Blueshift - September 16, 2009 - Swift sees Andromeda in a New Light.

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Maggie: Hello and welcome to the September 16th 2009 episode of Blueshift, the podcast from the Astrophysics Science Division at NASA's Goddard Space Flight Center. I'm your host for this week, Maggie Masetti.

If you've ever spent a fall evening stargazing under a clear, dark sky, you may have spied a faint cloudy patch in the constellation Andromeda. That patch is actually an entirely separate galaxy from our own. It's called M31 or the Andromeda Galaxy. It's a big spiral much like our own and the closest such galaxy to us. Yet the light we see from M31 has been traveling for two-and-half **million** years.

NASA's Swift satellite has taken a deep look at M31 using ultraviolet light. Here's Blueshift's Tommy Nelson with more.

Tommy: As evidenced by every suntan, there's more to the electromagnetic spectrum than the light we see. Many astrophysical objects, in addition to the sun and tanning booths, emit some of their energy as ultraviolet light.

Recently, the Ultraviolet/Optical Telescope on board NASA's Swift satellite surveyed neighboring M31 and produced the best-ever view of the galaxy in this spectral regime. Stefan Immler, a research scientist on the Swift team here at Goddard, led the project.

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Tommy: These images are quite remarkable. What scientific goals did you have in mind when you originally designed the project?

Stefan: We designed this project primarily to obtain the best ultraviolet image of any galaxy obtained to date, in terms of spatial resolution, and also coverage of the entire galaxy. And with that image we wanted to address a number of science questions like, how are stars being born in galaxies, how do they live throughout their lives, and how do they die?

Tommy: Now, M31 is pretty far away. Wouldn't it be easier to study star formation here in the Milky Way, since everything is closer?

Stefan: The problem with our own Milky Way galaxy is that we are located right inside the galaxy. It's almost like you're standing inside a forest and you want to get an idea how big the forest is. So M31 provides us like a bird's-eye view on top of the galaxy, so we can map the entire galaxy, and see all the processes that are happening inside the galaxy. And yet M31 is close enough that we can point our telescope to the galaxy and have a high spatial resolution, so we can see everything in great detail.

Tommy: When I think of Swift, I normally think of gamma-ray bursts and supernovae – the kind of astronomy that requires a rapid response time. Is Swift commonly used for the type of projects you designed for M31?

Stefan: It actually is. Swift – it's true what you say that Swift has been designed and operated as a mission that can turn around very quickly to new explosions in the universe. Actually the name “Swift” is not an acronym – it's what it does. It can swiftly slew across the sky. But on average we only observe about three or four gamma-ray bursts every week, so it has a lot of down-time for the observatory that we can use for other projects.

Tommy: You mention in the video that the UV sources are primarily young stars and clusters. Is that all we can see in the UV?

Stefan: So typically, optically you see objects that have a few thousand degrees. Now as you go to the ultraviolet wavelengths, you see objects that are actually much hotter than that. So these have typically a few tens of thousands of degrees. And young stars can be as hot as a few ten thousand degrees, so you see a lot of young stars in ultraviolet images. But you also see the hot phase of the interstellar medium as we call it, so these are hot clumps of gas and clouds inside those galaxies, that have been heated by nearby stars to temperatures of a few ten thousand degrees. And these are also objects we see in the ultraviolet. But then in M31 you see actually much more than that. You not only see individually all these different clumps where stars are being born out of these hot clouds of gas, and you see those newly-born stars. You also see, because we cover the entire extent of the galaxy, you see how there is almost a ring of fire around the galaxy, where all these star formation processes take place, where all these stars are born. And we think that there's this ring around this galaxy that is so bright in the ultraviolet because of the interaction – the tidal interaction – of the M31 galaxy with a number of companion dwarf galaxies that are orbiting the galaxy.

Tommy: How can these images be used to complement surveys of M31 at other wavelengths?

Stefan: Well, M31, as one of the nearest Local Group galaxies, of course has been studied in great detail by many observatories both ground- and space-based. But there was one piece of information that was actually still missing, and that's the ultraviolet. And ultraviolet astronomy is almost like a lost form of art, because in the 70s and 80s we had a number of satellites in space that were able to capture ultraviolet light, but these missions are not operating anymore. And most people who had been working at that time actually have retired. So we provide ultraviolet images that are like the last piece in the puzzle to fill up the entire electromagnetic spectrum, that is, all forms of light that we can study.

Tommy: So what's next for the project?

Stefan: This project will be continued. This project is part of a major effort to have a survey of nearby galaxies in the ultraviolet. What we actually want to do is, we want to make an inventory of the nearby universe in the ultraviolet. And we will use this survey of nearby galaxies later to study these kind of processes that lead to the formation, and to the death of stars in more distant galaxies. So this is all part of a larger effort.

Tommy: Stefan, thanks again for talking with us, and we look forward to seeing more of your results in the near future.

Stefan: Thank you, it was my pleasure.

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Maggie: M31 has been known to observers since at least 964 A.D., when the Persian astronomer Al-Sufi dubbed it "the little cloud."

If only the ancient astronomers could have seen the heavens as we're able to observe them today!

You can find more information on today's story, as well as some links on our website: universe.nasa.gov/Blueshift. You can also see what we're up to by following us on Twitter. We're @NASABlueshift.

That's it for now but we'll see you in another couple of weeks. This is Maggie Masetti, bringing the Universe closer to you with Blueshift.

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