Surrounded by Science

Newsletter #5

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Editorial

Welcome to the March 2023 newsletter

Get ready to bloom with excitement as we welcome the arrival of spring! We can't wait to share with you all the incredible updates on our latest activities and initiatives. Our team has been tirelessly working on promoting science learning through innovative hybrid educational activities that combine the best of the formal and informal science education worlds.

In this issue:

- Read about the Eratosthenes Experiment and discover how an experiment made more than two thousand years ago is still relevant today
- Get to know Vincenzo Schettini, an Italian physics teacher that is revolutionizing the way physics is taught
- Find out more about the pilot case study “From Galileo’s discoveries to the detection of gravitational waves” implemented by Ellinogermaniki Agogi in their school.
- Listen to our new podcast segment, with interviews from scientists, science communicators, science educators and science enthusiasts from all over the world, such as Javier Santaolalla and Stamos Archontis, The Mad Scientist
- Browse through our section "*What we're reading, listening to and watching*" to get inspired with insightful resources on out-of-school STEM

Be part of our journey as we dive into the mesmerizing world of science and discover the latest developments in our project! Don't forget to visit our website, subscribe to the newsletter, and follow us on the Surrounded by Science social media channels!


Sara Anjos & Monica Constantin
Newsletter Co-editors

News

Discovering the Size of the Earth: The Eratosthenes Experiment

Image credit: Eratosthenes Photo Contest

In 240 BC, Eratosthenes of Cyrene, a Greek polymath and chief librarian at the Library of Alexandria, accomplished what no one before him had been able to do – he measured the circumference of the Earth! This remarkable feat was achieved through an inquiry-based activity that involved keen observation, critical thinking, and precise calculations. Back then, the ancient Greeks knew that the Earth was round, but they had no idea about its size. Eratosthenes' ingenious experiment involved observing the sun's angle at noon on the summer solstice in two different cities – Syene and Alexandria – which were located at the same longitude. He noticed that at noon on the summer solstice, the sun was directly overhead of a well in Syene, without casting any shadows, while in Alexandria, a stick cast a shadow at the same time, making an angle of about 7.2 degrees. Using this information and the distance between the two cities, Eratosthenes was able to calculate the Earth's circumference with an impressive degree of accuracy, within 15% of today's measured values. This milestone discovery not only proved that the Earth was much larger than previously thought but also paved the way for future scientific discoveries.

Fast forward 2250 years and Eratosthenes' experiment remains one of the most beautiful and insightful experiments in the history of science. It is also an exemplary inquiry-based activity that can help introduce students to the scientific way of thinking. By recreating Eratosthenes' experiment in the classroom, students can learn about the power of observation, critical thinking, and mathematical reasoning.

In this video, Carl Sagan explains this monumental experiment.

Take part!
Want to take your students on an exciting journey through time and space, and inspire the next generation of scientists and researchers with the Eratosthenes Experiment? Take part in the international photo contest led by Ellinogermaniki Agogi. Hurry up! **The deadline for submitting your photo is 10 April 2023.**

Bend it like Schettini!

Image credit: La Repubblica

It is no secret that social media has become the primary channel for communication and information exchange in today's digital age. It is where we get our news, share ideas, debate, teach, and learn. However, social media can also be a powerful tool for science education, dissemination, and communication if used effectively.

Vincenzo Schettini, an Italian physics teacher at the Luigi dell'Erba Institute of Castellana Grotte, in the province of Bari, Italy, has become an internet phenomenon due to his innovative approach to teaching and his ability to engage students in the study of physics. Schettini has mastered the art of science communication on social media, particularly on TikTok and YouTube, where he uses humour and creativity to explain complex physics concepts.
The well-deserved popularity of the Apulian professor has truly amazing dimensions for a scientific populariser who focuses on the use of social platforms. To give a dimension that can make understand the breadth of Schettini's popularity among young Italians, a video published on Facebook and Instagram documents his triumphal visit to a high school in Palermo getting more than 5 million views.

Schettini's success on social media has highlighted the importance of innovation in education, especially in the increasingly digital world we live in. Educators need to find new and innovative ways to engage students and make learning more accessible and interesting, to prepare them for the challenges of the digital age.

By using platforms such as TikTok, Schettini has been able to reach a wider audience and create a more engaging learning environment for his students. His videos have been shared widely on

social media, and he has been praised for his ability to make physics more accessible and interesting to students, who often find the subject difficult and unengaging.

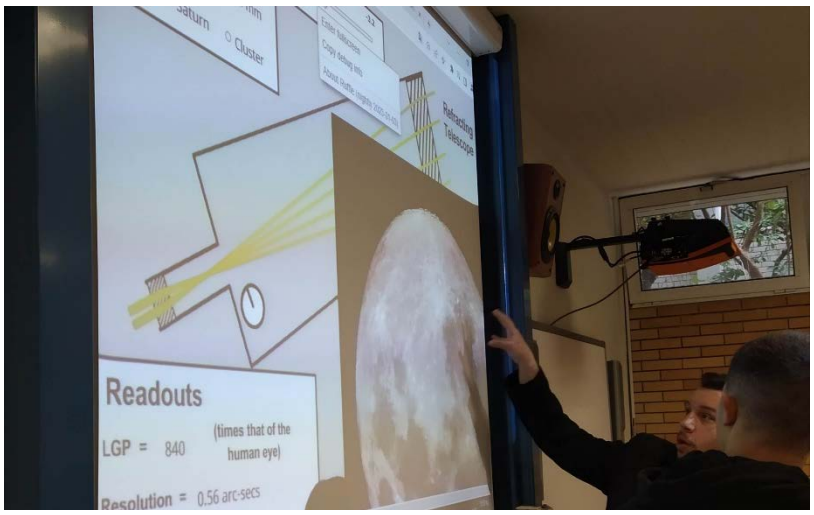
Cover of the book "La fisica che ci piace"

However, it is worth noting that Schettini is a talented communicator capable of magically orchestrating the various tools at his disposal: the most popular physics teacher in Italy is, not surprisingly, one of the protagonists of the national publishing scene. His book "The Physics We Like" (La fisica che ci piace) is a bestseller since its publication date, 2022. School education and direct contact with young students, however, have never ceased. He continues to teach in high school and his public lectures around Italy are numerous and always crowded with young high school students. Schettino is a tireless builder of bridges between the traditional school and the world of informal learning. Schettini believes that any student can succeed in physics if given the right support and encouragement. He encourages his students to ask questions and explore the subject in more depth. This approach has enabled his students to gain self-confidence and progress in their knowledge of physics.

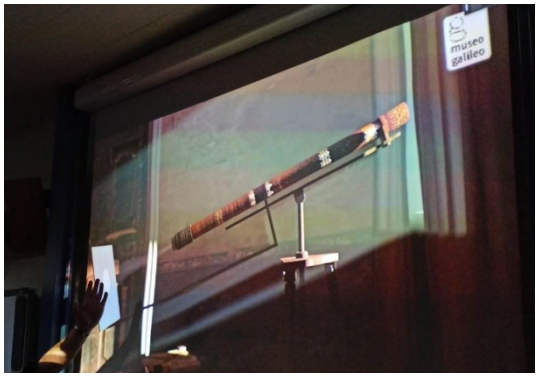
Schettini's innovative methods of teaching, such as hands-on experiments, have been showcased on his YouTube channel, Spotify, Instagram, and TikTok. During a lecture on pressure, he asked his students to sit in a chair and suddenly stand up, then asked them to describe what they felt and how pressure was involved. This practical example gave students a better understanding of the concept of pressure and how it applies in real life.

As science education researchers, science teachers, and policymakers, we must recognize the potential of social media as a tool for science education and communication. We must continue to explore innovative teaching methods that engage students and make learning more accessible and interesting. Schettini's success on social media provides an excellent example of how effective science education can be when given the right support and motivation.

From Galileo to gravitational waves



The Ellinogermaniki Agogi team is working diligently to implement their pilot case study called “From Galileo’s discoveries to the detection of gravitational waves”. This learning pathway aims to offer a concise introduction to modern astronomy’s ground-breaking scientific advances, starting with Galileo’s first discoveries using his telescope back in the 1600s, to the recent direct observations of gravitational waves by the LIGO and VIRGO detectors. The pathway is designed to crosscut different learning environments, interconnecting different educational settings, formal and informal, including a science museum, astronomy observatory, research infrastructure, web-based science-related contents, and the school. More than 150 junior high school students from Ellinogermaniki Agogi are participating in this educational pathway, which encourages students to engage with science in a meaningful and interactive way.



High schoolers of Ellinogermaniki Agogi take a virtual tour at the Galileo Museum (image credit: Thanos Leontios)

The first stage of the educational pathway has been completed with high engagement and enthusiasm from the students. The students were introduced to Galileo’s life and work, followed by a guided virtual tour to the Galileo Museo in Florence, where they saw Galileo’s telescopes, related exhibits, and models of the Universe. This was followed by a discussion on the scientific method and Galileo’s important contribution to it. The pathway then focused on Galileo’s observations of the Sun, where students discussed the dark spots Galileo saw and the main interpretations of their nature at his time.

To help students understand better, they studied the apparatus Galileo used to observe the Sun (helioscope) and experimented with an educational replica of the historical scientific instrument. Galileo proved that the sunspots are on the Sun's surface and not in orbit around it by calculating their velocity as they travel across the solar disk. Students retraced Galileo's steps and proved, the same way he did, that the sunspots are on the Sun's surface. They also compared the sunspots' motion with a body that is in orbit around the Sun by calculating Venus' velocity during the transit of 2012.

Students learn how a refracting telescope works (image credit: Thanos Leontios)

While the educational pathway is still under investigation, the students seem to be actively engaging with the material towards a better understanding of the scientific process. The first results of the assessment of Ellinogermaniki Agogi's innovative educational pathway, 'From Galileo to Gravitational Waves,' will soon be analyzed, with valuable data gathered through the Science Chaser app.

SciPerspectives

On this newsletter we bring you our new podcast series.

To understand and value the world we live in, we need to learn about science. And as Richard Dawkins has said, “the feeling of awed wonder that science can give us is one of the highest experiences of which the human psyche is capable.” That’s why we’re excited to launch our podcast series! In each episode, you’ll hear scientists, science communicators, science educators and science enthusiasts from all over the world sharing their stories, views and research on all things science and learning. You can follow us on Spotify!

Podcast: In the Universe of Javier Santaolalla

Interview by Angelos Alexopoulos

It is not an overstatement to say that Javier Santaolalla is probably the most known science communicator of the Spanish-speaking world. With a scientific background in telecommunications engineering and particle physics, Javi – as he is commonly addressed by friends and colleagues – has accomplished over the last decade what very few people of his generation have pulled off in the field of science communication. His passion, curiosity, and strong desire to connect authentically with multiple audiences in the digital context have been appreciated by millions and especially Zillenials. Santaolalla’s YouTube channel Date Un Vlog counts 2.4M subscribers, his Instagram account has more than 1.2M followers, and more recently his TikTok profiles exceeds 4M followers.

But he hasn't stopped there. Since 2016, he has written four books, with the most recent one entitled "What's a boson like you doing in a Big Bang like this?" just being hot off the press. And not to mention his countless public talks, TV appearances, and many other science engagement activities that make him an unstoppable creative force in science outreach and communication.

In between his busy schedule, Javier Santaolalla, or Javi if you like, takes a small break to share on this podcast hosted by Angelos Alexopoulos his perspective and passion for all things science and learning, and ways in which he thinks new technologies and social media make a difference to the everyday science-related experiences and attitudes of young people. Entering the universe of Javier Santaolalla is to experience, appreciate and learn from his authenticity, humbleness, great sense of humour, ability to listen and make a real connection with his audience, qualities that make him stand out.

"Emotions are connected to learning. So, if you want to teach, use emotions. Students are not robots. They have dreams, they have fears, they want to laugh, they want to feel, they have sentiments. If you take advantage of it, you can make a really big step in education. Try to avoid turn the school into a factory. [School] is a place where feelings need to be expressed."

– Javier Santaolalla

Podcast: Interview with The Mad Scientist

Interview by Joana M. da Silva

In the 2nd episode of our Podcast Series, we are thrilled to be joined by Stamos Archontis, a 30-year-old chemist and journalist who's using his expertise to bring science closer to the public. Many young people in Greece have come across his animated character, The Mad Scientist, who's been making waves on YouTube. Mad Scientist was created by Stamos to star on his YouTube channel counting more than 114K subscribers, where he loves to debunk pseudoscientific claims, doing an excellent job in examining, refuting, and spreading awareness about pseudoscience, an increasingly spreading phenomenon in which untrue factual claims or false reports of events are viewed as legitimate, despite the inadequate quality of the evidence for these beliefs.

But that's not all. Stamos has recently launched a new series of episodes in which he takes on interesting topics such as "why can't we walk on water?" and breaks them down in simple language in just a few minutes. With his engaging approach and dedication to facts, Stamos Archontis is definitely a rising star in the world of science communication.

Amidst his hectic schedule, Stamos, or Mad Scientist if you like, takes a small break to talk on this podcast about his decision to create a now-successful YouTube channel dedicated to debunking scientific myths, the double-edged role of social media but also the strong potential new digital media hold for informal science organizations for their public engagement and education purposes.

"These platforms [social media] have been used in a very clumsy way by educational institutions […] and it's partly because they realised the importance of these tools very late and, in their effort to catch up, they didn't pay attention in using them well"

– Stamos Archontis

Image credit:
www.themadscientist.gr

What we're reading, listening to and watching

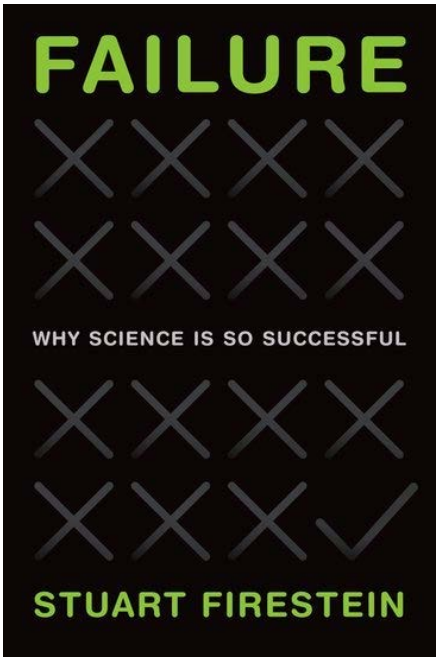
A curated selection of reads, movies and videos, podcasts, and more on out-of-school STEM learning.

Failures in Science

Have you ever stopped to think about how many failures scientists encounter on a daily basis? It might surprise you to know that failure is an essential part of the scientific method. In fact, without failure, science wouldn't progress at all. But despite its importance, failure is often kept under wraps, leaving young scientists feeling alone and uncertain when they experience setbacks.
But fear not! Our spotlight on the topic aims to pull back the curtain on scientific failures and show you that they're nothing to be afraid of. Our picks will help you embrace the allure of scientific failures, for they are the tantalizing stepping stones that pave the way to mind-blowing discoveries in science and technology.

READS

Failure: Why Science is so Successful



DESCRIPTION

The general public has a glorified view of the pursuit of scientific research. However, the idealized perception of science as a rule-based, methodical system for accumulating facts could not be further from the truth. Modern science involves the idiosyncratic, often bumbling search for understanding in uncharted territories, full of wrong turns, false findings, and the occasional remarkable success. In his sequel to Ignorance (Oxford University Press, 2012), Stuart Firestein shows us that the scientific enterprise is riddled with mistakes and errors – and that this is a good thing! Failure: Why Science Is So Successful delves into the origins of scientific research as a process that relies upon trial and error, one which inevitably results in a hefty dose of failure. In fact, scientists throughout history have relied on failure to guide their research, viewing mistakes as a necessary part of the process.

Citing both historical and contemporary examples, Firestein strips away the distorted view of science as infallible to provide the public with a rare, inside glimpse of the messy realities of the scientific process. An insider's view of how science is actually carried out, this book will delight anyone with an

interest in science, from aspiring scientists to curious general readers. Accessible and entertaining, Failure illuminates the greatest and most productive adventure of human history, with all the missteps along the way.

ABOUT THE AUTHOR

Stuart Firestein is an American neuroscientist and biologist. After earning his PhD in neurobiology, Firestein was a researcher at Yale Medical School, then joined Columbia University in 1993. At the Columbia University Department of Biological Sciences, Firestein is now studying the sense of smell. Dedicated to promoting the accessibility of science to a public audience, Dr Firestein seeks to reach broader audiences through non-scientific writing, public appearances, and his support of science in the arts

PODCAST

Episode: Why Science Needs Failure to Succeed

Stories of science are filled with eureka moments—from Archimedes' bath to Newton's apple—but the scientific process entails false starts and mistakes that are essential to success. In his new book, Failure: Why Science Is So Successful, neuroscientist Stuart Firestein makes a case for science as "less of an edifice built on great and imponderable pillars, and more as a quite normal human activity," and says "one must try to fail because it is the only strategy to avoid repeating the obvious."

You can listen to the episode here or check out other episodes from the Science Friday Podcast.

VIDEOS

What it takes to launch a telescope | Erika Hamden

TED Fellow and astronomer Erika Hamden leads the team building FIREBall, a telescope that hangs from a giant balloon at the very edge of space and looks for clues about how stars are created. She takes us inside the roller-coaster, decade-long journey to get the telescope from an idea into orbit — and shows how failure is inevitable when you're pushing the limits of knowledge.

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Our Team