - Documents and reports planetary protection compliance to the PPO and other NASA HQ stakeholders.
 - Performs materials technology work for new planetary protection approaches and applications.
 - Cost account manager to subtasks related to return sample science for the Mars 2020 mission.
 - *Planetary Protection Engineer, InSight Mission*
 - Implements project unique requirements for planetary protection (PP)
 - Documents and reports planetary protection implementation to demonstrate compliance.
 - *Engineer, Mars Science Laboratory Mission*
 - Perform MSL drill test operations to determine the life and performance of the drill components
- Caltech Postdoctoral Scholar, Jet Propulsion Laboratory, Pasadena, CA, Jan 2010 – Aug 2011**
Biotechnology and Planetary Protection Group, Planetary Chemistry and Astrobiology Group
- Development of a model community of spore and non-spore-forming bacterial, anaerobic archaeal, and fungal strains representing the microbial life able to survive in clean rooms.
 - Evaluate efficient recovery methods of biomolecules from metal surfaces through the development and validation of a standard operating procedure.
 - Assess archaeal and fungal diversity of JPL-Spacecraft Assembly Facility
 - Design and development of instruments germane to planetary protection
- Graduate Student Research Scientist, September 2006 – December 2009**
Drexel Plasma Institute, Drexel University, Philadelphia, PA
- Develop an understanding of the sterilization efficacy of plasma on varying spacecraft materials through methods to include standard plate count, PCR, and fluorescent techniques.

- Study mechanisms of sterilization by atmospheric pressure plasma.
- Develop standards for achieving complete destruction of extremophile microorganisms
- Maintain contact with scientists at JPL and NASA Headquarters on the plasma system

Co-op Student, June 2003 to September 2006

NASA Langley Research Center, Hampton, Virginia

- Team Leader, NASA DEVELOP Virginia Public Health team. Correlate pediatric asthma-related hospitalizations with PM2.5 and tropospheric ozone concentrations. (Summer 2006)
- Utilized Mathematica, Excel, and MaxIm imaging software to aide in investigating the behavior of plasma and its ability to exert forces for maneuvering applications. (Summer 2004 and 2005)

Data Analyst, July 2002 to May 2005

Center for Atmospheric Sciences, Hampton University, Hampton, Virginia

- Verify data from the SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) instrument using Interactive Data Language (IDL)
- Used IDL to simulate ion counts taken by the Galileo Plasma instrument

TV APPEARANCES/CONSULTING:

- Co-Host, Mars 2020 Launch Commentary, NASA TV.
- How the Universe Works (TV Series documentary), Season 8, 2020
- How the Universe Works (TV Series documentary), Season 7, 2019
- How the Universe Works (TV Series documentary), Season 6, 2018
- Origins, National Geographic, March 2017.
- Bill Nye Saves the World, Netflix, 2016. Panelist, life in the universe and Planetary Protection.
- How the Universe Works (TV Series documentary), Season 5, 2016-2017
- How the Universe Works (TV Series documentary), Season 4, 2015
- Man vs YouTube, National Geographic Documentary, Science and Engineering Consultant, 2014
- King of the Nerds (TV Series), 2013

AWARDS:

- 2021 KTLA Black History Month Visionaries
- The Root 100 Most Influential African Americans in 2020
- JPL Team award “For the successful support and execution of Mars 2020 Project Systems Engineering tasks leading up to launch.” 8/21/2020
- 2019 Bruce Murray Award. “For exemplary and innovative efforts in inspiring the next generation of women and children in STEM with special emphasis on underserved communities.”
- 2019 Team Award. “For outstanding leadership in M2020 Planetary Protection implementation performing hardware delivery assays and certifications for HRCRs.”
- NASA Early Career Public Achievement Medal. “For outstanding early career achievement in developing new molecular biology technologies and PP flight project implementation.” 2018.
- 2018 Charles Elachi Award for exceptional early career achievement, 2018.
- 2018 Voyager Award. “For technical and leadership excellence leading to the Return Sample Biological Contamination Control Review during Phase C of M2020.”
- Mars 2020 Project Sample Cleanliness Technical Leadership Team Award. August 2017.
- NASA Voyager Award, “Outstanding leadership in development & performing M2020 PP Precision Cleaning Study allowing for process/procedure updates, standardization & compliance” June 2015
- NASA Group Achievement Award, “For exceptional technical innovations in rover surface operations leading to significantly improved MSL prime mission performance and science.” 2015
- NASA Group Achievement Award, “For exceptional performance in the rigorous evaluation and rapid synthesis of a development strategy for the Mars Sample Return Planetary Protection technology.” October 2012
- Harriet G. Jenkins Pre-doctoral Fellowship Program Recipient, 2006
- Homeland Security Philadelphia Student Chapter (HSPSC) Specialty Award, May 2009

PATENTS:

- MATERIALS FOR DISINFECTION PRODUCED BY NON-THERMAL PLASMA, U.S. Provisional Patent Application No. 61/370,409, filed August 3, 2010.

- PUBLICATIONS:**
- Benardini, James N., Stricker, Moogega, and Venkateswaran, Kasthuri J., "Biological Contamination Control and Planetary Protection Measures as Applied to Sample Acquisition." p.313. *Advances in Extraterrestrial Drilling*. Yoseph Bar-Cohen. Taylor & Francis Group, 2020. ISBN 0367653478.
 - Mikellides, et al. "Experiments in particle resuspension and transport for the assessment of terrestrial-borne biological contamination of the samples on the mars 2020 mission, *Planetary and Space Science*, Volume 181, 2020, 104793.
 - Mikellides, et al. "Modelling and simulations of particle resuspension and transport for the assessment of terrestrial-borne biological contamination of the samples on the mars 2020 mission, *Planetary and Space Science*, Volume 181, 2020, 104792.
 - Malli Mohan, G.B., Stricker, M.C. & Venkateswaran, K. *Microscopic Characterization of Biological and Inert Particles Associated with Spacecraft Assembly Cleanroom*. *Sci Rep* 9, 14251 (2019).
 - R. D. Robinson, R. Rakhmanov, M. Cooper-Stricker and D. Dobrynin, "Subatmospheric Pressure Microsecond Spark Discharge Plasma Jet for Surface Decontamination," in *IEEE Transactions on Plasma Science*, vol. 47, no. 10, pp. 4677-4682, Oct. 2019, doi: 10.1109/TPS.2019.2936996.
 - Ioannis G. Mikellides, et al., The viscous Fluid Mechanical Particle Barrier for the prevention of sample contamination on the Mars 2020 mission, *Planetary and Space Science*, Vol. 142, August 2017, Pages 53-68.
 - Cooper, Moogega, and Christina Stam. "Nucleic Acid Purification from Soil and Environmental Sources." *Sample Preparation Techniques for Soil, Plant, and Animal Samples* (2016): 307-314.
 - Stam, Christina, Alberto Behar, and Moogega Cooper. "Sampling of Microbiological Samples." *Sample Preparation Techniques for Soil, Plant, and Animal Samples* (2016): 25-39.
 - M. Cooper, et al. "Comparison of Innovative Molecular Approaches and Standard Spore Assays for Assessment of Surface Cleanliness." *Appl. Environ. Microbiol.* 2011 0: AEM.00192-11
 - Joshi, S. G., et al. Nonthermal Dielectric-Barrier Discharge Plasma-Induced Inactivation Involves Oxidative DNA Damage and Membrane Lipid Peroxidation in *Escherichia coli* Antimicrob. Agents Chemother. 2011 55: 1053-1062
 - Kwan, K., et al. Evaluation of procedures for the collection, processing, and analysis of biomolecules from low-biomass surfaces. *Appl. Environ. Microbiol.* 2011 0: AEM.02978-10
 - M Cooper, G Fridman, A Fridman, SG Joshi. (2010). "Biological responses of *Bacillus stratosphericus* to Floating Electrode-Dielectric Barrier Discharge Plasma Treatment." *Journal of Applied Microbiology* 109(6): 2039-2048.
 - M Cooper, et al. Decontamination of Surfaces From Extremophile Organisms Using Nonthermal Atmospheric-Pressure Plasmas, *IEEE Transactions on Plasma Science*, 2009, 37, (6), pp. 866-71.
 - S. U. Kalghatgi, et al. "Mechanism of Blood Coagulation by Non-Thermal Atmospheric Pressure Dielectric Barrier Discharge Plasma." *IEEE Transactions on Plasma Science*, 35(5), Part 2, Oct. 2007, pp. 1559-1566.
 - RJ Exton, S Popovic, GC Herring, M Cooper. 2005. Levitation using microwave-induced plasmas. *Applied Physics Letters*, 86(12).

CONFERENCE

- PROCEEDINGS:**
- Gershman, Robert & Bar-Cohen, Yoseph & Hendry, Morgan & Stricker, Moogega & Dobrynin, Danil & Morrese, Alexander. (2018). Break-the-chain technology for potential Mars sample return. 1-21. 10.1109/AERO.2018.8396744.
 - Ganesh Babu Malli, et al. "Characterization of Biological Fallout Particles of Cleanrooms to Measure Spacecraft Cleanliness" 47th International Conference on Environmental Systems (ICES 2017).
 - Kazarians, et al. "The Evolution of Planetary Protection Implementation on Mars Missions." 2017 IEEE Aerospace Conference.
 - White, et al. "Organic and Inorganic Contamination Control Approaches for Return Sample Investigation on Mars 2020." 2017 IEEE Aerospace Conference.
 - Younse, P. et. al, "Sample Tube Sealing and Sample Integrity Analysis for Future Sample Return Missions." 45th Lunar and Planetary Science Conference, 17-21 March, 2014. LPI Contribution No. 1777, p.1054
 - H. Hasan, et al. (2008). Phenomenological estimation of sterilization kinetics using dielectric barrier discharge. *Plasma Science*, 2008. ICOPS 2008. IEEE 35th International Conference on , vol., no., pp.1-1, 15-19 June 2008. doi: 10.1109/PLASMA.2008.4590925

- M. Cooper, Y. Yang, G. Fridman, H. Ayan, V. N. Vasilets, A. Gutsol, G. Friedman, A. Fridman. “Uniform and Filamentary Nature of Continuous-Wave and Pulsed Dielectric Barrier Discharge Plasma” NATO Advanced Study Institute on Plasma Assisted Decontamination of Biological and Chemical Agents. Cesme-Izmir, Turkey: Springer 2008:311.
- S. Kalghatgi, D. Dobrynin, G. Fridman, M. Cooper, et al. “Applications of Non Thermal Atmospheric Pressure Plasma In Medicine” NATO Advanced Study Institute on Plasma Assisted Decontamination of Biological and Chemical Agents. Cesme-Izmir, Turkey: Springer 2008:173.
- M Cooper. “Validation of SABER Temperature Measurements Using Ground-based Instruments.” In Proceedings of the 2004 IEEE International Geoscience and Remote Sensing Symposium, p. 4099-4101, Anchorage, Alaska, 20-24 Sept., 2004.

PRESENTATIONS: *Invited*

- Royal Aeronautical Society Inaugural Mary Jackson Named Lecture, 21 January 2021
- Von Karman Lecture Series, Planetary Protection, Feb 4, 2021 (hyperlink)
- Moogega Stricker, James N. Benardini, Melissa Jones, and Doug Bernard, “Mars 2020 Planetary Protection Status. COSPAR 2018, July 14-22, 2018. Pasadena, CA.
- Moogega Stricker, “Mars 2020 and the Importance of Planetary Protection”, Fermi National Lab Public Lecture Series, October 27, 2017.
- Moogega Stricker, “Mars 2020 and the Importance of Planetary Protection”, Joint Fall Meeting of the Texas Section American Association of Physics Teachers (TS AAPT), Zone 13 of the SPS, and Texas Section APS. October 20-21, 2017. Richardson, TX.
- Moogega Stricker, “Mars 2020 and the Importance of Planetary Protection”, LIGO Hanford Observatory Post-Eclipse Celebration. August 21, 2017.
- Moogega Stricker, “Mars 2020 and the Importance of Planetary Protection”, American Association of Physics Teachers Winter Meeting, Atlanta, GA. February 20, 2017.

Other Oral Presentations

- Non-Equilibrium Atmospheric-Pressure Dielectric Barrier Discharge Plasma: A Technology for Achieving Planetary Protection Requirements. M. Cooper, G. Fridman, S. Joshi, A. Fridman. 61st Int’l Astronautical Congress, Prague, Czech Republic, 27 September-1 October 2010.
- Sterilization of Conductive and Non-Conductive Surfaces Using Atmospheric Pressure DBD Plasma, M. Cooper, et al. 36th Int’l Conf. on Plasma Sci. and 23rd Symposium on Fusion Engineering, May 31 – June 5, 2009, San Diego, California.
- Surface disinfection of spacecraft materials from microorganisms using non-thermal atmospheric pressure plasmas, M. Cooper, et al., 2nd Int’l Conf. on Plasma Med., March 16-20, 2009, San Antonio, TX.
- Sterilization and Complete Removal of Bacteria Using Atmospheric Pressure Plasmas, M Cooper, et al., 35th IEEE ICOPS., June 15 - 19, 2008, Karlsruhe, Germany.
- Effects of Substrate Conductivity on Dielectric Barrier Discharge Sterilization Efficacy, M Cooper, et al., 35th IEEE ICOPS, June 15 - 19, 2008, Karlsruhe, Germany.
- Spacecraft Sterilization using Non-equilibrium Atmospheric Pressure Plasma, Moogega Cooper, et al., 1st Int’l Conf. on Plasma Medicine (ICPM-1), October 15-18, 2007, Corpus Christi, Texas.
- Observations of Jupiter’s magneto-sheath with the Galileo Plasma Instrumentation, Moogega Cooper, William Paterson. 63rd Joint Annual Meeting of the Natn’l Institute of Science and Beta Kappa Chi Scientific Honor Society, March 22-26, 2006, Montgomery, Alabama.

PROFESSIONAL

- AFFILIATIONS:**
- Member, British American Project, 2019 Fellow
 - Royal Aeronautical Society Fellow, March 2021