

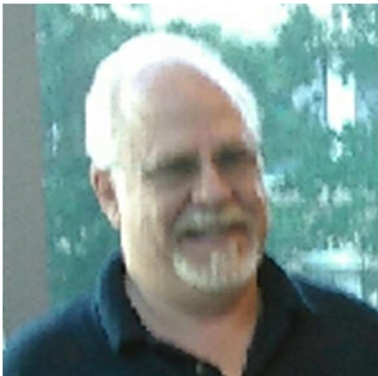


**DeVry University Online IEEE Student Branch  
Presents  
Electric Propulsion and the Lunar Gateway  
By Dr. Phil Ugorowski**

**Thursday, June 10, 2021, 7:00 pm CDT (8:00 pm EDT)**  
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**Abstract:** Reaching the moon with a large spacecraft, like the first section of the Artemis program Lunar Gateway, is beyond the capability of even the largest available conventional rocket. What was called 'Ion Drive' in science fiction is now being developed and used by NASA and others to send large payloads long distances. It is 10x more efficient in thrust delivered per pound of fuel, although the instantaneous thrust is much lower. It is now called 'Electric Propulsion' and relies on Hall-Effect thrusters powered by solar panels. This talk will focus on the application of electric propulsion to get the Lunar Gateway to a NHRO orbit around the moon and some of the expected uses of this space station during its' 15-year life.



**Speaker's Bio:**

Dr. Philip (Phil) Ugorowski is at NASA Glenn Research Center in Cleveland Ohio and is involved in Systems Engineering for the Power and Propulsion Element of the Lunar Gateway, part of the Artemis program. His career activities include 25+ years in nuclear engineering--development of nuclear radiation detection and spectroscopy systems for basic research, nuclear power safety, and homeland security (anti-smuggling); teaching engineering, physics and math at various colleges/universities and a NASA project on Advanced Energy Conversion (AEC), focusing on neutron spectroscopy. Dr. Ugorowski is a Reviewer for DOE Nuclear Energy University Programs (NEUP), NASA EPSCoR and judge for FIRST Robotics. Dr. Ugorowski earned a PhD in experimental nuclear physics from Western Michigan University, and postdoctoral research at Youngstown State University.

**Related Links**

Artemis Program  
<https://www.nasa.gov/artemisprogram>

Lunar Gateway  
<https://www.nasa.gov/gateway>

Hall Effect thrusters

[https://en.wikipedia.org/wiki/Hall-effect\\_thruster](https://en.wikipedia.org/wiki/Hall-effect_thruster)

<https://www.youtube.com/watch?v=Isn7FoJvtRY>

NASA Research on Hall Effect Thrusters

<https://www.jpl.nasa.gov/news/nasa-works-to-improve-solar-electric-propulsion-for-deep-space-exploration>

NASA Glenn Research Center (GRC) vacuum chamber to test Hall thrusters

<https://www.jpl.nasa.gov/news/nasa-glenn-tests-thruster-bound-for-metal-world>

NASA GRC Neil Armstrong Test Center (formerly Plum Brook Station) vacuum chamber – world's largest

<https://www.youtube.com/watch?v=E43-CfukEgs>

Near-Rectilinear Halo Orbit (NHRO)

[https://en.wikipedia.org/wiki/Near-rectilinear\\_halo\\_orbit](https://en.wikipedia.org/wiki/Near-rectilinear_halo_orbit)

<https://www.youtube.com/watch?v=jfCaac1ijRg>