

# What Hit Jupiter?

August 3 2009, by Dr. Tony Phillips

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South is up in this July 19th discovery image taken by Anthony Wesley using a 14.5-inch telescope in Murrumbateman, Australia.

(PhysOrg.com) -- It began with a furrowed brow, a moment of puzzlement, quickly dismissed.

The date was July 19, 2009. Amateur astronomer Anthony Wesley was photographing [Jupiter](#) from his backyard observatory in Murrumbateman, Australia, when something odd caught his eye.

"My attention was fixed on the Great Red Spot, which was setting beautifully over Jupiter's horizon," recalls Wesley. "I almost didn't notice the dark blemish near Jupiter's south pole, and when I did, I put it out of my mind."

*It's just another dark storm on Jupiter.*

"That's what I thought at first, but something about the dark mark puzzled me, it didn't look right, and I couldn't stop stealing glances at it."

Slowly, Jupiter's rotation turned the blemish toward Earth, Wesley got a better look at it, and the truth struck him like a thunderbolt.

*It was an impact mark. Something hit the giant planet!*

"I had seen the scars caused by fragments of Comet Shoemaker-Levy 9 hitting Jupiter in 1994, so I knew what an impact looked like," he says. "After I'd convinced myself that this was real, I could hardly use the computer. My hands were shaking. It was quite unbelievable."

He quickly emailed his photos to friends and colleagues around the world, and within hours telescopes great and small were turning toward Jupiter to photograph the aftermath of a powerful collision.

"We believe it was a comet or asteroid measuring perhaps a few hundred meters wide," says Don Yeomans of NASA's Near-Earth Object Office at JPL. "If something of similar size hit Earth—we're talking about 2000 megatons of energy--there would be serious regional devastation or a tsunami if it hit the ocean."

In a stroke of luck almost as big as Wesley's, JPL astronomers Glenn Orton and Leigh Fletcher were already scheduled to observe Jupiter on July 20th, barely a day after impact, using NASA's Infra-red Telescope Facility (IRTF) atop Mauna Kea in Hawaii. The 3-meter telescope revealed a fresh cloud of debris about the size of Mars floating among Jupiter's clouds.

"The object, whatever it was, exploded in Jupiter's upper atmosphere," says Orton. "It blew itself to smithereens. What we're seeing now are bits and pieces of the impactor and possibly some strange aerosols formed by

shock-chemistry during the impact."

On July 23rd, the Hubble Space Telescope took its first pictures of the blast site. Hubble was still undergoing checkout and calibration following the STS-125 servicing mission in May, but this event was too big to skip. Space Telescope Science Institute director Matt Mountain allocated emergency telescope time to a team of astronomers led by Heidi Hammel of the Space Science Institute in Boulder, Colorado.

As usual, Hubble photos stole the show. They revealed a swirling maelstrom of dark cindery debris jostling with natural storms near the top of Jupiter's atmosphere:



A Hubble Space Telescope image of the Jupiter impact scar taken on July 23, 2009, taken using Hubble's new camera, the Wide Field Camera 3 (WFC3).

"The debris cloud is lumpy because of atmospheric turbulence," explains planetary scientist Amy Simon-Miller of the Goddard Space Flight Center. "Polar winds blowing 25 m/s (~55 mph) are causing it to spread out and grow larger. This will make the cloud even easier to see through backyard telescopes."

Judging from the behavior of the [Comet Shoemaker-Levy 9](#) impacts fifteen years ago, she estimates that the 'Wesley debris cloud' could remain visible for many weeks to come. Researchers will put the time to good use. Further studies of the cloud might yet reveal the great unknown:

*What hit Jupiter?*

"We just don't know," says Yeomans. "No one saw the object prior to impact."

Indeed, there was no warning. The object emerged from darkness, unknown and uncatalogued, and—wham!—before anyone could photograph the body intact, it had become a cloud of debris. (There is a lesson here for Earth, but that is another story.)

The cloud's chemical composition holds clues to the nature of the impactor. Orton says ground-based observers are now analyzing light reflected from the cloud to figure out what it is made of. "If the spectra contain signs of water, that would suggest an icy comet. Otherwise, it's probably a rocky or metallic asteroid."

Meanwhile, it's a big dark mystery—the kind that Wesley can't take his eyes off of. "I am still observing Jupiter almost every night using my 14.5 inch telescope," he says. "The cloud is expanding and taking on some interesting shapes."

"I wonder," he says, "what will happen next?"

Source: by Dr. Tony Phillips, Science@NASA

Citation: What Hit Jupiter? (2009, August 3) retrieved 9 April 2024 from  
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