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Julie Cohen

‘Milky Way Blues’

Scientists often transform astronomy data in a way that allows for interpretation with visual plots such as color-coded graphs. UC Santa Barbara postdoctoral fellow Greg Salvesen went in a different direction. He decided to instead map raw data to sound to make the excitement of astronomy — a traditionally visual science — accessible to people with visual impairments.

Salvesen’s recently launched website, Astronomy Sound of the Month or AstroSoM (pronounced “Astro Psalm”), features different sounds produced from actual astronomy data, along with a brief explanation written by an astronomer.

“AstroSoM explores how sound complements more traditional astronomy data analysis,” Salvesen said. “Besides, making sounds out of real astronomy data is just plain cool!”

For his latest feature, Salvesen collaborated with University of Massachusetts astronomy professor Mark Heyer to produce a piece called “Milky Way Blues” that allows listeners to “hear” how our galaxy rotates. Heyer created the sonification and Salvesen supplied the visualization, incorporating an existing image of our galaxy created by Robert Hurt of IPAC/Caltech. The combined efforts reduce complex data into visual and aural components that track the movement of gas through the galaxy.

“‘Milky Way Blues’ has a bit of a player piano look and feel to it, which is what we wanted,” Salvesen explained. “What you’re hearing is the rotation or the motion of

gas in our galaxy.”

Radio telescopes observe different spectral emission lines to probe different phases of gas (atomic, molecular, ionized). Astronomers measure the Doppler shifts of these lines to determine gas velocities along the path that the telescope is pointing. To turn one of these observations into musical notes, the measured gas velocities are mapped to a pentatonic minor blues scale.

Each note and circle represents gas that is either coming toward Earth (high notes and blue color) or moving away from it (low notes and red color). Different gas phases are played by different instruments — acoustic base (atomic), wood blocks (molecular), saxophone (ionized) and piano (molecular) — and are represented by different colored borders on the circles.

A line showing where the telescope was pointing represents each observation, and the positions of the circles along a line show the locations of the gas in the galaxy. The star symbol shows the location of the sun. The intensity of the emission coming from the gas is heard as longer note durations and shown as larger circles.

With every new measure, the lines swing around to new observations. Putting it all together, the variation of musical pitches heard in “Milky Way Blues” portrays the motion of gas as it orbits around the center of our galaxy.

Previous features on the AstroSoM website are: “The Sound of a Fast Radio Burst”; “The Inner Solar System Plays Radiohead’s Saddest Song”; “Never a Mundane Supernova in the Sky”; and “Our Galaxy is Only One of Trillions in this Amazing and Expanding Universe.” Each post includes a short summary and links for more detailed explanations.

Funded by the National Science Foundation’s Astronomy and Astrophysics Postdoctoral Fellowships program, Salvesen works with UCSB physics professor Omer Blaes, studying black holes using supercomputer simulations and X-ray telescopes in space. AstroSoM is part of his broader ongoing efforts to develop accessible educational materials that use sound as a complementary medium for teaching astronomy concepts. Incorporating data sonifications into the classroom, he said, makes astronomy accessible to students with visual impairments and aural learning styles and to those for whom English is a second language.

About UC Santa Barbara

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