

PRAXIS

Research we can use

SUN SONGS

ROBERTO MORALES TURNS UP THE VOLUME ON HIS laptop, and a whirl of static fills the room. His fingers dance across the keyboard with the grace of an expert pianist, but the “music” we’re listening to sounds nothing like Bach. This is far more alien: There’s a sudden high-pitched burst—like a hammer pounding out scales on a xylophone. Morales smiles mischievously. His frizz of dark curls seems to stand on end as if zapped by electricity.

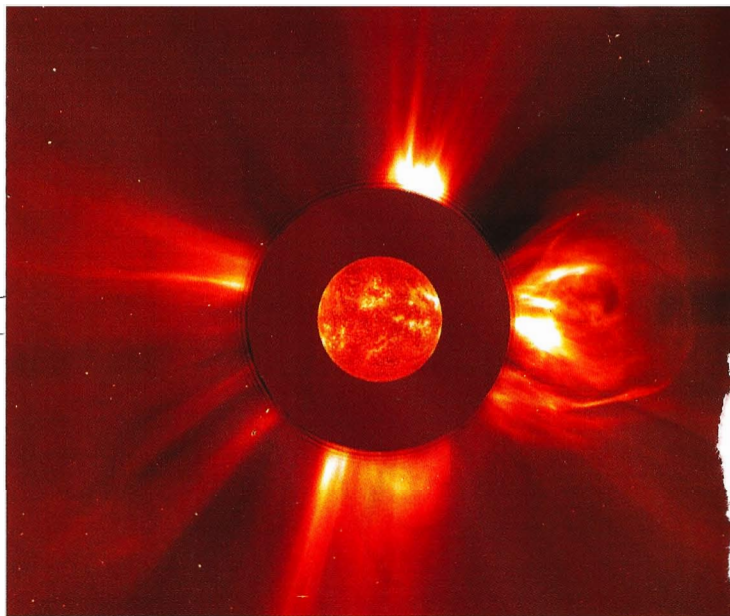
What we’re listening to is actually the music of a solar burst—the sudden ejection of charged particles from the sun’s corona. The sun emits a constant drizzle of particles from its corona, or outer atmosphere—creating the static we heard. But every now and then, large bursts of particles explode into space. Morales, a musician, composer, and doctoral student at Berkeley’s Center for New Music and Audio Technologies, has been working with researchers at the Space Sciences Lab for two years to translate satellite data from solar bursts into sound—a process they call “sonification.” By collaborating with musicians like Morales, scientists can analyze solar bursts using their ears instead of their eyes.

Solar bursts are responsible for those ghostly illuminations in the night sky known as aurora borealis, or “Northern Lights.” But beyond creating a pretty picture, they can also be dangerous. Charged solar particles can rain down on earth, disabling satellites and causing blackouts and other costly disruptions in the earth’s magnetic field. The last large solar burst in October 2003 caused power surges across the globe, from the U.S. to Sweden. Studying what scientists call “coronal mass ejections” will help government agencies prepare for similar disasters in the future.

Far up the hill from Morales’ basement studio, the concrete hulk of the Space Sciences Lab sits shrouded in fog. At the lab, I ask Laura Peticolas, the coordinator of the sonification project, how listening to solar bursts is different from looking at them. “We’re listening for unusual patterns or signatures,” she says. “What listening to the data will do is pick up nuances that you might not pick up visually.”



Astronauts can grow two to three centimeters taller while in space. Without the effect of gravity, the vertebrae move slightly farther apart, causing joints in the body to become misaligned. Astronauts’ suits are designed to compensate for this “rubber band” effect.



Hot stuff: If you thought the surface of the sun was blazing (it’s about 10,000 degrees Fahrenheit), it’s arctic compared to the 2.7 million degrees Fahrenheit temperatures found in the corona. Above, the largest solar flare on record.

The true test of the project will come at the end of the summer, Peticolas says, when two NASA satellites called STEREO will launch with the specific goal of capturing data on coronal mass ejections. “With two satellites, we can put one satellite’s data in one ear and the other in the other ear, and have stereo sound,” Peticolas explains. “We can learn a lot about how [the solar particles] travel through space, from the sun to earth. Do parts of it slow down? Do other parts speed up? Does it turn? The two satellites take measurements in space, so when the coronal mass ejection goes by, it’s like two buoys in the ocean when a wave propagates past them.”

Finding a middle ground between science and art hasn’t been easy, Peticolas says. “[Scientists] need the data to be as accurate as possible,” she says. “But Roberto wanted to make something much more musical and artistically interesting.” In the end, science won, but Morales was able to turn the solar burst data into a musical composition called “Turning Point,” performed by the University of Guanajuato’s Philharmonic Orchestra in 2004.

Peticolas taps her keyboard and the eerie solar music fills her office. We sit and stare at her computer screen. The whole scene reminds me of *Close Encounters of the Third Kind*, that classic film from the late ’70s in which extraterrestrials send messages to earthlings through music.

“This is pretty trippy,” I tell her.

“It is trippy,” she exclaims, laughing. Peticolas is in the final month of pregnancy, and I suddenly wonder what her unborn son must think of the strange music he’s constantly subjected to.

“I think this is the first time he’s heard it since his ears developed,” Peticolas says, pensively. “Yeah, what’d you think of that?” she asks her extended belly. “I hope I’m not freaking you out.”

—Carrie Ching



Tap water in some states might be safer to drink than bottled water. A study of bottled water found 22 percent contained levels of pollutants such as arsenic that exceeded the California limit. Tap water is regulated by the EPA, which has stricter requirements of disinfection and testing for parasites. An estimated 25 percent of bottled water is really just tap water in a bottle.