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# Deaf Students Feel the Universe's Vibrations in New Workshop



A purple and green aurora lit up the sky above Delta Junction, Alaska, on 10 April 2015. Deaf students felt the vibrations of sonified aurora data in a new workshop that featured the vibrations of the universe. Credit: Sebastian Saarloos

**A** new workshop brought the vibrations of the universe to Deaf students, a group often overlooked in informal outreach activities. Astronomers and teachers at a school for Deaf children partnered to design an activity that transformed cosmic phenomena into vibrations that students could feel and could connect with visuals and a scientific narrative.

“It’s the beginning of trying to think of scientific outreach with a much broader appeal, where everyone is capable and must have access to public outreach of science,” Mario De Leo-Winkler, an astronomer and director of the National System of Researchers of Mexico, told *Eos*.

When he began looking into astronomy outreach activities for children with physical disabilities, De Leo-Winkler found that there were many activities designed for blind people, who could not see the stars, but few designed specifically for Deaf children.

“We all like the stars,” he said. “If that was enough—if looking through a telescope or interacting with things related to science or to astronomy in general was enough—then we would all be scientists or we would all be astronomers. You need an extra push as a citizen to be enticed or enamored with science.”

### Making Astronomy Data Vibrate

According to recent surveys, over 5% of the world’s population are Deaf or hard of hearing, but this community represents only about 1% of recently awarded science and engineering doctorates. This is partly due to the scarcity of Deaf-accessible science, technology, engineering, and mathematics (STEM) courses in higher education, De Leo-Winkler explained. The number of Deaf-accessible STEM and astronomy-related outreach and research programs has grown in recent years, and De Leo-Winkler wanted to create one in his own backyard.

De Leo-Winkler and other astronomers at the University of California, Riverside decided to create their own outreach activity in partnership with the California School for the Deaf, Riverside (CSDR). The team decided to focus on developing an activity that uses the sense of touch to convey information. Research into brain development has shown that in people who are born Deaf or who lose hearing later in life, the brain rewires itself to process vibrations in the absence of sound through a phenomenon known as neuroplasticity.

The researchers gathered recordings of Earth and astronomical phenomena that produce distinct sounds or that vary with time. For data that were outside the range of human hearing—about 20–20,000 hertz—they used an algorithm to shift the sounds into that range.

For nonauditory data sets, the researchers used a technique called sonification to transform the data into sounds and vibrations the students could experience.

CSDR teachers gave their expertise and guidance to the astronomers when selecting sounds that would produce detectable and distinguishable vibrations. They also developed American Sign Language (ASL) interpretations for unfamiliar astronomy terms in the accompanying narrative.

The team held the workshop in a multisensory sound lab at CSDR. The lab converts sound into other mediums, such as vibrations and light, that can be experienced by Deaf individuals.

**The brain rewires itself to process vibrations in the absence of sound through a phenomenon known as neuroplasticity.**

“We’re giving the explanation, we’re showing the imagery, and we’re producing the vibrations at the same time,” De Leo-Winkler said.

### Vibrations of the Universe

The researchers held two workshops in the multisensory sound lab for CSDR students in grades 3–8. They collected feedback from participants after the first workshop and altered their set of vibrations, visual materials, and verbal and ASL narratives in the second workshop in response to that feedback.

The students first learned some introductory astronomy in their classrooms before participating in the workshop. The workshop presenter then introduced students to the idea that sounds and vibrations are connected and gave examples that students might be familiar with, like thunderstorms or pots of bubbling water. The presenters explained that everything in the universe produces energy and that energy can be converted into sounds or vibrations that they could feel.

The workshop activity took the students on a journey from Earth outward to the edges of

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the solar system and beyond with 19 different vibrations. Some of the vibrations they experienced include Earth’s auroras, the vibrations of the Sun, and radio emissions from Saturn recorded by the Cassini spacecraft (listen to the accompanying audio files at [bit.ly/Eos-vibrations](http://bit.ly/Eos-vibrations)).

Eighty-three students participated in the two workshops and provided overall positive feedback about the experience. The team analyzed the survey responses and published the results in February in the *Journal of Science Education and Technology* ([bit.ly/astronomy-deaf](http://bit.ly/astronomy-deaf)).

### Opening the Door

This workshop focused on astronomy phenomena, but the techniques could easily be adapted to other STEM disciplines, such as physics, stem cell research, or genome mapping, De Leo-Winkler said.

“I think the possibilities are limitless,” he said, “as long as you have a clear interpretation of the information that you want to transfer to the students and as long as it’s fun.”

The team has made all of its sound files and presentation materials freely available online at [bit.ly/astronomy-vibrations](http://bit.ly/astronomy-vibrations).

“We’re opening the door for others to be able to explore for themselves what has been done and to think out of the box,” De Leo-Winkler said. “We invite people to take it in, to use it, to reimagine it, and to follow some of the steps and create new and innovative things.”

By **Kimberly M. S. Cartier** (@AstroKimCartier), Staff Writer



Photo by Lija Treibergs; submitted by Adrianna Trusiak

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