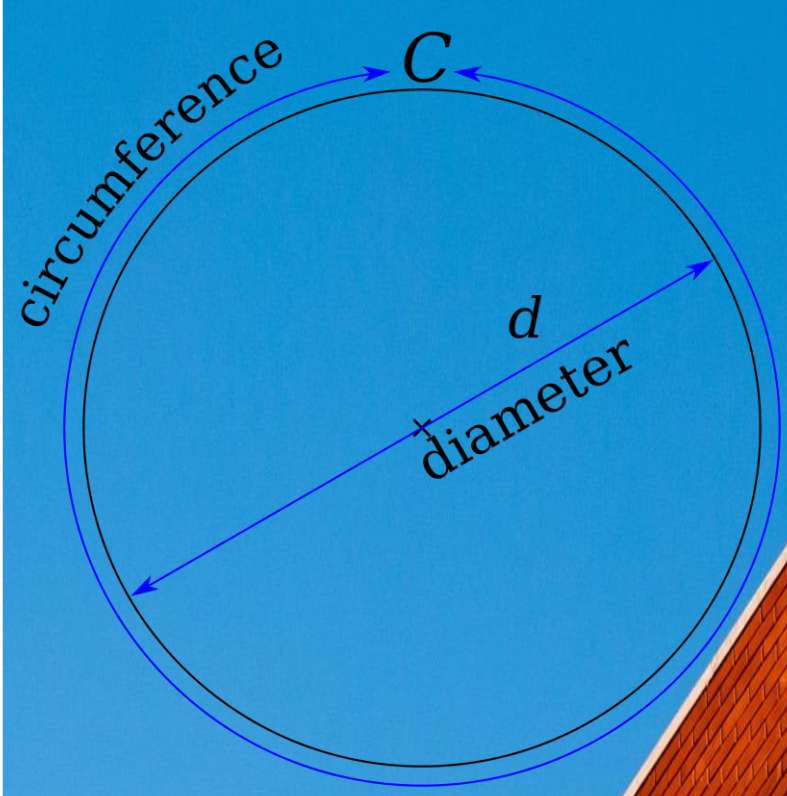
SAN JACINTO UNIFIED SCHOOL DISTRICT

Science Monthly

District NGSS and Science News



PI DAY 3.14

MARCH 2020

Website of the Month: Exploratorium Education

YouTube Channel Of the Month: Exploratorium

NGSS Explained: The SEPs Part III

Pi Day March 14th

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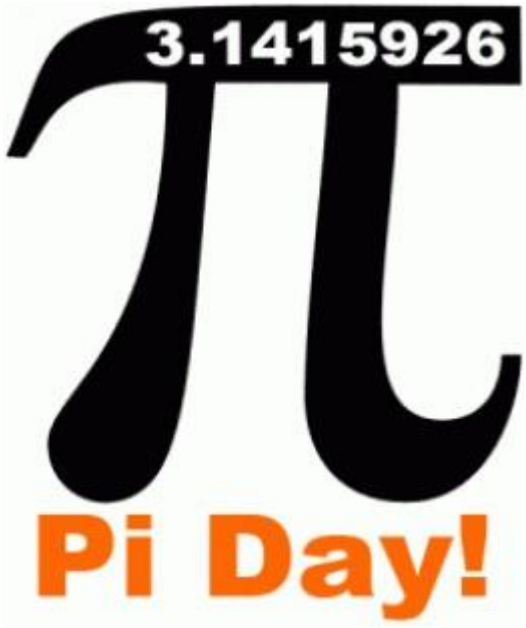


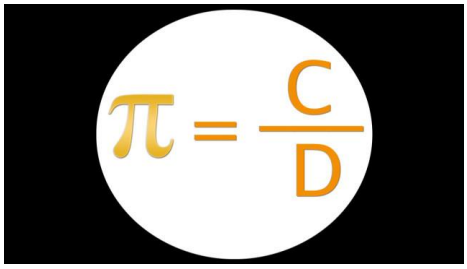
As someone who has always loved science, I was frustrated when my passion seemed to also combine with my arch nemesis, mathematics. The way my mind works, possibly like many of you as well, I struggle to find meaning in a formula all by itself. Once I started taking algebra and my teacher presented abstract formulas without reaching for any manipulatives, my brain felt like it was grinding to a hault to understand what was really happening with these numbers. Imagine my surprise when I went into my advanced science classes and saw those same terrifying formulas with letters and symbols in them. The difference in my science classes however was that we had those manipulatives again. We were measuring distances of physical objects and applying the mathematical formulas. Why is it that I was able to calculate the same rigorous math easier in my science class?

Understanding the ratio of pi was another experience for me where I needed to see the direct application of the numbers to see how they interacted with each other and finally understand what the formula is saying. I saw the number, 3.14, I knew it was important for calculating measurements with circles but just accepted the fact that it is part of a formula too complex for me to understand. It wasn't even until I was observing a 6th grade class during my credential program that a light bulb went off and I finally understood the meaning of pi!

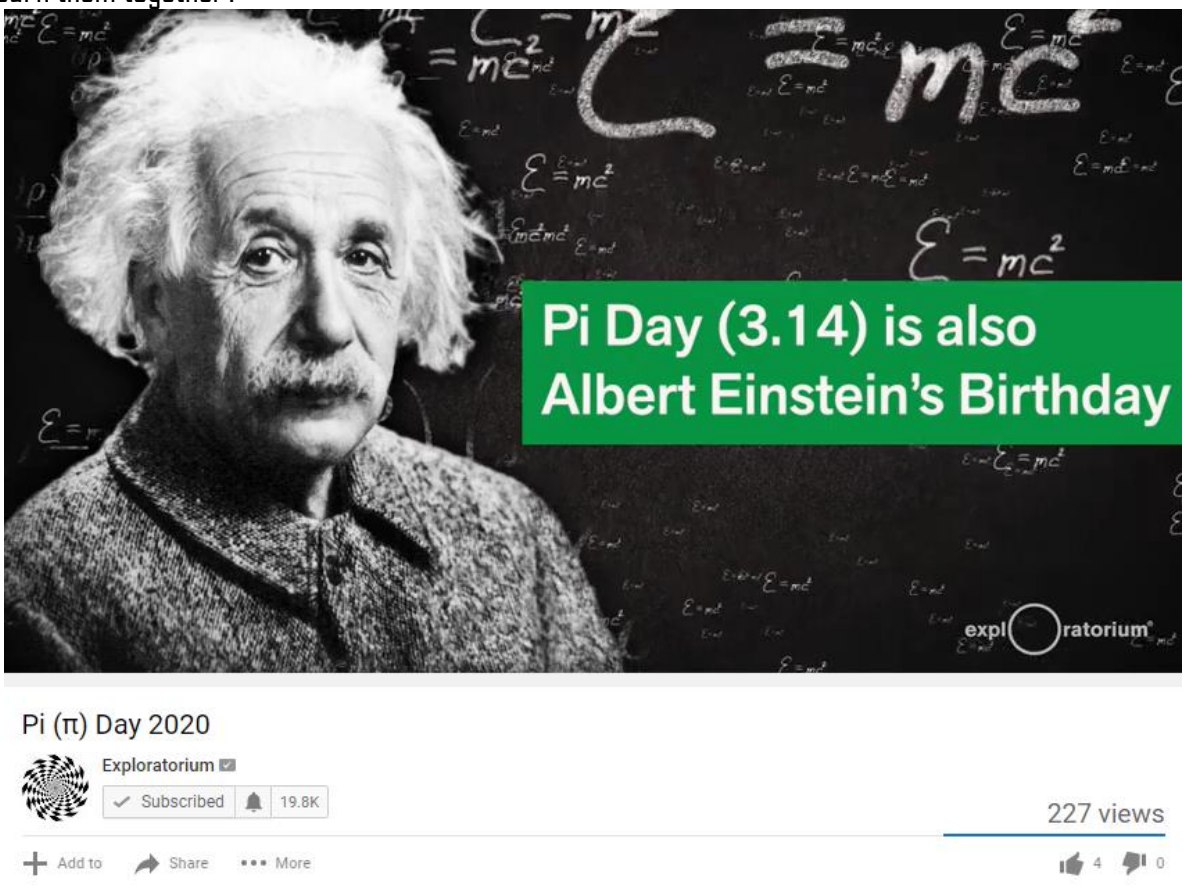
During a SCIENCE class, the teacher took the day to have the students choose different circles and cylinders around the room. She gave the students string, rulers, and simple calculators to perform some tests on the objects. On the whiteboard was a big chart for students to input their measurements for how long the string was around the circle (circumference), how long the string could stretch across the center at its longest point (diameter), and asked the students to use the calculator to divide the first number by the second number and record the final answer. While some of the students knew the terms, the teacher chose not to write them on the board to keep things simple. Soon enough, students started recording their final calculations on everything from large paint buckets to small plastic markers and all of the answers ranged from 3.05-3.4.

When the tests were done, the teacher called the class together to talk about the results of their investigations. As the students with prior knowledge used the correct terms, she would write them on the board. Distance around became circumference and distance across became diameter and the students started explaining their new observations using the proper vocabulary terms. Finally, the teacher asked the students what it means that all of the answers were within this tiny range of 3- plus a little bit more. Students were able to articulate that the circumference around a circle will

always be equal to the diameter three times plus a little bit more. They brought up that their numbers might be different because of how they cut their string or measured but that they all had a very close range of answers. It was then that the teacher wrote "pi" above the column of numbers. I could almost feel the twinge of my neurons as my understanding clicked into place.



Never again in my life will I forget what pi MEANS. Yes, it is generally input as 3.14 and yes I could continue to simply plug & chug my way through any more computation, but NOW I can look at the orbits around the Sun and understand the ratio of the orbit to the distance from the Sun. Circular movement is incredibly important in physics where calculations are a necessary aspect to the science. There is value in understanding the numbers beyond simply memorizing formulas and science class provides an opportunity to demonstrate the applications of these formulas. Math and science always have and always will rely on each other to understand the natural laws of our universe, so why not learn them together?



Website of the Month: Exploratorium Education
https://www.exploratorium.edu/education

Often times when we are looking for new lessons to spice up a chapter, we may explore the websites of popular museums to see what special lessons we can borrow. More and more, these informal institutions are trying to align their educational outreach with the Next Generation Science Standards but one institution in particular has dedicated itself to assisting California teachers in shifting the way that they think about and teach science. The Exploratorium on Pier 15 in San Francisco designs learning experiences for all ages to spark the natural curiosity in all of us.

"Our mission is to create inquiry-based experiences that transform learning worldwide. Our vision is a world where people think for themselves and can confidently ask questions, question answers, and understand the world around them. We value lifelong learning and teaching, curiosity and inquiry, our community, iteration and evidence, integrity and authenticity, sustainability, and inclusion and respect."

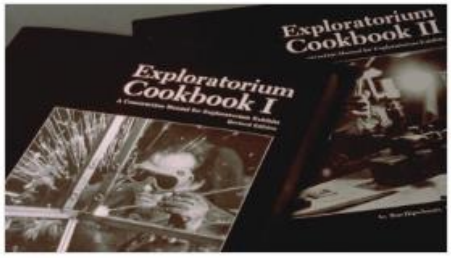
A new word I borrowed from the Exploritorium is "**exploriment**," or exploring by experimenting and testing. Exhibits are designed with learners in mind to come to their own conclusions about the principles of science rather than simply relying on the exhibit description to teach the concept. Even the machine shop that makes the exhibits is on display and visitors are encouraged to walk up and ask the engineers what they are working. Value is placed on engagement, either through conversation or through doing, and is reflected in the way that the museum spaces are designed. These values also carry over into their educational outreach programs that engage teachers as learners themselves.

Designing Teaching and Learning Tools

Our tools for teaching and learning go far beyond our exhibits—they are designed to spark curiosity, exploration, and understanding in learners and educators of all ages, near and far, and in all kinds of settings.

Science Snacks

Try these low-cost, teacher-tested activities for the classroom and the curious.



Publications

Explore some of our publications.

Explore, Play, Discover

Dive into websites, activities, apps, and more.

Advancing Ideas about Learning

We believe there are different ways of learning and knowing: through direct experience, art, dialogue, and making. Research and evaluation help us find out more about how people learn, and how we can improve our work.

Visitor Research & Evaluation

Research about learning in informal environments

Sign Up for our Educator Newsletter

Get the most out of the Exploratorium's teacher-friendly content, delivered to your inbox.

If you find yourself able to travel to San Francisco, you can apply to participate in one of many PDs and teacher institutes, but the website itself serves as a tool to enhance STEM education in your classroom. The education page for the Exploratorium provides "Science Snacks" or small demonstrations you can do with your students as well as full lessons and professional development resources for teachers to learn from as well. As we shift our teaching practices to better align with the action-driven NGSS, some of us may need to rethink how we are facilitating learning opportunities for our students. The Exploratorium's education staff is dedicated to supporting science teachers local and abroad and are always willing to help. If you are an elementary teacher looking for resources or guidance, contact the Institute for Inquiry to work with their elementary specialists where they are currently working on incorporating more ELD with science. Secondary teachers should check out the Teacher Institute for ways to add engagement and depth to your lessons, supporting a love of lifelong learning in our teens.

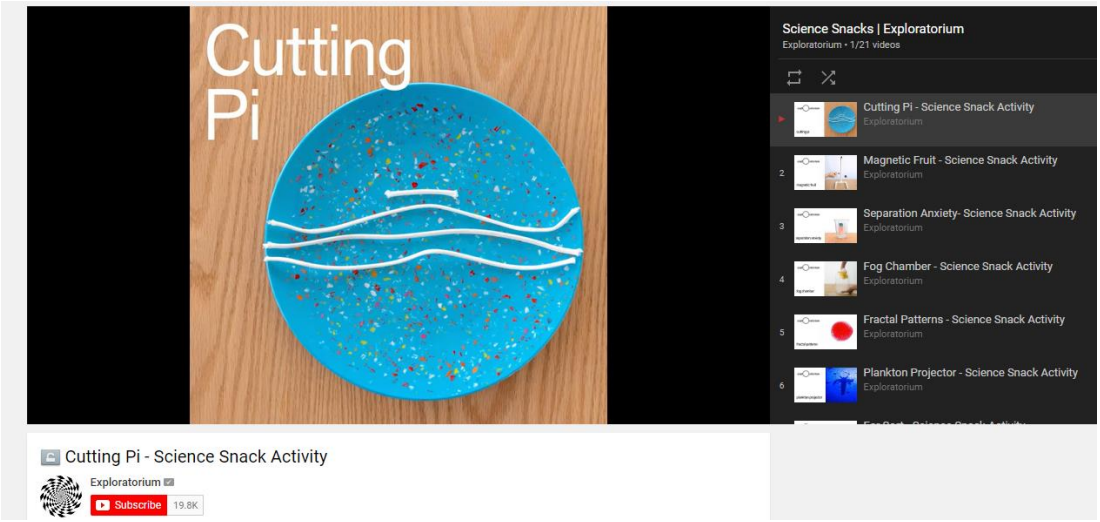
YouTube Channel of the Month: Exploratorium

https://www.youtube.com/channel/UCR4I4iSvzItLN_WumwIBC3Q



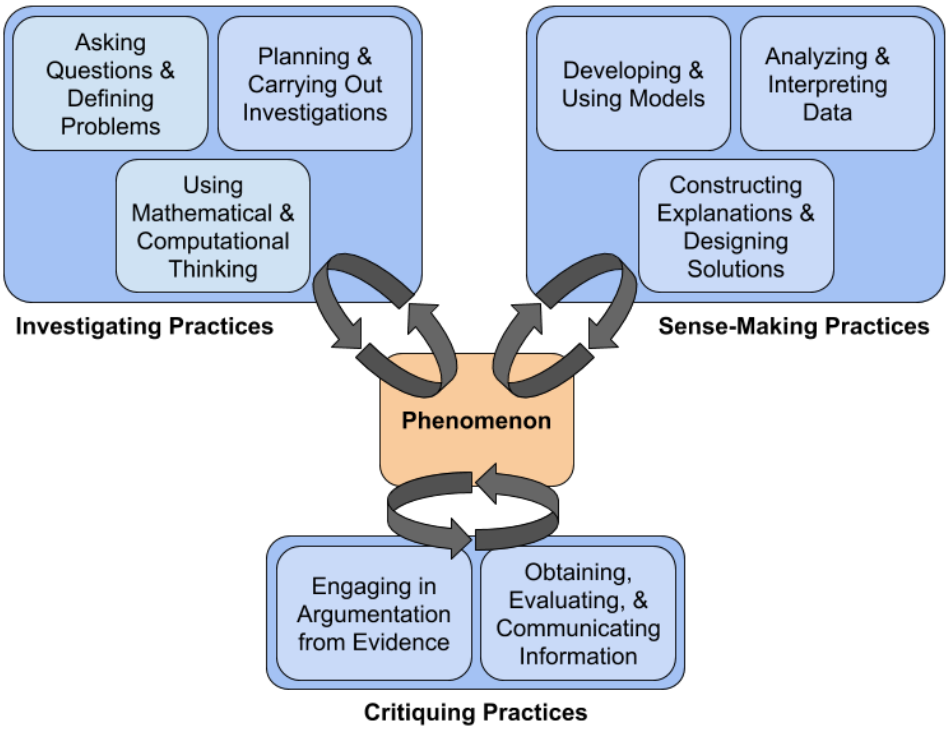
As previously mentioned, the Exploratorium is more than just a museum, it is a movement to spark curiosity and support science education in all of its interactive forms. To recreate many of these experiences in your own classroom, the Exploratorium has created multiple "Science Snacks" or hands-on activities that demonstrate various scientific concepts.

Beyond just getting ideas for lessons, there are also many videos from past lectures, explanations from official museum "explainers," and professional development videos on science facilitation. Just like our students, many teachers are visual learners as well and sometimes it's easier to watch a video about a demonstration than to just read the instructions. Take some time to explore the video playlists from the Exploratorium and try some exploriments for yourself!

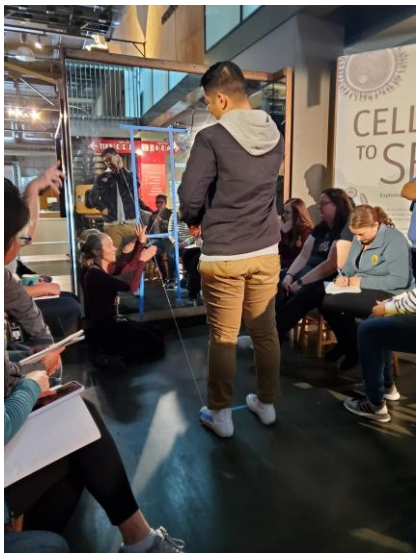


NGSS Explained: The Science and Engineering Practices (SEPs)

Part III of our series continues through the SEPs, spotlighting the skills our students are building in our classes as they absorb all the knowledge we can cram into their heads.



Using Mathematics and Computational Thinking



Math class is with another teacher or during another block but computational thinking is a skill necessary for conducting tests and collecting data. The opening article discussed an experience of learning the relationships between numbers, a skill that needs to be built and developed. If our society is expected to continue advancing our technology, we need citizens that are prepared to interpret and act on data. A student who only learns how to solve equations like a calculator has sharpened their mental acuity, but they have not been provided the opportunity to see how those equations relate to what the numbers are doing. Elementary teachers are great at pulling out plastic bears and moving them back and forth to show students how the numbers are interacting with each other. When I have one pile of 4 red bears and put it next

to a pile of 3 green bears, how many bears do I have in my new big pile? With our eyes and hands we observe the relationships of numbers by using manipulatives. As students advance in their math courses, the manipulatives begin to disappear, but step over into a Physics class and you see these math concepts being applied to real-world problems. With string and a ruler, students can understand how to calculate pi, they can understand how the numbers are related to each other; the manipulatives have moved from the elementary math class to the secondary science class. Math and procedural thinking are natural aspects of science and everyday life, take the chance to show your students how the numbers relate to each other outside of the formula.

Constructing Explanations (for Science) and Designing Solutions (for Engineering)

Being able to explain yourself is a life skill students should be learning everywhere, however in science class this skill is incredibly important. A well-supported argument presents evidence then states why that evidence is connected to a principle or concept. A lawyer presents evidence but then has to explain to the jury why the evidence matters. In a similar way, an engineer may be challenged with a problem and then has to present a solution with an explanation as to why this is a good solution. The ability to elaborate on a topic beyond a one-word answer must be practiced, especially when it comes to science and engineering.

Constructing Explanations: CERs are becoming extremely popular tools to use in science classrooms. A Claim-Evidence- Reasoning writing assignment sets students up with a format for thoroughly explaining themselves.

Claim: The distance around a circle is equal to the diameter times 3.14.

Evidence: A string wrapped around a cylinder could be cut into 3 equal lengths across the diameter, plus a little bit of string left over.

Reasoning: The ratio of any circumferences to the diameter in a perfect circle is the same, therefore no matter how big or small the circle, the ratio will always equal 3.14, or π.

Designing Solutions: At our STEAM Explosion this year, many students chose to design and build a prototype solution to some problem of their choosing. For anyone who has watched Shark Tank, you know that pitching your new prototype can be tricky but the best pitches have evidence to prove that their product is worth using. The engineer has to explain how it works and how it is better than the alternative with data.

Teen Earth Optimism March 14th, 2020

ATTENTION TEENS!

The Western Science Center in collaboration with the Smithsonian and Smithsonian Affiliates across the country will present a free Earth Optimism Teen Conference from 9:30am to 4pm on Saturday, March 14th, 2020.

As we look forward to celebrating the 50th anniversary of Earth Day, we recognize that teen leaders will be playing an important role in improving the world we live in. You are the ones that will inherit this planet and we are dependent on you to lead us all to be better.

Are you active in a club or have started a recycling program? Do you encourage other students to reduce waste in our oceans? Maybe you have a passion for animals and are concerned about the effects of local wildfires? This is your chance to meet other likeminded teens and find ways to take action and make a difference!

We want you!

We're looking for teens between the ages of 12 to 19 that have a strong interest in environmental issue on a local or world wide scale. **This is a free conference**!

Teen Earth Optimism 2020: Changing the Climate Conversation
9:30am to 4pm | Saturday, March 14th, 2020
Visit us at WesternScienceCenter.org to register today!

What you can expect at Teen Earth Optimism 2020:

- Hear the Earth Optimism teen panel discussion by teens from the D.C. area.
- Meet local organizations, scientists, volunteers, and peers to learn more about environmental science, actions, and solutions.
- Take part in two of the following Empowerment Session themes: Habit Loss, Ocean Health, and Reducing Your Carbon Footprint.
- Enjoy a provided lunch with other teens from around the area.
- Be empowered to look for solutions, while developing teen-lead action projects.
- Present an action project idea to other teens while changing the conversation from doom and gloom to empowerment and solutions.

Get Involved!

Are you interested in discussing a project that you started or helped start? Would you, or you and a group that you are involved in want to share a project that you are involved in at a conversation table or in a session?

Questions?

Email us at mozolins@westerncentermuseum.org bdooley@westerncentermuseum.org

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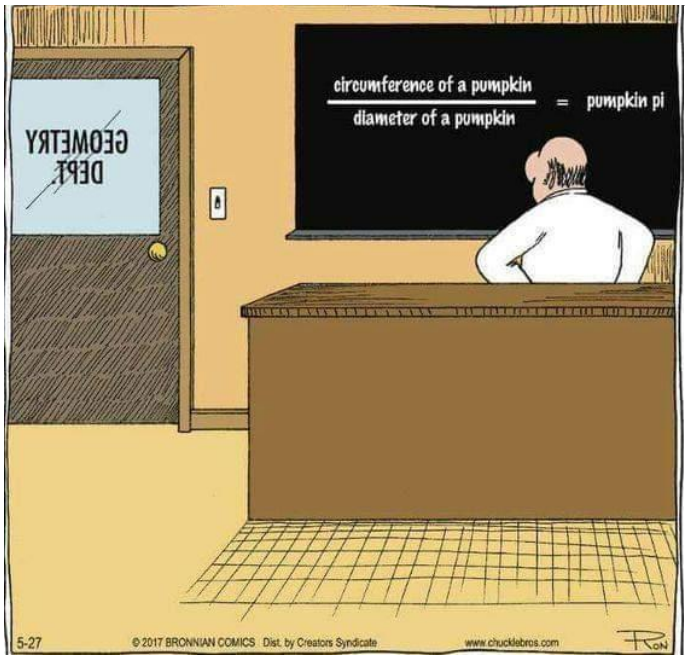

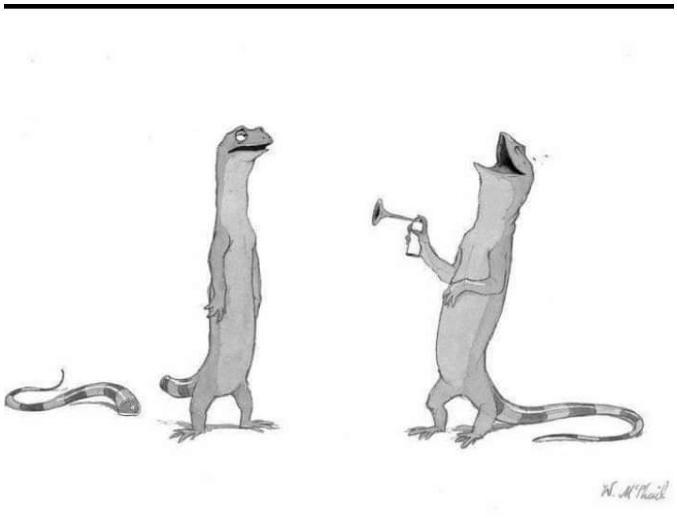

"You know what doesn't grow back, Susan? Trust."

Contact and Support

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All Science Monthly Resources: http://bit.ly/sciencemonthly
Website: https://thefishnerd.weebly.com