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CMU Works on Wide Bandwidth to Avert Interference

Full article on page 4

USGS & SSA Research Smaller Earthquakes "With Ambition"

Full article on page 10

IN THIS ISSUE

Mr. Geoffrey Ament of STC Receives NASA Ames Contractor of the Year Award

Moffett Field, California, Summer 2020

Mr. Geoffrey Ament, an STC employee who works on the AEMMS contract at NASA Ames in Mountain View, CA, was recently awarded the NASA Ames Contractor of the Year Award. Mr. Ament is a Research Associatein the field of Mechatronics Engineering. The award citation reads, "Mr. Ament's desire to explore, design, and innovate embodies the true spirit of what a NASA Engineer should be. He is articulate, meticulous with his work, and strives for excellence." In their nomination letter the nominators cited that, "Since the start of his employment as a Science and Technology Corporation (STC) research associate in August of 2015, Mr. Ament has made substantial contributions to NASA's RLVT mission with respect to both terrestrial and Martian flight. In 2017, he was part of the Multicopter Unmanned Aerial Systems (UAS) performance test team, during which he designed and manufactured quadcopter mounting hardware for mounting to the 7-by-10 ft wind tunnel sting mount. He was the test director for the first-ever wind tunnel test of a simulated rotorcraft in forward flight at Mars atmospheric conditions, which led to a data report that he presented at the 2018 AHS conference in San Francisco, CA, and subsequently led to a NASA Contractor Report (NASA/CR-2018-219736). Furthermore, as part of the Mars Helicopter risk reduction effort, he designed and assembled the test hardware for the rotor blade spin-up in the JPL Space Simulator, a requirement for Mars Helicopter testing; moreover, he led efforts to build a dust chamber and coaxial rotor control system to perform dust studies in order to study saltation and the effects of dust on the helicopter's on-board sensors. Currently, Mr. Ament is the lead for all rotorcraft testing performed at Martian atmospheric densities in the Planetary Aeolian Laboratory (PAL), and he designed (and is currently assembling) a 2-by-2 meter wind tunnel for rotor testing at Martian atmospheric conditions as well as terrestrial UAV testing."

STC would like to congratulate Mr. Ament on this award and to thank him for the years of exceptional service that he has provided to NASA Ames through STC.

Detecting Wireless Interference

BY Krista Burns June 23, 2020

ECE researchers were awarded a $1M NSF grant to investigate a system that allows devices to scan wide bandwidths to avert interference.

In a time where countless devices are connected to the Internet wirelessly, interference is inevitable. Spectrum pollution in the Internet-of-Things (IoT) era is something all users experience—a lag in connecting to your favorite app, not being able to sync to a wireless printer, the dreaded loading circle when trying to stream your favorite show. But what if IoT devices could detect and respect the presence of other devices on a shared spectrum? This would allow for devices and users to have a seamless wireless experience.

Swarun Kumar, Anthony Rowe, and Robert Iannucci from Carnegie Mellon University's Department of Electrical and Computer Engineering in new window have been awarded a $1 million National Science Foundation (NSF) grant to investigate a system that allows teams of geo-distributed low-power devices to quickly and efficiently scan wide bandwidths to avert interference.
"The core challenge is the low-power and simplicity of most IoT devices," said Swarun Kumar, assistant professor and principal investigator. "They are narrowband and unable to sense and avoid incumbents on shared spectrum."

The proposal presents a system designed for low-power devices to sense spectrum at minimal energy and cost, allowing these devices to behave as low-cost and distributed spectrum observatories.

Much like land and water, radio spectrum is a shared resource by many stakeholders; Wi-Fi routers, cellular companies, AM/FM radio stations, television towers, etc. Companies lease spectrum use under multi-year contracts. However, a lot of the spectrum is not used consistently, leading to significant wastage of a costly resource. What if there was a way to monitor the spectrum and signal when it's available at a given location so that it could be leased on-the-fly when vacant? This would save companies

"The core challenge is the low-power and simplicity of most IoT devices. They are narrowband and unable to sense and avoid incumbents on shared spectrum."

money, and increase the speed of our devices. However, building such a spectrum monitoring infrastructure can be costly. It would need to be replicated all over the country, and it would need to scan huge swaths of spectrum, increasing the cost further.

Referred to as Swallow, this project explores the use of low-cost and low-power IoT devices to serve as spectrum monitors that are cheap and can be placed anywhere. Globally, IoT devices are projected to be deployed in tens of billions and be ubiquitous in the coming years. Rather than viewing these as yet another part of the spectrum sharing problem, this project views them as part of the solution in effectively monitoring radio spectrum.

The project's objective, if successful, could pave a new way to manage, monitor, and better exploit spectrum—a valuable national resource—as the world embarks on high-speed wireless beyond 5-G.

"The testbed developed through the project will serve as a vehicle for undergraduate and graduate-level projects as well as workshops for K-12 students in the city of Pittsburgh," said Kumar. "The team has direct experience working with sensor deployments at Carnegie Mellon, the city of Pittsburgh, United States Geological Survey (USGS), and local industry partners and will leverage these connections to deploy Swallow at scale."

The project will be implemented and evaluated on a large programmable Low-Power Wide-Area Networking testbed in the Carnegie Mellon University campus that serves large parts of the City of Pittsburgh. This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

Carnegie Mellon University

BREAKTHROUGH INITIATIVES

San Francisco – September 15, 2020

INITIATIVES TO FUND STUDY INTO SEARCH FOR PRIMITIVE LIFE IN THE CLOUDS OF VENUS

New evidence suggests presence of potential biosignature on closest planet to Earth.

Breakthrough Initiatives, the privately-funded space science programs founded by science and technology investor and philanthropist Yuri Milner, are funding a research study into the possibility of primitive life in the clouds of Venus. The study is inspired by the discovery, announced yesterday, of the gas phosphine, considered a potential biosignature, in the planet's atmosphere.

The science team undertaking the research will comprise of world-class physicists, astronomers, astrobiologists, chemists and engineers, led by Sara Seager, Professor of Planetary Science, Physics and Aerospace Engineering at the Massachusetts Institute of Technology. The group will investigate the scientific case for life and analyze the technical challenges of an exploratory mission in the event that such evidence proves compelling.

Discovery of Phosphine

The new paper, from lead author Jane Greaves of Cardiff University, Seager and their collaborators, demonstrates the presence of phosphine (PH3) in the Venusian atmosphere via an analysis of millimeter-waveband observations by the Atacama Large Millimeter Array (ALMA) in Chile, with additional evidence from the James Clerk Maxwell Telescope (JCMT in Hawai'i).

The level of phosphine detected in the clouds of Venus – about 20 parts per billion – is completely unexpected for a gas susceptible to destruction by ultraviolet radiation, either directly or by ultraviolet-induced radicals. This suggests that some process is replenishing the gas. But what process?

Phosphine is a "biogenic" chemical: all samples encountered on Earth have been produced by biological or human-made processes requiring considerable energy inputs. Although the precise biological mechanisms generating phosphine are un-

known, they are associated with the breakdown of organic matter by bacteria, with the gas being found in oxygen-free environments such as marshlands and swamps, as well as the guts of animals. While the presence of phosphine on Venus may turn out to stem from a non-living process, no such process on a terrestrial planet is currently known to science.

"The discovery of phosphine is an exciting development," said S. Pete Worden, Executive Director of the Breakthrough Initiatives. "We have what could be a biosignature, and a plausible story about how it got there. The next step is to do the basic science needed to thoroughly investigate the evidence and consider how best to confirm and expand on the possibility of life."

"Finding life anywhere beyond Earth would be truly momentous," said Yuri Milner, founder of the Breakthrough Initiatives. "And if there's a non-negligible chance that it's right next door on Venus, exploring that possibility is an urgent priority for our civilization."

"We were stunned to find a molecule in Venus's atmosphere that could come from organisms," said Greaves. "We will continue to monitor and hunt for more clues, to pinpoint where exactly on the planet the phosphine is coming from."

And Seager commented, "We are thrilled to push the envelope to try to understand what kind of life could exist in the very harsh Venus atmosphere and what further evidence for life a mission to Venus could search for."

Project Leadership

Sara Seager – MIT – Principal Investigator
Janusz Petkowski – MIT – Deputy PI
Chris Carr – Georgia Tech
Bethany Ehlmann – Caltech
David Grinspoon – Planetary Science Institute
Pete Klupar – Breakthrough Initiatives Chief Engineer

The Breakthrough Initiatives are a suite of space science programs investigating the fundamental questions of life in the Universe.

In July 2015, together with Stephen Hawking, Yuri Milner announced the launch of the $100 million astronomical program Breakthrough Listen, to reinvigorate the search for extraterrestrial intelligence in the universe; and in April 2016 they launched Breakthrough Starshot, a $100 million research and engineering program seeking to develop a new technology for uncrewed interstellar travel. Breakthrough Watch is an astronomical program to develop Earth- and space-based technologies that can find evidence of primitive life on Earth-like planets in our cosmic neighborhood. All these philanthropic initiatives are funded by Breakthrough Foundation established by Yuri and Julia Milner.

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NEW "Virtual" & "Hands On" ESD Program Monitor Certification Training Developed by RMV

Moffett Field, California November, 2020

For USA high-tech companies rapidly adapting to the new business environment, Bob Vermillion, Founder RMV Tech Group LLC (RMV), has developed a two-day Virtual Interactive and one-day comprehensive "Hands On" ESD (Electrostatic Discharge) Program Monitor Certification Course specific to NASA requirements and tailored for Ames Research Center (ARC). The first class was held from the 12th-13th and 16th-17th of November 2020 for NASA ARC prime contractors.

Starting virtually with live videos and interactive experiments, Vermillion then led the "Hands On" Workshop over the next two days with social distancing in the RMV Building 19 ESD Laboratory.

An RMV Personnel Safety Plan and PPE were required for each student during the "Hands On" Workshop. Vermillion emphasized the correct usage of ESD instruments in a "learn-by-doing" team approach. Verification of static control materials, consumables, hand tools and products in the Electrostatic Protective Area (EPA) were practiced by each student during the session. A big "take away" was materials manufactured and labeled as "ESD Safe" constitute no guarantee of ANSI/ESD performance to NASA standards.

Reliance upon supplier technical data sheets, the Internet and catalog buys is a common practice from procurement to R&D and support staff.

A traceable Material Qualification List (MQL) will mitigate the number of non-compliant and suspect counterfeit products in the NASA supply chain.

Located on-site to verify EPA compliance, the ESD Program Monitor provides real-time value in support of current and future mission success for NASA and other science and technology companies within the Bay Area and even across the nation.

RMV implements new Space & Defense Virtual Four-Hour ESD Operator Certification Training to meet future NASA 8739.6B requirements

Bob Vermillion, named the Agency ESD Technical Authority at the Quality Leadership Forum in 2018, is conducting a four-hour Space & Defense Virtual ESD User/Operator Certification Training with live demonstrations that started in 2021.

For example, ESD fundamentals of grounding, the consequences of non-compliant

"We didn't know how much there was to learn about ESD" ... "It is like drinking out of a fire-hose"

materials in proximity to flight hardware and safe material handling techniques in the EPA are covered with live demos for better engagement.

Wrist straps, garments, footwear, consumables and hand tools for the handling of devices are discussed with interactive software to demonstrate the elements of a successful ESD program.

In the program, Users and Operators will learn the elemental differences between anti-stats and static dissipative polymers from the workstation to design and build CubeSats for mission success. Just as important to understand is the risk of a charge board effect (CBE) at the workstation for ESD Awareness. Bob Vermillion's use of live demos further enhance the learning process.

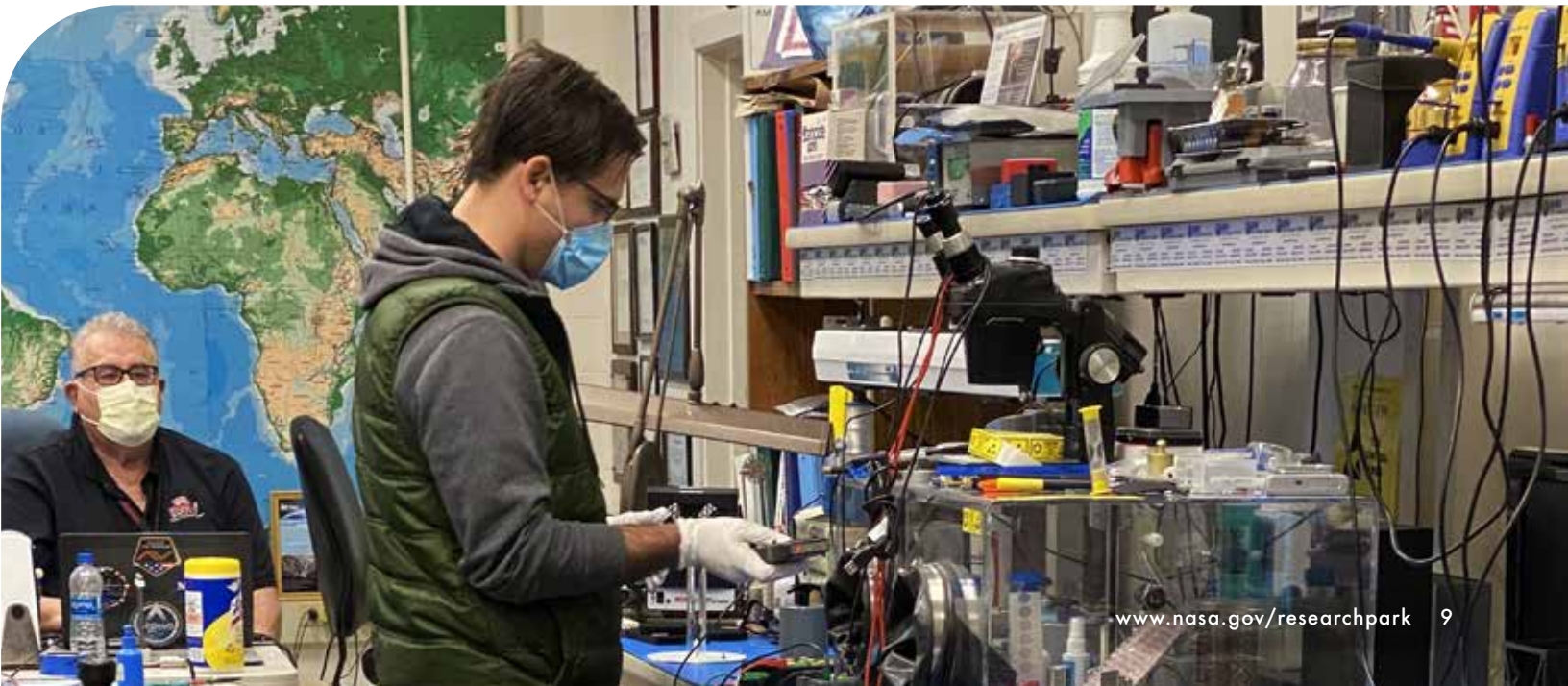
Although multiple companies offer ESD Awareness Training, RMV has realized from participant feedback that its training needs to be "specific" to be effective for NASA requirements.

As Renee Mitchell, RMV President stated, "What NASA requires, the Department of Defense also requires. Because of our collaboration with NASA, it in turn benefits the US Military."

For more information on RMV "Virtual and "Hands On" ESD Programs, contact:

Renee Mitchell
renee@esdrmv.com
650-964-4792

You can also visit:
www.esdaerospacetraining.org
to learn more about our company and the range of Application Specific training programs from our NASA Research Park location.



Smaller Earthquakes "With Ambition" Produce the Most Ground Shaking

Published on 4 November 2020
Seismological Society of America

Seismological Society of America

An earthquake of magnitude 8.0 or larger will almost always cause strong shaking, but a new study suggests that smaller earthquakes—those around magnitude 5.5 or so–are the cause of most occurrences of strong shaking at a 60-kilometer (37-mile) distance.

Small earthquakes are expected to produce relatively weak shaking, and for the most part that's true, said Sarah Minson of the U.S. Geological Survey. However, ground motion is highly variable, and there are always outlier earthquakes at every size that generate more shaking than expected.

Combine that with the fact that there are more smaller magnitude earthquakes than large magnitude earthquakes, and most shaking comes from these "little earthquakes with ambition," Minson and her colleagues report in Seismological Research Letters.

The researchers found that for all distances and for all levels of shaking, "the earthquakes that cause that level of shaking are systematically smaller magnitude than the earthquakes that should cause that level of shaking," said Minson, noting that this makes these smaller earthquakes a significant source of earthquake damage.

The findings could change how people think about and prepare for the "Big One," the large magnitude earthquakes that loom large in the imaginations of people from California to Chile, said Minson.

A future magnitude 8.0 San Andreas Fault earthquake will cause more total damage across the Los Angeles Basin than a smaller, local earthquake like the 1933 magnitude 6.4 Long Beach earthquake, simply because the larger earthquake causes shaking over a wider area. But that just means that there will be more overall shaking, not that the shaking will necessarily be stronger in any particular locality, she explained.

While waiting for the Big One, places like Long Beach are likely to have multiple damaging medium earthquakes, "and thus most damage at any location is probably coming from smaller earthquakes with ambition," Minson added.

The 1969 Santa Rosa, California earthquakes, around magnitude 6, caused about $50 million damage in today's dollars, while the magnitude 5.7 Magna, Utah earthquake earlier this year caused similar amounts of damage just to 100 government buildings, the researchers noted.

"For a lot of us, if we do look back over our personal experiences, the earthquake that we had the greatest amount of damage from is not the largest magnitude earthquake that we've felt at all," Minson said.

It's a "sharks versus cows" concept, she added. "Sharks are scary, and cows are not, but cows kill more people every year than sharks do."

The researchers began with calculations of the variation of expected ground acceleration from an earthquake of a certain magnitude and distance away from the shaking, along with the well-known Gutenberg-Richter magnitude-frequency relationship. The relationship demonstrates how the frequency of earthquakes decreases as the magnitude grows, so that for each magnitude 8 earthquake that occurs within a given region and time period, there will be 10 magnitude 7 earthquakes, 100 magnitude 6 earthquakes, and so on.

Together, these two factors suggest that most shaking should come from smaller earthquakes that are "ambitious outliers" in terms of the amount of ground acceleration they cause. "The probability of any of these small earthquakes producing shaking is tiny, but there are many of them," Minson said.

Minson and colleagues confirmed this hypothesis after examining three data sets of earthquakes from across the globe, ranging from magnitude 0.5 to 8.3.

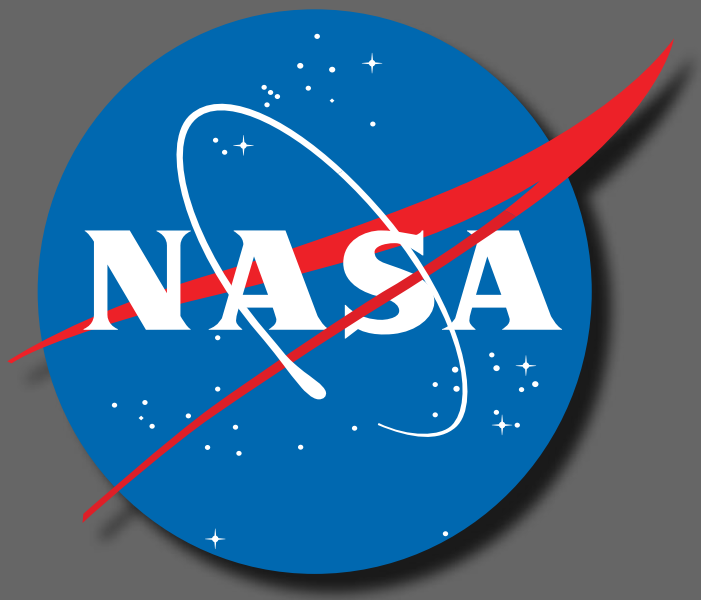
Ambitious little earthquakes may cause difficulty for some earthquake early warning systems, which alert users to potential damaging shaking after an earthquake begins, the researchers write. The closer users are to the earthquake source, the less likely it is that the alert arrives before they feel the shaking.

"If it turns that most of our shaking is coming from smaller magnitude earthquakes, well, smaller magnitude earthquakes are spatially more compact," Minson said, who noted that some systems also may not send out an alert at all for small earthquakes that aren't expected to produce damaging shaking.

The findings do not change the total amount of earthquake hazard calculated for a region, Minson stressed. "All we did is say, OK, when that shaking comes, what is it likely to come as? And it's much more likely to come as little earthquakes with ambition than a big earthquake doing what big earthquakes do."

This means, as Minson's USGS co-author Sara McBride says, that "it's time to talk about the medium ones." Surveys and studies show that people often are demotivated by efforts to prepare for the Big One, overwhelmed by fatalism in the face of such an event. Focusing on smaller but significant events could encourage people to devote more time and effort to earthquake preparedness, the researchers suggest.

"If we talk about earthquakes like Loma Prieta and Northridge, and ask people to be prepared for that, it's more tractable," Minson said. "Those are the earthquakes that people have experienced and know how to prepare for and survive."



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