Study Guide

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Introduction

- Spacetime is an artful, fact-filled multi-media performance that celebrates the human quest for understanding as it speaks for planetary stewardship, telling the story of our cosmic origins from both scientific and poetic perspectives.
- The performance is richly illustrated with animated computer graphics and astronomical images brought to life by a live, blazingly virtuosic electric guitar score and original poetry that embraces the vastness, complexity, and beauty of the cosmos and our efforts to understand it.
- A live show forging art and science; imagery and sound; inquiry and imagination.

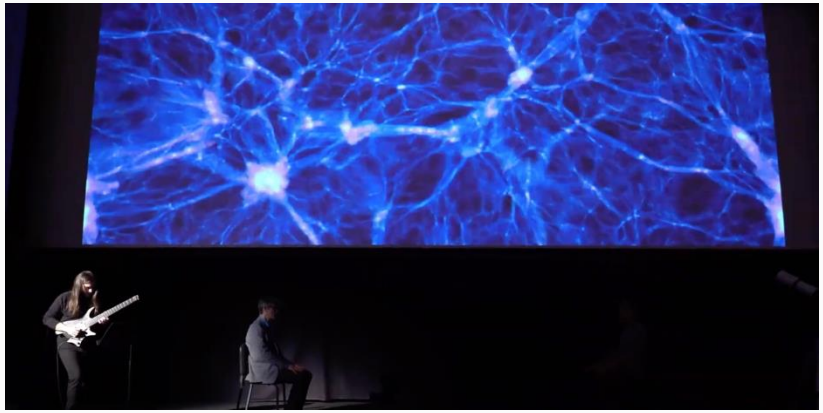
SPACETIME

THE UNIVERSE STORY AND OUR PLACE IN IT

A show for audiences who gaze at the stars and wonder, who have questions and seek knowledge, and who know that science and art are expressions of the same basic human impulse to explore. Be prepared to have your mind blown, your heart opened, your eyes widened, and your ears treated to sounds they've never imagined before.

SPACETIMESHOW.ORG

Watch video trailer



Watch after-show audience's reaction

A CAST OF CREATORS

In Spacetime we invite our audience along as a poet,
a musician, and a scientist do what they do every day to present an experience that is anything but everyday.

David González
Poet, Storyteller, Musician

"With speech, sound, mime, and above all, inspired imagination, David Gonzalez has the gift of creating magical worlds and drawing his audience into them."
- New York Times

Álvaro Domene
Guitarist, Composer, Recording Artist

"Domene continues his virtuosic exploration of the guitar as a tool to conjure soundscapes, induce pure thought via music, and invoke sonic mayhem."
– Ed Keller (Creative Director Venice Biennale)

Luke Keller
Astrophysicist, Educator

Award-winning Professor of Physics and Astronomy at Ithaca College, Luke Keller is fascinated by questions of origins. His research studying the formation of stars and their planetary systems has been supported by NASA, the Universities Space Research Association, and the Research Corporation for the Advancement of Science.

David GonzÁlez

- David is an award-winning writer, storyteller and musician.
- He received his doctorate from New York University's School of Education.
- Besides Spacetime, David has written plays, musicals, poetry, and even an opera libretto.
- He plays and writes music for the guitar and piano.
- David enjoys hiking, and in 2006 he climbed to the top of Mount Kilimanjaro - the highest mountain in Africa.
- www.davidgonzalez.com

Álvaro domene

- Álvaro is a guitarist-composer-producer who was born in Madrid, Spain but has been based in New York since 2015
- Domene is considered, by press and peers, one of the most inventive, fearless, and prolific electric guitarists active today, with over 35 albums of original music released in less than 10 years
- He won the *Conlon Nancarrow Award for Excellence in Music* for his 2022 album *Not Arbitrary*, which was described as *"the alien response to Voyager's 1 Golden Record"*
- Besides Spacetime and his solo work, Álvaro works in music production, education, film scoring, sound design, and co-runs Iluso Records, an independent record label especialised in exploratory new music.

www.alvarodomene.com

Luke Keller

- Luke is an award-winning Professor of Physics and Astronomy at Ithaca College, New York
- Keller is also a a popular public speaker, invited to give presentations and lead astronomy events throughout New York State
- Luke's astrophysical interests are in the chemistry and evolution of proto-stellar and proto-planetary objects
- He was Project Scientist and co-investigator on a team that built an infrared camera for SOFIA, NASA’s airborne observatory
- Luke is a licensed pilot and lives with his family in Etna, New York

Luke's blog: Cosmic Origins Café

SPACTIME Episodes

1 - ***Overture***: The introduction of the show focuses on the *Small Flash*, our Home Galaxy, scientific models, data-driven *Hopscotch*, and how exploring on a cosmic scale inspires us to astonishment and action here on Earth.

2 - ***Black Holes***: These mysterious cosmic entities are formed when massive stars collapse under their own gravity, creating a region in space where the gravitational pull is so intense that nothing, not even light, can escape.

3 - ***Star Formation***: Discover how massive clouds of gas and dust, driven by gravity, collapse and ignite nuclear fusion, giving birth to new stars that shape and light up the cosmos.

4 - ***Planet Formation***: Witness how dust and gas in a young star's orbit gradually collide and coalesce, creating solid bodies that evolve into diverse worlds.

5 - ***Our Planetary System***: We look at the creation of the Sun and its orbiting planets. Learn how Earth found its place in the Goldilocks Zone, making it uniquely suited for life.

6 - ***Our Planet***: Delve into the formation of planet Earth, a dynamic world developed over billions of years. As we marvel at its beauty, we face a stark truth: join us in understanding the urgent need to safeguard our home.

Pre-show Poetry Activities

1 - Take a look at this image from Spacetime. It shows an amazing celestial event called a “galaxy merger”. Write a list poem using one word per line to describe what you see.

2 - Look closely at this image, complete this poem, and read it to a classmate.

On the ground, strange and beautiful trees,
In the sky, the Milky Way,
In between, ……...

3 - The left image is from the remarkable Hubble telescope, and the right is of the same place in space but from the astounding James Webb Space Telescope.

→Write a short poem describing the difference in these photos using some of these words:

Sparkle
Clarity
Dimension
Detail
Brilliance
… and any other descriptive words you like!

Here are more writing prompts for you to explore:

HAVE FUN!

Pre-show Science Activities

1 - In Spacetime a scientist, a musician, and a poet work together to help their audience (you!) understand our universe and our planet. Does this make sense? What are some ways that art can be compatible with science to help us learn more that we can with just art or just science? Discuss.

2 - In the performance the poet and the scientist will be talking about models of the universe. What is a model? What are some examples of models that you use? How can we use models to answer questions about things we do not fully understand?

3 - One of the themes of Spacetime is that our ability to understand the whole universe can inspire us to understand and appreciate Earth and the environment. Use your own inspiration of understanding some part of the universe to create a poster that will motivate you and others to think of our place in Earth's ecological systems.

Interactive online activity:

Spacetime uses many images and videos to help illustrate and describe different parts of our universe. You can find some of these on the NASA James Webb Space Telescope: https://science.nasa.gov/mission/webb/multimedia/images/

→ Find three different images and read the descriptions included on the website with the images.

→ How would you explain each one to a kindergartener? Someone who has not had as much experience as you have with science.

Pre-show Music Activities

1 - Have a **listen** to this piece titled “Still Unfolding”, composed by Álvaro Domene and featured on the album EXU3DC.

→ Close your eyes, relax, and let the music take you on a journey.

→ Once the piece reaches its conclusion, discuss the type of
cosmic phenomena you envisioned.

2 - When you gaze at the stars in silence, what sounds and/or music can YOU imagine?

How would that music/sound affect your mood?Would you feel happy? Melancholic? Sad? Would it perhaps be inspiring? Scary, or maybe inviting? Discuss.

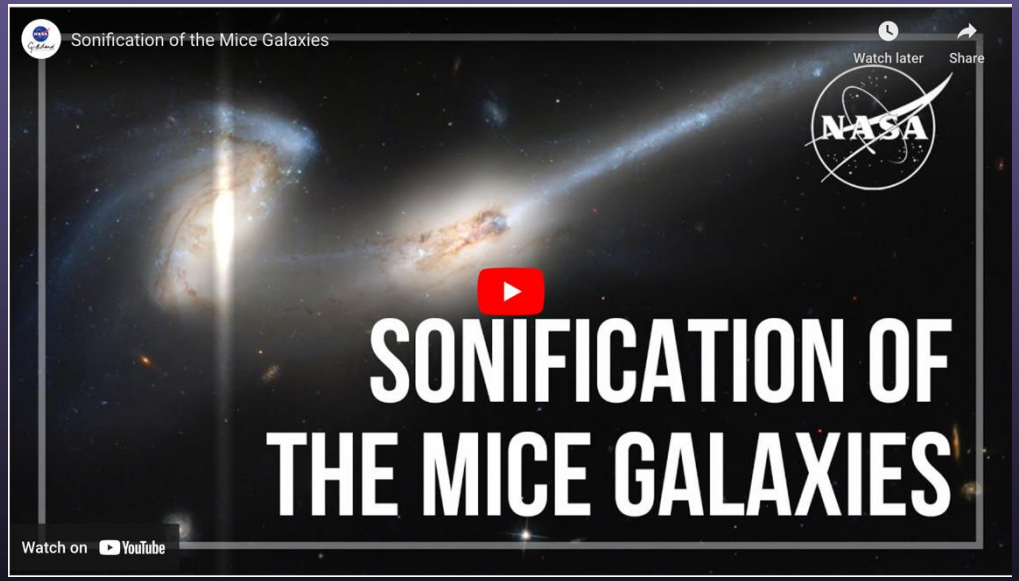
3 - From Data to Melody

Data sonification is a field that involves the transformation of data into sound. This approach allows researchers, scientists, and music composers to use their sense of hearing to interpret and analyze complex datasets.

Ever wondered what the music of the spheres would sound like? Hubble brings us cosmic sights, but these astronomical marvels can be experienced with other senses as well. Through data sonification, the same digital data that gets translated into images is transformed into sound.

Elements of the image, like brightness and position, are assigned pitches and volumes. No sound can travel in space, but sonifications provide a new way of experiencing and conceptualizing data. Sonifications allow the audience, including blind and visually impaired communities, to “listen” to astronomical images and explore their data.

The Mice Galaxies are a colliding pair of galaxies, that will eventually merge into a single galaxy. They’re located about 300 million light-years away in the constellation Coma Berenices. In this data sonification, scientists represented brightness with volume and pitch – brighter light is louder and lower pitched. The vertical position of objects in the image is used to control the pitch of sustained musical strings, and cymbals swell following the brightness of the galaxy cores. Listen for a cymbal crash played for the foreground star with diffraction spikes, too!



POST-show Poetry Activities

→ Poetry was a big part of Spacetime. Discuss with a classmate how and what David's poetry added to the show.

→ Which poems in Spacetime did you like best? Why?

→ Activity: Use this online research tool to learn about a science topic that interests you, then write a short poem about it.

POST-show science activities

→ Discussion: In the beginning of Spacetime, David (the poet) felt frustrated when Luke (the scientist) first talked about the science of the universe. Have you ever felt frustrated when someone talked about science? How did David and Luke work through this frustration to help each other and their audience understand the universe better?

→ Activity: In Spacetime Luke says: "Astonishment kindles our imagination, imagination sparks creativity, creativity ignites innovation, and innovation motivates us to action here on planet Earth." What does this mean to you? Write a short reflection on a time that you felt astonished. Did it motivate you? If so how? If not, why?

→ Activity: At the end of Spacetime, David and Luke are excited that the universe story is also the Earth story and our human story. What is your story? How do you fit into the Earth and Universe stories?

Follow up resources to find out more about science themes in Spacetime:

Gravity:
https://spaceplace.nasa.gov/search/gravity/

The universe, galaxies, stars, our solar system, and life:
https://thecrashcourse.com/topic/astronomy

How science works:
https://undsci.berkeley.edu

POST-show MUSIC activities

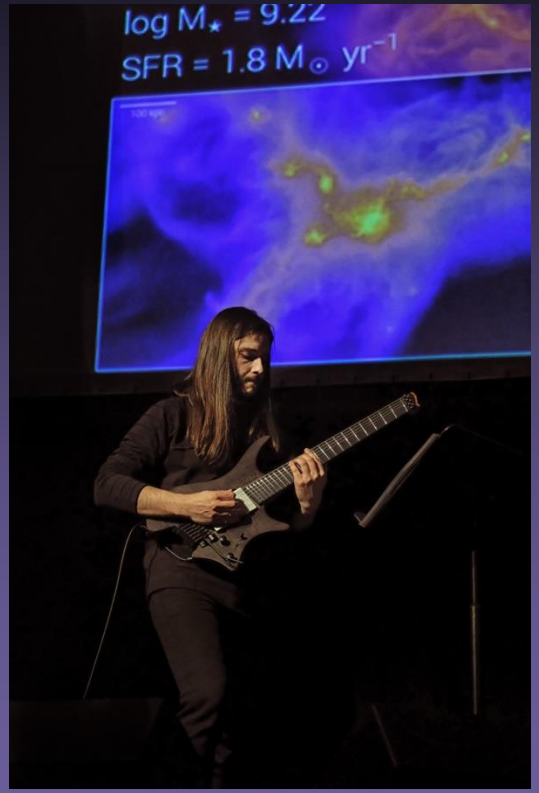
→ Briefly describe your impressions and thoughts on the music of Spacetime

→ Discuss how the music of the show helped shaping the story and conversation between the poet and the scientist

→ The music of the show was performed live on a seven string electric guitar which was augmented with electronic devices on the floor of the stage (guitar pedals) and that the performer used to manipulate and extend the possibilities of his sound in real time and in response to the imagery and dialogue.

Have you ever heard those types of sounds come out of a guitar before? Which other musical instruments you think would be cool to hear in a similar context? Give 3 examples.

→ Make sure to visit Domene's website to listen to more otherworldly music!



LINKS

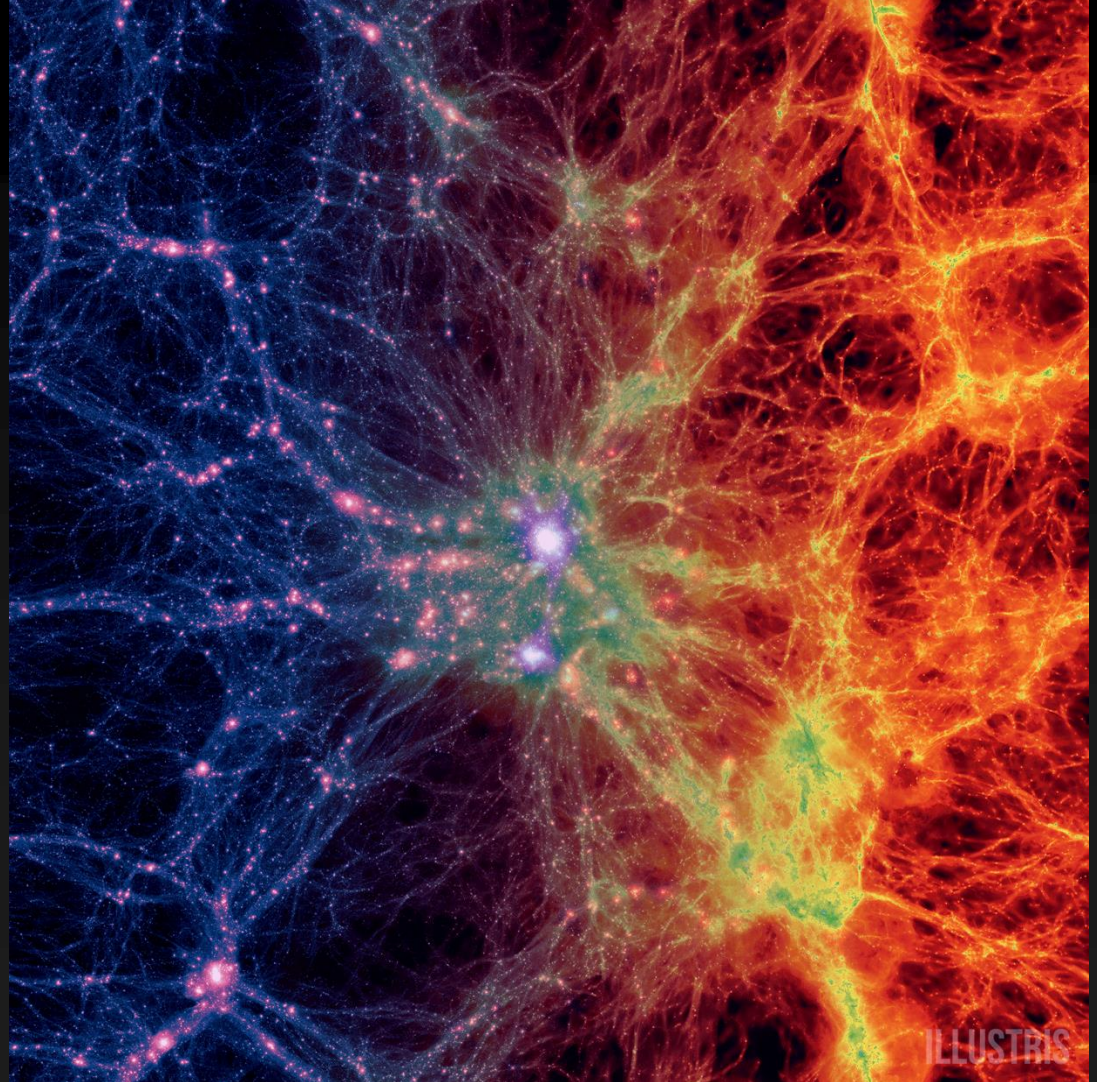
SPACETIMESHOW.org

davidgonzalez.com

alvarodomene.com

Luke Keller's TED Talk

Luke Keller - Ithaca College



Álvaro Domene on Spotify

Iluso Records

Iluso Records on Bandcamp

Enid Farber Photography