Faculty Spotlight
Faculty Profile: Dr. Ricardo Arevalo, Jr.

The discovery of life beyond our planet will likely not be the stuff of science fiction movies. In fact, over the past couple of decades, the question that has plagued scientists for centuries has also brought them closer to home, on the surface of our celestial neighbor, Mars. For Associate Professor Dr. Ricardo Arevalo, Jr. and colleagues at NASA, you could say they’ve homed in on the red planet with laser focus. For close to a decade, Rick and his team of scientists developed a specialized instrument called the Mars Organic Molecule Analyzer (MOMA), a miniaturized mass spectrometer that uses a laser to analyze organic material in search of biosignatures and other basic building blocks of life. In 2020, the instrument will be ferried to Mars on the back of the ExoMars rover, the first rover to be able to drill into the planet’s surface as deep as two meters below the surface, where intact organic compounds may safely exist. Both a geochemist and planetary scientist, Rick left NASA in 2017 to come to UMD’s Geology department, sharing with students and colleagues his knowledge, curiosity, and penchant for looking both under his feet and skyward for clues to our cosmic makeup. Below, Rick discusses his path to science, a “lofty” hobby, and how the hardest part of building a rover instrument isn’t creating the technology, it’s shrinking it:
What was your path to science, and more recently, your work with NASA? A lot of it had to do with good teachers. When I was young, I loved earth science because I had a really kooky instructor in eighth grade who made it fun and piqued my interest. Then, when I went to grad school, I was paired with an advisor I really meshed with. After getting my Ph.D. at Maryland, where I studied the chemical signals of rocks using lasers, I had every intention of applying for the NASA post-doctoral program, even going so far as to visiting Goddard and speaking with the team of advisors. For a couple of reasons, I didn’t end up applying, but they remembered my doctoral work; when a civilian job opened up on a team that was developing miniature laser mass spectrometers, they asked if I’d be interested. I said, “of course!” I was at NASA for seven years.

What brought you to UMD? NASA has a very robust summer internship program and I found that I really enjoyed the element of teaching. In leading young research teams, you are teaching
them about the basics of chemistry and terrestrial samples, while encouraging them to think about big picture stuff, like planet-forming processes. During my time as a project manager, I relished the problem-solving aspect and the collaboration with team members and their perspectives. But at the same time, I wanted to return to my research roots. Where I am right now lets me to do that, while still maintaining the instrument development path, and of course allowing me to teach.

One of your most notable NASA projects was the Mars Organic Molecule Analyzer, or MOMA, which ultimately will go to Mars in a few years. Was it hard to let it go when you were finished? No, the scary parts will be when they launch it, and when it lands. Those will be the moments my heart may stop. Seven-plus years of your life could end abruptly, but hopefully it will be really successful.

What can the makeup of other planets teach us? For instance, will it be able to tell us if there is life on other planets? Well, the information you can get from these types of analyzers can certainly feed into that line of inquiry, but that’s not the primary science mission. MOMA is the first instrument in a long time specifically looking for life on Mars, but it’s doing it in a way that’s never been done before on another planet. It enables the detection of potentially larger biosignatures; so, if you’re so lucky to come across, say, a protein, you’d be able to see it, where with traditional means, you might miss it. Mars is a tough environment because it has a limited atmosphere and is constantly bombarded by radiation; any organic content that might have been in the upper meter of the surface may be destroyed. What’s new about this Mars rover is that it can drill two meters deep; at two meters there’s a much bigger probability that you’ll be able to see biosignatures. From there we can ask, is it biological? Is it Martian or was it delivered by something else? It will open a lot of doors and inspire a lot of questions.

What are you working on right now that’s got you excited? There are two things. Even though the instrument has been built, I’m still part of the MOMA science team. Once the instrument is in use on Mars, that data will begin transmitting back to us. The primary mission is to look for biosignatures. That being said, when you hit a rock with a laser, you also get a lot of information about the actual rock. As a geologist, I’m also interested in what’s going on with that rock itself, such as its elemental makeup. One of my goals is to establish what our capabilities are for measuring the different elemental signals and understand what we can infer from that.

I’m also working with a team of French scientists and Goddard on a next-generation mass spectrometer that incorporates an analyzer called an Orbitrap—they are used a lot commercially, particularly in the pharmaceutical industry because they offer a much higher resolution. I want to develop that for space flight because it can do many things the MOMA instrument can, but a little bit better in several metrics. Everything we’ve sent to space is founded in something that’s commercialized because that’s how we know it works. The commercial ones are huge, so we need to develop it in the lab, and shrink it down while still getting all of the science out of it. It
brings a lot to the table that the scientific community recognizes.

What do you like about teaching? I like interacting with the students, and it’s completely different when you’re teaching a lower-level and a higher-level course. In my 100-level class, only 1 out of 99 kids is an actual geology major. So, when you see an indifferent student transform from “let’s get this over with” to truly interested and excited, it’s a real pay-off. And if one of them migrates over, that’s the greatest feeling ever. The upper-level classes are a little bit different but just as rewarding; the interest is there, but they ask fun, engaging questions, which shows that their knowledge base is growing. Plus, when you’ve had an impactful instructor yourself, you want to be that guy, because you know how much of an impact that person had on your life.

What’s one thing about yourself that not many people know about you? I am a big mountain climber. Last summer, I finally summited Mount Rainier. I didn’t do the mainstream route but went up an ice cliff, because I had the double ice tools and wanted to use them! The next one I’d like to do is Denali in Alaska, but its 20,000 feet, compared to Rainier which is around 14,000; so that would take three weeks, where Rainier took four days. I’d have to go on sabbatical!

What do like to do in your spare time? Mostly I’ve been cycling a lot. I did my first century ride (100-mile ride) this past October.

Article by Maggie Haslam

Recognition & Awards
DST Lecture Series

Shibley Telhami:
October 25
"The Clash of Values, at Home and Abroad"
Anne Simon:
October 30
"25 Years of National Science Foundation Broader Impacts: Inspiring a Generation of Women Scientists by Infusing Science into The X Files"

Ichiro Takeuchi (center): November 1
"Robot (Materials)"
Upcoming DST Lectures
Nov. 15: Merle Collins, "The Search for the Story of Louise Langdon Norton Little, Mother of Malcolm X"

Nov. 27: Jeffery Davis, "Sticking and Stacking: Building Molecular Cages, Channels and Gels"

Upcoming Awards
Professional Track Faculty Excellence
Nomination period: January 15 - February 15, 2019

Policy & Procedures
Expectations of Faculty
The instructor of record is responsible for the overall management of the course, including management of aspects of the course and coursework delegated to teaching assistants and laboratory assistants. Read more.

Student Course Responsibilities
The University expects each student to take full responsibility for their academic work and academic progress. Students have the responsibility to be familiar with and uphold the Code of Academic Integrity and the Code of Conduct. Read more.
Faculty Development

Professional Track (PTK) Symposium

On Friday, October 26, the first-ever PTK Symposium was held in Stamp Student Union. Over 170 faculty members attended. Having grown to more than half of UMD’s faculty, Professional Track (PTK) faculty members provide important contributions to achieving the institution’s teaching, research, and service mission. The Symposium celebrated that importance by providing a place for PTK faculty members to gather and share knowledge, learn from experts, find support, and network towards higher aspirational goals. Read more about the Symposium.
Tips & Resources

How One Email From You Could Help Students Succeed
By Jarod Opperman
A few years ago, Zoë Cohen noticed a troubling sign in her “Physiology of the Immune System” course: A larger number of students than usual had failed...Read more.

Disrupting Illusions of Fluency
By Shreyas Desai, MS, Kenja McCray, PhD, and Curtis L. Todd, PhD
No matter the academic discipline, course level, or time of day, the last five minutes of class often present instructors with a
News & Events

Big Ten Academic Alliance News

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Events

Postponed - December 6*       Faculty Forum: Immigration and America (This forum will be held in Spring 2019)

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