PISCES HAWAII'S PORTAL TO SPACE NEWSLETTER

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Astronauts Share Tips on Coping with Isolation Amid COVID-19 Pandemic

Above: *Canadian astronaut Chris Hadfield suited up inside the International Space Station. Hadfield spent five months aboard the ISS between 2012 and 2013, serving as Commander. Credit: Mark Sowa/NASA-JSC.*

Astronauts may be among the most qualified people on Earth to give advice about coping with isolated living situations. And several have come forward with advice to the hundreds of millions of Americans ordered to stay home amid the growing COVID-19 pandemic.

Astronaut Christina Koch, who recently returned from the ISS after a record-breaking 328-day stint (the longest spaceflight by a woman), lived and worked at the South Pole for two winters while traveling the artic and Antarctic regions between 2004 and 2007. She experienced the extremes of sensory deprivation, far-flung isolation and back-to-back months without sunshine, family or friends.

"The way to think about this new normal is to look at it as if it were a new planet to explore," she said in a Washington Post article. Koch underscored the importance of bridging the divide between people by creating shared, meaningful experiences through

> *Continued on* **Page 3**

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Letter from the Director

Rodrigo Romo

Aloha kākou,

We are living though unprecedented times. It is hard to believe that something invisible to the naked eye can bring the whole world to a grinding halt. The COVID-19 pandemic has impacted countless lives and seriously affected Hawai'i's economy as well as the global economy.

The PISCES staff is working primarily from home to comply with government restrictions imposed to prevent the spread of the coronavirus. A review of all current and upcoming projects has been done to determine which aspects can be moved forward while working remotely. All of our staff coordination and meetings are being held online or through teleconference to avoid contact and thus prevent any potential spread of the virus.

In an effort to support the local health services industry we are donating any unused personal protection equipment

> *Continued on* **Page 5**

NASA Competition Seeks Public Help for Lunar Robotic Design

NASA is seeking the public's help to improve upon the design of its lunar mining robot RASSOR (Regolith Advanced Surface Systems Operations Robot). RASSOR is a teleoperated space robot capable of effectively mining and hauling regolith material in extremely low gravity.

The RASSOR Design Challenge calls for redesigning the robot's bucket drum, a component that captures and retains regolith for transport to a storage facility. Specifically, NASA wants a better shape for the bucket drum and baffling (the sheet metal inside the bucket that captures regolith) to capture more material, and improve retention and efficiency while loading and unloading it.

Lunar mining for ISRU (in-situ resource utilization) will be an important step for establishing a human presence on the Moon—NASA's current target destination under the Artemis program. Lunar regolith is being sought as a resource to build infrastructure and provide critical resources that will support future astronauts. RASSOR's current design has already been tested using various configurations in a lunar simulant arena at NASA's Kennedy Space Center in Florida. NASA says successful bucket drum designs will have regolith fill ratios exceeding 50%.

The challenge is being hosted by GrabCAD, a website that allows the public to post 3D models. Eligible individuals can submit an original design that has not previously been published, exhibited or produced. All entries will be judged according to criteria including design, measurements and regolith capture volume.

A total of $7,000 will be awarded to the top five submissions. Submissions will be accepted through April 20, 2020. For more information and to register, go online.

Above: *NASA's lunar mining robot RASSOR (Regolith Advanced Surface systems Operations Robot) has been tested using various configurations in a lunar simulant arena at Kennedy Space Center. Credit: NASA/Kim Shiflett.*

PISCES NEWSLETTER
www.pacificspacecenter.com
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PISCES Joins Initiative to 3D Print PPE for Hospital Workers

The Hawaii Science Technology Museum (HSTM) has launched a coordinated effort to produce 3D-printed personal protective equipment (PPE) for healthcare providers and first responders in Hawaii County amid the growing COVID-19 pandemic. The shields are in short supply and workers could be ill-prepared without additional equipment should case numbers spike.

PISCES, NexTech, the Maunakea observatories and several local robotics teams have joined the effort which will provide protective face shields for staff at Hilo Medical Center. Christian Wong, Director of HSTM and a Hawaii County firefighter, says the face shields will help protect workers against infection during exams and medical procedures while extending the life of their N95 masks.

Hawaii County has seen 21 confirmed cases of COVID-19 as of April 1. Statewide, there are more than 230 confirmed cases. Gov. David Ige has responded to the pandemic by ordering a mandatory 14-day quarantine for inbound visitors to the state as well as interisland travellers, and a statewide shelter-in-place order for all residents through April 30.

Astronauts Offer Advice for Coping with Isolation ...

> *Continued from* **Page 1**

Credit: NASA

video conferencing including games, music and other interactive activities. "There's something to be said for actually doing the same things at the same time."

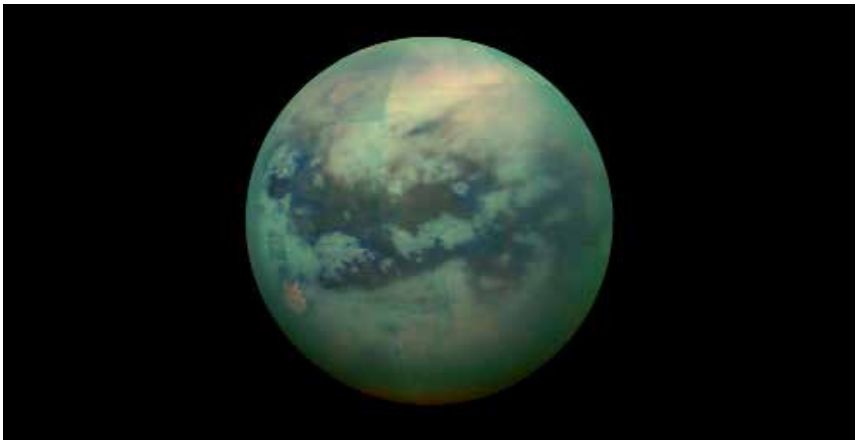
Chris Hadfield, a Canadian astronaut who served as Commander aboard the ISS (who is perhaps famously known for performing his own version of David Bowie's *Space Oddity* in space), shared practical steps for staying productive in a YouTube video last month. First, he said, understand the risk. "Don't just be afraid of things, get credible information and find out what you are facing."

Hadfield advised becoming an expert on the virus, monitoring the threat level in the nearby area and acting accordingly to minimize any risk of exposure. He also recommended getting clear on personal objectives, obligations and situational constraints, followed by a course of action. "This is a chance to do something different which you may have not done before."

Retired NASA astronaut Scott Kelly shared his thoughts in a New York Times op-ed, prescribing a daily routine to help people adjust to the new normal. Kelly, who spent nearly a year aboard the ISS, said a regular sleep schedule is especially important for maintaining one's well-being. Kelly also advised that people pace themselves with work and take time out for fun. He recommended taking up hobbies like music or art, and keeping a journal—a scientifically proven method for improving emotional well-being in isolated situations.

"The spread of the coronavirus is showing us that what we share is much more powerful than what keeps us apart, for better or for worse," Kelly wrote. "All people are inescapably interconnected, and the more we can come together to solve our problems, the better off we will all be."

Titan: A Good Bet for a Sustainable Human Settlement Beyond Earth



By: Dr. Amanda Hendrix, Planetary Science Institute

Top: *A composite image of Saturn's moon, Titan. Credit: NASA.* ***Above:*** *Author, speaker and planetary scientist Dr. Amanda Hendrix. Courtesy photo.*

As a kid I knew I wanted to grow up studying space in some capacity. After earning degrees in engineering and planetary science, I am fortunate enough to have my dream job of working on space missions and studying our solar system. As a science co-investigator, I worked on the Galileo mission at Jupiter and the Cassini-Huygens mission at Saturn, and I continue to work on the ongoing Lunar Reconnaissance Orbiter, plus a few other projects in between. I am also the principal investigator of the Toolbox for Research and Exploration (TREX), which is a node of NASA's Solar System Exploration and Research Virtual Institute (SSERVI).

The TREX team is working to advance progress in both human and robotic science and exploration of the Moon. My focus is the study of moons and small bodies such as asteroids. I'm interested in what they're made of and how their surfaces evolve in response to external processes such as micrometeoroid bombardment and radiation. Most of the moons in the solar system—including Earth's Moon—don't have atmospheres or magnetospheres to protect their surfaces from these processes.

One moon in the solar system that stands out as being significantly different from the rest is Saturn's largest moon, Titan. Working on the Cassini-Huygens mission, first as a post-doctoral researcher at the University of Colorado, and later as the mission deputy project scientist when I worked at NASA's Jet Propulsion Laboratory, Titan captured my interest because it has a significant atmosphere. It struck me that this atmosphere shields Titan's surface from the dangerous space radiation that affects other planets and moons in the solar system. For humans, the most dangerous space radiation is the energetic galactic cosmic rays. But even these particles don't make it through Titan's thick atmosphere.

Titan is arguably the most Earth-like place in the solar system, with its weather and (hydrocarbon) lakes—except that it's COLD. The temperature at Titan is about 95K (-290°F), so water is frozen and hydrocarbons such as methane are liquid. But if we were to ever consider an outpost on Titan, these native materials would provide plenty of options for oxygen and energy production. I am so intrigued by Titan that, with a colleague, I wrote a book about the challenges of human space exploration and how Titan might be our best bet for a sustainable human settlement elsewhere in the solar system. It's called *Beyond Earth: Our Path to a New Home in the Planets*.

PISCES NEWSLETTER
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Students Enjoy Hands-on Space and Science During 16th JTTU Program

Above: *PISCES geologist Kyla Edison gives students at Waiākeawaena elementary school an imaginary taste of life on the Moon during Journey Through The Universe week.*

PISCES staff visited several classrooms in East Hawai'i during Journey Through The Universe week in early March to show students what it would be like to live on the Moon.

JTTU is an annual, week-long STEM initiative involving more than 70 space professionals who visit classrooms to promote science literacy and encourage keiki to reach for the stars.

PISCES geologist Kyla Edison met with students at Hilo Union, Waiākeawaena and Keaukaha elementary school during the week, sharing a sensory activity about life as a lunar astronaut. Students touched lunar dust simulant, smelled the sulfur-like odor of the Moon's surface and tasted pieces of freeze-dried space food.

Kyla was among 74 astronomers, scientists, engineers and educators who participated in the 16th annual JTTU. The week-long intensive includes teacher workshops, classroom visits and activities, public lectures and family science nights. This year, the program reached some 8,000 students in North and East Hawai'i schools in Hilo, Hāmākua and Waimea.

"Two of the scientists I saw today in classrooms commented that they knew they wanted to be scientists when they were eight years old!" Hawai'i DOE Deputy Superintendent Phyllis Unebasami said in a news release by Gemini Observatory. "When I heard that I thought, 'and here they are now sharing their love and knowledge with our 8-year-olds.' That is truly impactful."

JTTU was developed by the National Center for Earth and Space Science Education and began in 2004 in Hawai'i as a partnership between Gemini Observatory and the State Department of Education. Hawai'i is one of only 10 communities nationwide designated for JTTU. The program has reached more than 60,000 students since its inception.

Letter from the Director

> *Continued from* ***Page 1***

to local health facilities and coordinating with others to provide support with our current equipment such as our 3D printers to manufacture PPE components needed by first responders.

We wish everyone out there a safe outcome in this situation and express our most heartfelt appreciation to those in the front lines of the battle.

A hui hou,

R. Romo

Rodrigo Romo
Program Director
PISCES