ASTRONOMY BEHIND THE HEADLINES
A podcast for Informal Science Educators
from the Astronomical Society of the Pacific
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Episode 4: IMPACT ON JUPITER
with Dr. Heidi B. Hammel, Space Science Institute

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Produced by the Astronomical Society of the Pacific

HOST: Welcome to Astronomy Behind the Headlines, a podcast by the Astronomical Society of the Pacific.

On July 19, 2009, Australian amateur astronomer Anthony Wesley made a wonderful discovery. He spotted a dark-colored scar high in the clouds over Jupiter's southern polar region. It looked suspiciously familiar — like the scars left behind by Comet Shoemaker-Levy 9 when its shattered fragments crashed into Jupiter in the summer of 1994. The aftermath of that impact told planetary scientists a great deal about how Jupiter's atmosphere responds to such collisions.

As soon as news of this most recent impact broke, astronomers rushed to observe the area where the object plunged into Jupiter's upper cloud decks. They used an array of both ground-based and space-based observatories to study the aftermath of the collision.

Dr. Heidi B. Hammel of the Space Science Institute in Boulder, Colorado is one of those astronomers. She focuses much of her attention on the giant planets Uranus and Neptune. But, she's also one of the experts who studied the 1994 collision at Jupiter and used what she learned from that impact to understand more about this most recent one. Her team's observational data come from the Hubble Space Telescope, as well as the Keck and Gemini telescopes in Hawai'i. The data are still being studied and analyzed to understand both the nature of the event and what this one did to Jupiter's atmosphere. We talked with her about what she and her colleagues are learning from the July impact.

Dr. Hammel, what kinds of observations did you and your team make using the Hubble, Gemini, and Keck cameras?

HEIDI HAMMEL: We were taking imaging observations with all three telescopes, that I was involved in. Images with Hubble with very high resolution at visible wavelengths — high spatial resolution. The Gemini telescopes we were doing mid-infrared imaging — that's essentially measuring the heat from Jupiter and from the impact site. And, with the Keck camera at the Keck telescope, we were imaging in the near-infrared. This is wavelengths longer than your eyes can see, but it's still reflected light.

HOST: One of the most important goals of your observations was to watch as the morphology — the shape — of the impact site changed over time after the collision. Clearly you've been able to do that. What else have you been looking for in your data?

HH: We were specifically looking for signatures of different chemicals, or chemistry, in the atmosphere of Jupiter that may have been caused by the impact. Effectively, what this debris that we're seeing — the dark stuff at visible wavelengths — is debris from the explosion that occurred when whatever that body was hit Jupiter. And, by tracking that debris, we can can trace out the wind motions of the atmosphere of Jupiter — effectively letting Mother Nature inject dye into the atmosphere of Jupiter, and then we can watch how the winds move that dye around..

HOST: What did your observations reveal about the entire event?

HH: Well, we're still working very hard to figure out what the observations are telling us. The zero-order thing that we learned was that another impact happened very quickly after Shoemaker-Levy 9. And that was a big surprise. We were expecting NOT to see another event like this in our lifetimes. We were expecting to wait a hundred, two hundred, five hundred years. So, to have one happen fifteen years — that surprised us. So, either that means we were just very lucky — statistics works that way sometimes, you know. You can flip a coin and have it come up fifteen times in a row — it does happen. Or, else it could mean that our understanding of the population of the bodies is not quite right. Maybe there's a lot more out there than we were anticipating. And so, we'll be debating that quite a bit.

As to what we're learning about Jupiter specifically — we're actually still very deeply involved in getting new data and analyzing the data. So, we're not really ready yet to talk about what science we've learned yet. We're still right in the midst of observations. We still have Hubble observations to come, yet.

HOST: How much longer will you be observing it then?

HH: Well, with Hubble we have just one more orbit of telescope time left. There are other programs with other telescopes that will continue. Basically, we're going to try to keep looking as long as we can still see material.

Now, the dark stuff that you see at visible wavelengths that was first seen by the amateurs — that material is being very much dissipated by the winds of Jupiter. Based on our experience with Shoemaker-Levy 9, I anticipate that not many more weeks will be left to track that. It will be so dispersed and spread out by those winds of Jupiter, that we won't be able to say what is impact and what is just regular Jupiter cloud material.

There are other wavelengths of light that do let us track things for much longer in the atmosphere. I think that some of the chemistry that we saw in the upper atmosphere was detectable up to a year later — a year after the Shoemaker-Levy 9 impacts. So, we'll be continuing to look at Jupiter as often as we can, to see what's still visible to us.

HOST: One of the most interesting lessons learned from this summer's impact is that our solar system still has a great many smaller objects that can cross orbits with planets and their moons. When they do that, there's always a chance that they'll smack into those worlds, just as the small object did at Jupiter earlier this summer.

You can learn more about the Jupiter impact, the populations of small solar system objects, and Dr. Heidi Hammel's work, at the Astronomical Society of the Pacific's Astronomy Behind the Headlines web page at www.astrosociety.org/abh. Thanks for listening!

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Special thanks to Dr. Heidi B. Hammel