

# COSMIC DIMENSIONS

October 2023

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**CENTI ASTRO-SPACE  
ACTIVITIES**

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Hello and welcome to the October edition of COSMIC DIMENSIONS, the newsletter that explores the mysteries of the universe and Space Exploration. In this issue, we will dive into topics such as:

- WHAT'S UP IN THE NIGHT SKY FOR OCTOBER
- 2024 TOTAL SOLAR ECLIPSE
- **PURCHASE YOUR ECLIPSE GLASSES**
- STUDYING VENUS ON EARTH
- and more

Whether you are a curious beginner or a seasoned enthusiast, COSMIC DIMENSIONS will take you on a journey of intrigue and fascination. So, begin to explore and enjoy the ride!

- WHAT'S UP IN THE NIGHT SKY FOR OCTOBER
- 2024 TOTAL SOLAR ECLIPSE
- TO SEE OTHER EARTHS
- ELAINE DENNISTON
- **PURCHASE YOUR ECLIPSE GLASSES**
- PROBE TO SAMPLE VENUS' ATMOSPHERE
- STUDYING VENUS ON EARTH
- SPACE PIC OF THE MONTH
- BOOK ON BENNU ASTEROID
- DO BLACK HOLES HAVE BOTTOMS?
- ENORMOUS CRATER NEAR THE LUNAR SOUTH POLE
- SOUNDS OF SPACE

## WHAT'S UP IN THE NIGHT SKY FOR OCTOBER

Presented by

Adventure Science Center Nightwatch - Bill McClain

<https://www.youtube.com/watch?v=oji-IGZHFFw>

Tonight's Sky: October

[https://www.youtube.com/watch?v=uE4GXmf\\_ba0](https://www.youtube.com/watch?v=uE4GXmf_ba0)

# HOW LONG WILL THE 2024 TOTAL SOLAR ECLIPSE LAST?

By Michael E. Bakich April 8, 2023



This is combination of two images taken during Total Solar Eclipse 2009 on the board of the ship in neighborhood of Iwo Jima Island. Marta and Michal Zolnowsk

Next year's total solar eclipse is set to be a relatively long one. On April 8, 2024, the maximum duration of totality anywhere along the eclipse path will be 4 minutes 28 seconds. For comparison, the maximum length of totality for the last total solar eclipse to cross the continental U.S., which occurred on Aug. 21, 2017, was just 2 minutes 40 seconds.

Indeed, some eclipse totalities last but a few seconds. And the longest eclipse totality from 2000 B.C. to A.D. 3000 is 7 minutes 29 seconds. That eclipse will occur July 16, 2186.

## What determines the length of a solar eclipse?

So why aren't all totalities 7½ minutes long?

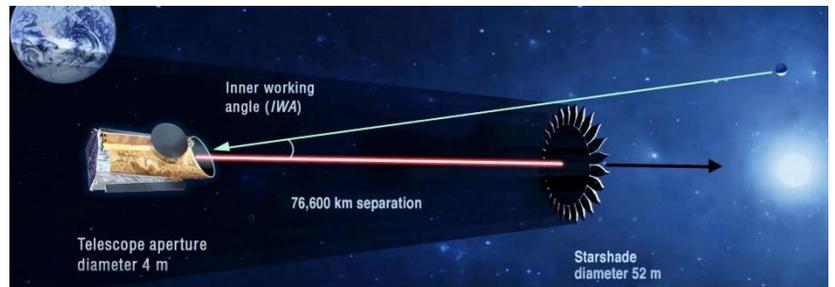
The explanation for this goes way back to the time of the German astronomer, Johannes Kepler, who lived from 1571 until 1630. In the fall of 1600, Kepler began working for the Danish astronomer Tycho Brahe, who had for years been accumulating observational data on the planets. Tycho paid Kepler to analyze the data. But in October 1601, Tycho suddenly died and Kepler became the imperial mathematician, a position he held for 11 years. For more information click on the link:

<https://m.astronomy.com/news/observing/2023/04/how-long-will-the-2024-total-solar-eclipse-last#:~:text=>

# AN AMBITIOUS NEW TECHNOLOGY MIGHT BE NEEDED TO SEE OTHER EARTHS

BY BRIAN KOBERLEIN SEPTEMBER 18, 2023

The race is on to discover truly habitable Earth-like worlds. While we are starting to observe the atmospheres of large potentially habitable planets such as [Hycean worlds](#) with the telescopes we currently have, the most significant breakthroughs will likely come with the development of advanced specialized telescopes. These new designs will likely use a starshade to hide the glare of a star and allow us to directly observe its exoplanets. But will that be enough to study distant terrestrial planets? To read more click the link: <https://www.universetoday.com/163269/an-ambitious-new-technology-might-be-needed-to-see-other-earths/>



How a starshade would reveal exoplanets. Credit: NASA/JPL

# ELAINE DENNISTON: THE WOMAN WHO CORRECTED APOLLO'S CODE

*Although her job description ended with punching programs into cards to be run by the computer, this sharp-eyed keypuncher corrected programmers' code on her own to ensure it ran properly.*

By Korey Haynes June 21, 2019



Elaine Denniston  
Image courtesy of Draper

Away from the flurry of control rooms and high-end software engineering, there were many women working on computer programming for Apollo. In these early days of computer science, it took a village to create a single program, and few people worked on a given program alone from start to finish.

Instead, engineers wrote the programs on long sheets of paper, and someone else – a nontechnical staff member, usually – punched those programs into cards that the early computers could read.

Elaine Denniston was one of these keypunchers. Born and raised in Boston, Massachusetts, she was hired into MIT's Instrumentation Lab (now called Draper) via a staffing agency based on her experience keypunching cards for an insurance company. She had only a high school education. In her mind, it was simply a job, and she was a young mother with children to feed. "Apollo was in the background," she recalls. "I was a fairly naive, immature 26- or 27-

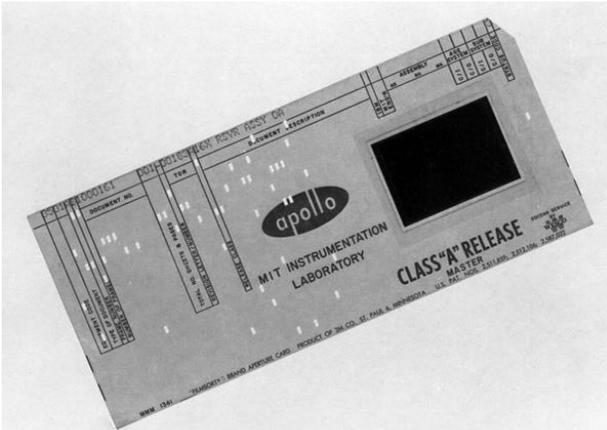
year-old. ... I didn't have a science background. I didn't even take physics because [my high school] was a girls' school."

But half a century later, her former boss would remember Denniston with the rest of the section's Apollo team.

## Staying tough

Denniston's job was simple on the face of it. Each engineer on the team wrote their own piece of the code, which Denniston collected from them. She then keypunched the program into batches of cards six inches thick, containing hundreds or thousands of pages. These cards had to be run together through the computer, usually overnight, and a single mistake could ruin the whole run, wasting valuable time while the space race was still very much on.

The logistics of collecting all the code from a roomful of engineers aware they were making – or trying to



make – history was more demanding. Her boss at the time, Dan Lickly, recalled for [Draper](#), "And of course these prima donna programmers would be late, 'I got to do this over,' 'Give me another half hour,' and so on and so on. [Denniston] had to go around at night before she left and beat up on all these programmers to get their information, run it, make sure there were no errors in it, and then turn it in for the overnight run."

Denniston is only slightly more circumspect: "I don't want to say nag, but that's kind of what I did. ... I had two young children, and I had to get home to them," she told *Astronomy*.

## Sharp eyes

But her nagging isn't what cemented her in her supervisor's memory. Denniston also reviewed the engineers' code, though she didn't think of it like that at the time. "I would read over what people had written and punch them and would notice if

Computers of the Apollo era used punch cards to read programs. If the card (or the program) contained an error, valuable computing time was lost. Image courtesy of Draper

something hadn't been completed. I had absolutely no programming experience, but I thought if you had a left parentheses, you should have a right parentheses somewhere," Denniston says. She was right. These days, most programmers rely on text editors that use font color to hint when developers have dropped a parentheses or typed a period instead of a comma, similar to the way a word processor will underline a misspelled word. But in those days, there were only the tired eyes of the programmer himself or the overnight run crashing to indicate a mistake – unless Elaine Denniston caught it first.

Although Denniston started as a temp, she was soon hired directly by the Instrumentation Lab. But she stayed only two years. "I trained somebody to do what I did, and when they reorganized my department, they made them my boss," she says. "He had some college, a few credits. I had none at the time." She acknowledges that the difference in their education was perhaps valid, but at the time, the reason she was given for being overlooked was that "they needed someone to come in if the program failed, no matter what time," she says. She feels that her position as a mother was what truly closed that door to her. Either way, it was clear to her that she would not be advancing further. "I think looking back that was the only time I felt being a woman was against me, so to speak," she says.

"But in the end, that turned out to be the best thing that could have happened to me," she says now, because she left with an "I'll show them" attitude. She decided to go to college. Her husband, a doctor, recommended what he referred to as "that school over in Wellesley." "He meant Harvard," Denniston laughs, and laughs again when she recalls being interviewed by the school. "They asked me why do I want to come to Harvard? 'I'll get a good education,' I told them. 'And it's the closest to where I live.'" Denniston says the interviewer was taken aback at her response. But within days, she had been accepted.

## Moving on

After Harvard, she went on to law school and spent most of her career in the public sector, working for the city of Boston or the district attorney's office. She has been retired since 2012.

But without the space race, the magic of keypunching evaporated for her. "When I was in college, a couple of times I took up a keypunching job. Boy was it boring," she says.

"I didn't realize then that what I did was anything special," Denniston admits. "I typed, I found errors, I nagged people." But she credits her start with Apollo for her interest in science, even if she never pursued it professionally. She reads Dava Sobel's books about science and scientists, and has visited the Greenwich Observatory with her son, where she was fascinated by the progression of clock technology.

She looks back on her time with Apollo fondly. "I think it had to do with doing things that were interesting, and doing them well," she says.



Denniston in 1977 at her graduation from law school. Image courtesy of Draper

Source: Astronomy.com

**☞ ☞ ☞ Don't forget to purchase your eclipse glasses to view the October 2023 and April 2024 solar eclipses**

To view the upcoming eclipses safely there are many products available. Click on the link below to see them. **This is an affiliate link which means if you click on it and purchase any items, I will receive an affiliate commission at no extra cost to you.** This commission helps support my education programs.

[https://www.eclipseglasses.com?sca\\_ref=4135201.w76xb24WgN](https://www.eclipseglasses.com?sca_ref=4135201.w76xb24WgN)

# ESTONIA BUILDING INSTRUMENT PROBE TO SAMPLE VENUS' ATMOSPHERE

Bruce Dorminey September 21, 2023



An impression of the greenhouse planet, the third smallest planet in the Solar System (after Mars and Mercury). Venus is almost totally featureless seen from space, owing to its dense carbon-dioxide atmosphere. GETTY

For decades, researchers have argued over whether the sulfuric acid-rich clouds of Venus could harbor microbial life. With extraordinarily high temperatures and pressures, the surface of the planet is a veritable hellhole. But Venus' mid-level atmosphere between 40 to 60 km altitude is thought to be surprisingly earthlike.

Trouble is, there's currently a dearth of in situ data from Venus' thick atmosphere. But over the next decade, three privately funded, MIT-led Venus missions will aim to characterize Venus's atmosphere for habitability and, ultimately, life.

Estonia's Tartu Observatory is building an instrument which will fly as the second of three so-called 'Morningstar' Venus missions and is tentatively scheduled for launch by 2030. Upon arrival at Venus, the TOPS (Tartu Observatory pH

Sensor) will descend into our sister planet's atmosphere to measure the acidity of single Venusian cloud droplets.

To read the full article click the link: <https://www.forbes.com.cdn.ampproject.org/c/s/www.forbes.com/sites/brucedorminey/2023/09/21/estonia-building-instrument-probe-to-sample-venus-atmosphere/amp/>

## STUDYING VENUS ON EARTH: ICELAND AS A STAND-IN FOR VERITAS MISSION

BY: Laurence Tognetti, MSc September 20, 2023

An international team of researchers led by NASA's Jet Propulsion Laboratory (JPL) [recently traveled](#) to Iceland to perform an analog study on the volcanic behavior of the most inhospitable planet in the entire solar system, Venus, in preparation for NASA's eventual [VERITAS](#) (Venus Emissivity, Radio science, InSAR, Topography, And Spectroscopy) mission to the second planet from the Sun. While this two-week excursion last month comes after NASA [announced in November 2022](#) that VERITAS was postponed, and later referred to as "[functionally a soft cancellation](#)". Despite the VERITAS mission not slated to launch until sometime in the 2030s, this hasn't stopped scientists from wanting to learn more about Venus and its volcanic attributes.

"Iceland is a volcanic country that sits atop a hot plume. Venus is a volcanic planet with plentiful geological evidence for active plumes," said Dr. Suzanne Smrekar, who is the principal investigator for VERITAS and a senior research scientist at NASA JPL. "Its geological similarities make Iceland an excellent place to study Venus on Earth, helping the science team prepare for Venus." To learn more click the link:

<https://www.labroots.com/trending/space/25931/studying-venus-earth-iceland-stand-in-veritas-mission-2>



VERITAS science team members exploring a recent lava flow during their Iceland excursion in early August. The researchers used the volcanic environment as a Venus analog to test radar technologies and techniques for the eventual VERITAS mission to Venus. (Credit: NASA/JPL-

## SPACE PIC OF THE MONTH



### OSIRIS-REx Sample Return

NASA ID: NHQ202309240019

The sample return capsule from NASA's OSIRIS-REx mission is seen shortly after touching down in the desert, Sunday, Sept. 24, 2023, at the Department of Defense's Utah Test and Training Range. The sample was collected from the asteroid Bennu in October 2020 by NASA's OSIRIS-REx spacecraft. Photo Credit: (NASA/Keegan Barber)

Date Created: 2023-09-24

## IUP GEOSCIENCE PROFESSOR CO-AUTHOR OF BOOK ON BENNU ASTEROID

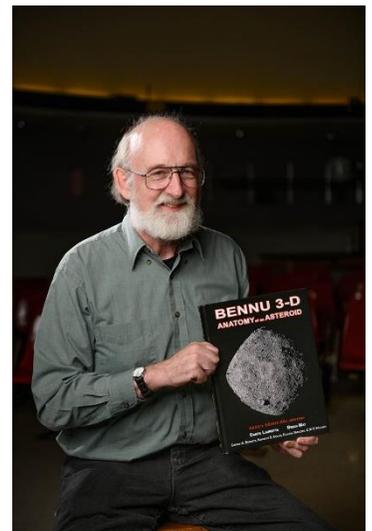
September 21, 2023

Following his 2019 book, *The Atlas of Mars: Mapping its Geography and Geology*, Indiana University of Pennsylvania **geoscience** professor Kenneth Coles has moved on to writing about something significantly smaller in size, but a project that could help scientists make big new discoveries about the origin of the Earth and the Solar System.

Coles is part of the writing team of *Bennu 3-D: Anatomy of an Asteroid*, published jointly by the London Stereoscopic Company and the University of Arizona Press and launched in London in July 2023.

To read more click the link:

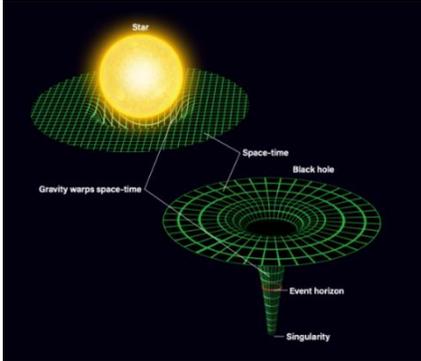
<https://www.iup.edu/news-events/news/2023/09/iup-geoscience-professor-co-author-of-book-on-bennu-asteroid.html>



# DO BLACK HOLES HAVE BOTTOMS?

*Black holes are surrounded by a spherical event horizon, and your spaceship can indeed fly under, over, or around it.*

By Astronomy Staff September 14, 2023



Is there a bottom of a black hole? Can a spaceship travel under one, or does it go on and on?

To find out click the link here:

[https://www.astronomy.com/science/do-black-holes-have-bottoms/?utm\\_source=acs&utm](https://www.astronomy.com/science/do-black-holes-have-bottoms/?utm_source=acs&utm)

Einstein's theory of general relativity describes how mass warps space-time, drawn here as a grid. Although the illustration appears to show a black hole like a funnel with no bottom, this is misleading — it is simply a limitation of the way we depict the universe on a printed page. Credit: Astronomy: Roen Kelly

# ENORMOUS CRATER DEEPER THAN THE GRAND CANYON NEAR THE LUNAR SOUTH POLE

By Jeff Spry September 21, 2023

The lunar south pole looks haunting in a new mosaic image that uses photography from two different NASA cameras in orbit around the moon.

National Geographic, in coordination with NASA, shared a never-before-seen, high-resolution composite image of the lunar south pole with a detailed companion map of [Artemis 3](#) candidate landing sites.

This striking image of the moon's south pole region was composed from a series of photos taken by the Lunar Reconnaissance Orbiter Camera (LROC), a network of cameras mounted on NASA's [Lunar Reconnaissance Orbiter](#) which has been circling the moon since June 2009, and ShadowCam, a NASA-funded instrument on the Korea Aerospace Research Institute's Korea Pathfinder Lunar Orbiter (KPLO). ShadowCam is 200 times more sensitive to light than previously deployed NASA lunar cameras, according to an agency [statement](#). To find out more click the link:

[https://www.livescience.com/space/the-moon/haunting-new-moon-images-reveal-enormous-crater-deeper-than-the-grand-canyon-near-the-lunar-south-pole?utm\\_term=D66A7F3E-FC72-4CF0-BBC7-9BBE5286D454&utm](https://www.livescience.com/space/the-moon/haunting-new-moon-images-reveal-enormous-crater-deeper-than-the-grand-canyon-near-the-lunar-south-pole?utm_term=D66A7F3E-FC72-4CF0-BBC7-9BBE5286D454&utm)

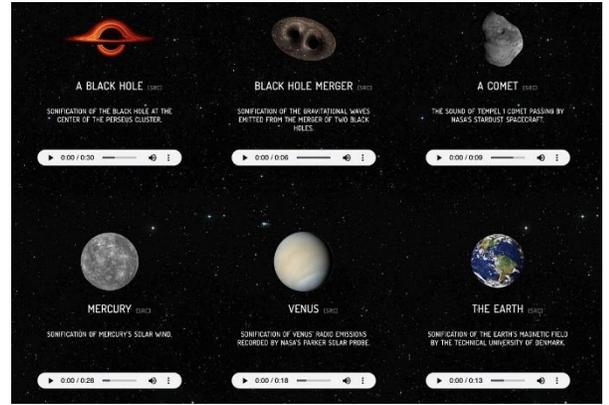


A new mosaic of Shackleton Crater as seen by NASA's Lunar Reconnaissance Orbiter Camera and ShadowCam. (Image credit: Mosaic by NASA, Korea Aerospace Research Institute, Arizona State University)

# SOUNDS OF SPACE

What does a comet sound like? How about Earth's magnetic field? Although sound as we think of it doesn't exist in the vacuum of space, it's possible to sonify other kinds of data that spacecraft collect. The [Sounds of Space](https://scientific.place) website offers a collection of sonified data from planets, black holes, a comet, and the Sun. *Image credit: scientific.place.*

<https://scientific.place/sounds-of-space/>



**👉 👉 👉 Don't forget to purchase your eclipse glasses to view the October 2023 and April 2024 solar eclipses**

To view the upcoming eclipses safely there are many products available. Click on the link below to see them. **This is an affiliate link which means if you click on it and purchase any items, I will receive an affiliate commission at no extra cost to you.** This commission helps support my education programs.

[https://www.eclipseglasses.com?sca\\_ref=4135201.w76xb24WgN](https://www.eclipseglasses.com?sca_ref=4135201.w76xb24WgN)

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