My name is Jasper Halekas and I'm a research scientist at UC Berkeley. I've been working on the ARTEMIS mission basically since it started. I'm now the deputy principal investigator for Vassilis Angelopoulos, who's the principal investigator.

How would you describe the ARTEMIS mission to a high school student?

There are two things I want to communicate about ARTEMIS. One is the amazing technical achievement that it is. ARTEMIS, if you haven't heard about it, is two spacecrafts that were originally part of the five spacecraft mission called THEMIS. But two of the five spacecraft, when they finished their original mission (to observe the space around the Earth) were taken out to the moon. The orbital design for that was just amazing. They took them flying way up out of the orbital plane of the Earth and the Moon, dove them back in, did a really cool lunar swing by orbit, orbited around the special points in space called Lunar Lagrange Points, and then finally brought them into lunar orbit. The technical achievement there was amazing.

And then, of course, the whole reason for that was the science of the ARTEMIS mission, which is basically looking at how the Moon interacts with its environment in space. The Moon is kind of just hanging out there -- it doesn't have an atmosphere or a magnetic field to protect it from the space around it. So it's basically getting pelted all the time by -- think of it as a sort of a hailstorm of stuff coming off of the Sun, mainly. So there's photons (sunlight) coming from the Sun and then there is a hot soup of charged particles that we call plasma, always streaming out from the Sun. These two things, as well as micrometeorites, just bombard the Moon. And with ARTEMIS we can see what that does to the environment around the Moon.

What would you say are the main science concepts related to ARTEMIS?

The fact that the Moon is very unlike the Earth; it has no atmosphere, actually a very, very thin atmosphere. It has no global magnetic field like the Earth, so it's much more unshielded. It's basically bombarded constantly by external influences, many of them coming from the Sun. There's photons (sunlight) and there's this hot soup of ionized gas called plasma that's constantly flowing out from the Sun, bombarding the Moon. Once a month, the Moon goes through the Earth's magnetosphere and is actually affected by the Earth's magnetic field and plasma. But it's just sitting out there, getting hit by all of this stuff, getting bombarded by this hailstorm of stuff. The way that it responds to that and what happens to the Moon because of that bombardment is what ARTEMIS is studying.

How is ARTEMIS studying the Moon? (What kinds of data is ARTEMIS collecting?)

ARTEMIS is a plasma physics mission. So we're measuring plasma. That means we're measuring charged particles and ions and measuring electromagnetic fields. So we measure the electric field, magnetic field, and we measure electrons and ions. We can use those as remote probes of what's going on around the Moon. For example, one thing that we're measuring with ARTEMIS is something called pick-up ions. These are ions that are actually produced in the very tenuous atmosphere of the Moon. The Moon has very little atmosphere, but it has enough atmosphere that there's a thin layer of gas there on the Moon. Some of that gets ionized and when that happens, the ions get accelerated by the fields in the solar wind, and they can form this giant plume extending

out from the Moon towards the spacecraft where we observe it from ARTEMIS. We're seeing these things, 10,000, 20,000 kilometers from the Moon. But by understanding where they came from and how they were formed, we can actually learn something about what happened very near the surface of the Moon. So that's just one example, and there are a number of other things that ARTEMIS is looking at besides that, but many of them fall under the same idea of measuring something far from the Moon and extrapolating that to things happening back at the surface.

What is your role in the ARTEMIS mission?

My role is deputy principal investigator, which is basically the second in command of science on the mission. So I make sure that everything is running smoothly, which is very easy. We have a great ops team which runs itself. I'm also trying to make sure that we get the most science that we can out of the ARTEMIS mission. I do my own science too. But I'm also trying to talk to other people and collaborate with people. I help them get to the data they need, and make sure that we can get the best bang for our buck from this mission, basically.

What's the basic process that you use to do your research?

Mostly I sit down and look at the data. I see what I find and I try to explain it. Some people like to do science by formulating a hypothesis and going and trying to solve that. That’s the great classic way of doing science and I do some of that too. But what I really like to do is look at data that no one has seen before. We're getting this brand new data from the Moon that no one has ever looked at, and I see what's interesting and try and figure out what it is.

How will that research impact everyday people in the future?

From a science stand point, we're studying the moon. It's a typical rocky body in the solar system. So by understanding the Moon we can understand other planets and our place in the solar system as a whole. There's also an application potentially to space exploration. The Moon has potential as a stepping stone or as a test bed for future exploration adventures. People talk about putting a base on the Moon as a precursor to one on Mars or something like that. So from that standpoint, understanding the lunar environment is very important.

What do you find most exciting about the ARTEMIS mission?

The thing that's really the most cool about ARTEMIS for me is the fact that we're seeing that the Moon isn't just this dead body sitting there. You look up at the Moon in the sky and it's very serene and tranquil view, but if you could look at that through ARTEMIS's eyes, you would see this environment that's just kind of burbly and seething with activity. And we're seeing that that zone of activity around the Moon extends really far out -- 20,000 kilometers out from the Moon we're seeing the effects of its presence.

Could you please describe a challenge you faced in your work and how you overcame it?

My whole job is solving problems. Some of the problems are little, some of them are big, but every day I get up in the morning and I'm faced with a new set of problems. Be they some scientific

problems that I try and figure out or some problems with an instrument that I'm working on or you name it. So I get up and try and solve problems. The process for solving them is kind of the same for all of them. I have to try and find the information I need, if I don't know it already. That involves doing research, talking to people that might know the answers, sometimes it even just involves trying random things until you hit the right answer.

On a more personal note, could you describe your educational background?

I was a physics and math major at the University of Washington. I got involved in Space Physics for the first time when I was at UW because I had a NASA space grant scholarship. They set me up with a summer research program there where I started studying space physics. Through that, I met a lot of people, including my eventual advisor here at Berkeley. So when I finished my bachelor's degree at Washington, I came here to Berkeley for a PhD. I started that PhD in 1998, and I've been here ever since. I got my PhD and I stayed on as a post-doctoral research associate and now I'm a research scientist.

What advice do you have for high school students interested in a career in STEM?

Get involved! The opportunities out there now are amazing for young scientists. Whether you're in high school or middle school or college, there are opportunities out there for you to get involved and research at some level. Getting involved and trying it out and seeing if you like is the best way to go.

What do you like to do when you're not working?

I'm kind of an outdoorsy guy. I like to run, cycle, and rock climb. In reality, I have very little time for all those things recently because I have an eight-month old son, so mostly I wrangle him, and follow him around and try and keep him from crawling off of precipices and stuff like that. I've done ultramarathons in the past, but I retired a couple years ago.

Growing up, was there any person, moment, or experience that you had that influenced you in becoming a scientist?

Well as a young kid I was always interested in science fiction. Science fiction predisposed me a little bit towards space and science and things. But if I had to answer that question in one way, I would say Carl Sagan. I read a bunch of Carl Sagan books when I was a teenager and got inspired by science at that point. From then on I knew I wanted to get a college degree in some kind of science. After that there were lots of accidents along the way but that was the first thing that pushed me into it.