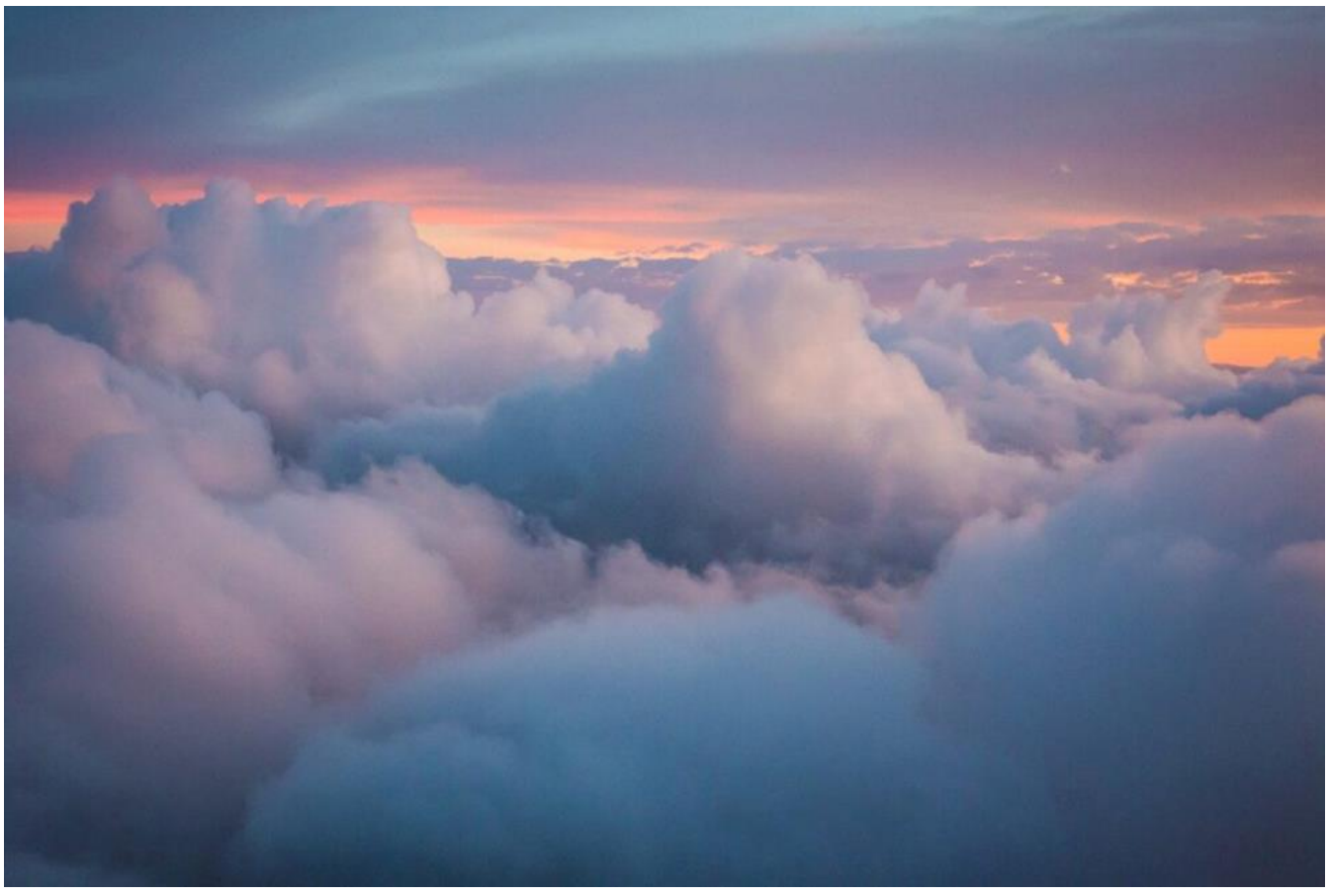
# How much do clouds weigh?

Clouds. We see them nearly every day, and admire the beauty they contribute to the earth. They glow various colors of red and orange in a sunrise or sunset, or saturate our land to help it grow. Other than admiring the beauty they offer, have you ever stopped to think of how much a cloud weighs? It is floating in the sky, it can not possibly weigh that much, right? Well, clouds consist of millions and millions of water particles floating in the sky due to heat from the earth's surface rising upwards. Think of it this way; if you had a billboard covered in condensation and you collected all of it into a large bucket, it would fill the bucket nearly full. Simply small drops of condensation. So, imagine how much water you could extract from a cloud if you put all the millions of particles it contains together. For your average cumulus cloud, this equates to around 1,000,000 lbs. Other types of clouds, such as wispy cirrus clouds, weigh around 10 times less at 100,000 lbs. Storm clouds, or cumulonimbus clouds, on the other hand, are around 2 billion lbs! If we look on an even larger scale at hurricanes, they weigh 100 times more than a cumulonimbus cloud! A whopping 200 billion lbs! So next time you go cloud watching, make sure to give your friends and family some info on the fluffy cotton balls of the sky. Their importance to our ecosystem "weighs" a lot heavier now.

Written by Maestro, STARBASE 2.0 team





In February we all experienced a once in a lifetime experience! It was a “twosday”, meaning the date was 2.22.22 on a Tuesday. Scientists call this phenomenon a palindrome,  palindrome means that the date reads the same backward and forward. It’s not only a palindrome in the United State’s calendar format, it’s a palindrome worldwide! With this memorable date, thousands flocked to Las Vegas to get married, the Las Vegas airport even offered a limited service of granting people marriage licenses in the Las Vegas airport. Las Vegas wasn’t the only city with celebrations going on, Sacramento California also celebrated this palindrome. 222 couples all gathered together at the State Capitol to be married at exactly 2:22 pm. Some would say that this was the best “Taco Twosday” ever!

Sources:
https://www.cnn.com/2022/02/22/world/twosday-february-22-wellness/index.html

By: Rey


Portable Kid IV Backpacks. CO2 Batteries. Robot Earthworms. Grandma Gaming Systems and Solar Powered Air Purifiers.

You guessed it… These were ALL invented by kids!

When I was young (just a Junior Mint really) I thought about all of the inventions I would make when I was older. I came up with some good ideas: a videocassette recorder (VCR), a novel with multiple endings, and a seedless watermelon. Well, I didn't invent them fast enough. Other inventors went to work and we enjoy these inventions today. (*See information about the inventors below) I hope YOU are actively working on developing your own ideas. Here are some kids that are changing the world using hard work and STEM:

After beating cancer at age 9, Kylie Simonds wanted to solve a problem that plagued chemotherapy patients. While she was staying in the hospital she and the other patients tripped over wires, got tangled up and had to drag a big IV around. So Kylie, now 11 years old, invented a Pediatric IV Backpack that allows children receiving medical transfusions to move around, and makes their treatment a little more bearable.

14-year old Sahil Doshi of Pittsburgh recently developed PolluCell, a battery that uses carbon dioxide and other waste materials, clearing the atmosphere of greenhouse gases and providing a low-cost alternative to electricity in developing countries.

13-year old David Cohen's big idea is the perfect example of how clever and creative kids can be when they are allowed to think outside the box. Cohen was learning about earthworms in science class when he wondered if anyone had ever built a robotic earthworm. He built and wrote the programming for his prototype robot so it could be used to squeeze into tiny and/or dangerous spots after natural disasters or fires. His robot can be used to find and rescue people and animals by using heat-sensing technology and GPS!

Cohen is currently working on a robotic mosquito to help stop illnesses spread by mosquitoes.

12-year old Jai Kumar of South Riding, Virginia likes to invent things that provide simple solutions to everyday problems. The 12-year-old middle-schooler has created a gaming system for the senior center where he works as well as an automatic light dimmer that senses sound levels in the school cafeteria. But when he created a window-mounted solar-powered air filtration device designed for developing counties where air pollution is very high he received awards. The device uses inexpensive components to purify the air before it enters the houses. Simple. Brilliant. Life-saving.

"I want to be an Electronics Engineer. I really enjoy exploring how to use technology to solve everyday problems." –Jai Kumar

These are just a few of our awesome kid inventors. We would love to hear about YOUR creative problem solving and inventions! Please share them with us on our website: www.starbasehill.org  STEM ROCKS!

Peppermint Pattie


"Energy and persistence conquer all things."-  Benjamin Franklin

* Inventor Charles Paulson Ginsburg, otherwise known as the "father of the video cassette recorder," was born in San Francisco in 1920.

In 1976, R. A. Montgomery was in charge of a small independent press when Ed Packard approached him with a brand-new idea. After telling his children bedtime stories and asking them about the ending and receiving two different answers, he developed the very first multiple-ending book.

Seedless watermelon production began its evolution in 1939. The first specimen was developed by Professor H. Kihara, a Japanese scientist at Kyoto University. They didn't create a large market for themselves until the late 20th century.

Credit to Treehugger.com, USNews.com, ABCnews.com, and Sphero.com

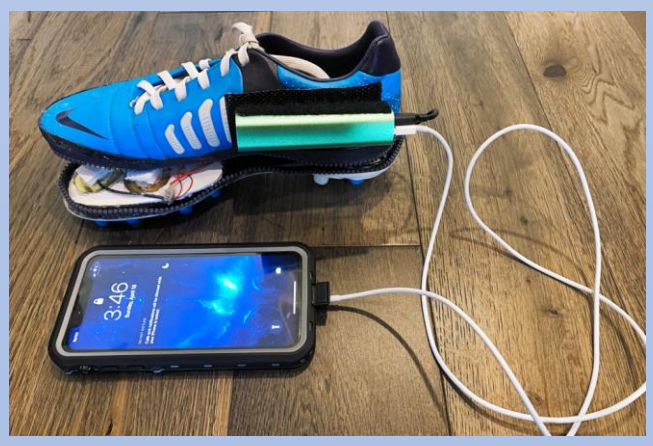
# Hey You, What's your big idea?

Here at STARBASE, we learn a lot about the engineering design process. Why? Well, to solve problems. Have you ever had a problem and thought…"someone needs to invent something to fix this problem?" . Me too!!!! Let me introduce you to Lino Marrero. He's a 15 year old kid. Yep, not much older than you.

Marrero must have been listening in his science class when he learned about ENERGY! He learned that energy transfers and transforms. One afternoon after soccer practice, Marrero needed to call his mom and couldn't because his phone was DEAD! Out of Battery! Marrero had a thought come into his mind that could solve this problem! If he could make shoes that could store the energy he just used while running at soccer practice, then he would have enough energy to charge his phone.

Time magazine reports that Marrero, after spending hours at the drawing board, tinkering with wires and creating 10 different prototypes, created a shoe insert that collects kinetic energy and converts it into battery power to charge a cell phone. Marrero calculates that 12 minutes of walking can generate enough kinetic energy to charge 10 percent of a cell phone battery. He calls his invention "Kinetic Kickz".

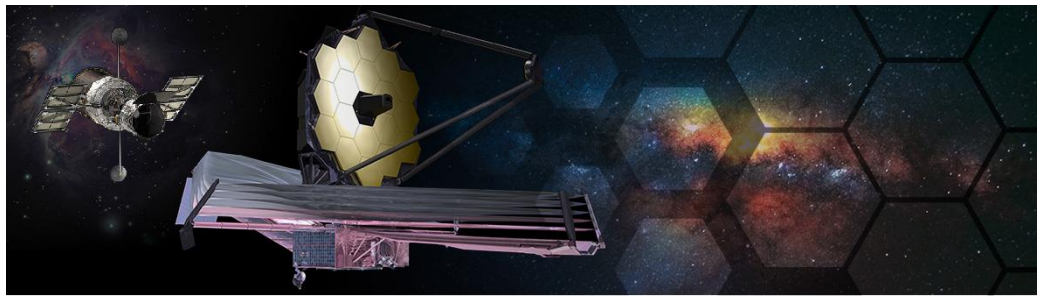
If you can solve a problem, DO IT! You don't have to reach a certain age or know everything before you start. You just have to start. Good Luck!




By: Skyfire

# ***Blast from the Past***

**by Batman**



On December 25th, 2021, NASA received a Christmas gift like no other, a successful launch of their 10-billion-dollar project, the James Webb Space Telescope (JWST). The idea for a "Next Generation Telescope", as coined by NASA and the Space Telescope Science Institute, actually began gaining trajectory in September of 1989. However, with stars in their eyes, NASA finally approved funding in 1996. So, after 30 plus years of planning, developing, engineering, constructing and redesigning, project participants witnessed their hard work blast into space, the final frontier, from a spaceport in French Giana.

The JWST reached its resting location at approximately 1.5 million kilometers from Earth towards Mars. The telescope will actually orbit around this spot for the purpose of keeping it steadier while taking photos of its point of interest. However, even with the great distance between Earth and the JWST, commands will only take six seconds to reach the telescope. These commands travel by radio waves allowing controllers to adjust the JWST quickly.

With 18 different sections and a mirror measuring 6.5 meters across, the controllers will be able to see 13.7 billion light years into the past. These sections act independently, in essence scientists have 18 telescopes for their use. Currently, the JWST must align these sections to synchronously point toward the same object and develop one clear picture. Along with these multiple sections, the JWST gathers infrared light rays, unseen by the human eye, to develop its pictures. Many space specimens such as dead planets, red stars, and brown dwarfs shine brightest in infrared. Following, an example of the detail obtained through the capture of infrared light waves:

(Credit NASA/ESA/Hubble Heritage Team (STScI/AURA))

The famously "Pillars of Life" photo by the Hubble Telescope takes on a very different vantage when instituting infrared light wave analysis. The JWST, in reality, will be able to view through the dust to see the space specimens beyond. This advancement gives scientists much more to observe in their never-ending task to better understand our ever expanding universe.

So, how are we seeing in the past. Well, since the JWST analyzes infrared waves, these waves hold the light data first emitted from space specimens millions upon millions, if not billions upon billions of years ago. Scientists have the opportunity of analyzing the first stars birthed in the universe. Two questions to consider is what do these planets, stars, galaxies, etc, look like today? Then, how can we get there? James Webb will be the ultimate history experience…imagine if you lived on a planet 200 million light years from Earth, if you had this telescope's ability, the light data you intercepted from Earth would show you the dinosaurs roaming our planet. Pretty AMAZING!

# The Reason Behind the Seasons

People often think that it is hotter in the summer (in the northern hemisphere) because the Earth is closer to the Sun. In fact, during summer in the northern hemisphere, the Earth is 3.1 millions miles farther away! (Fig. 1)

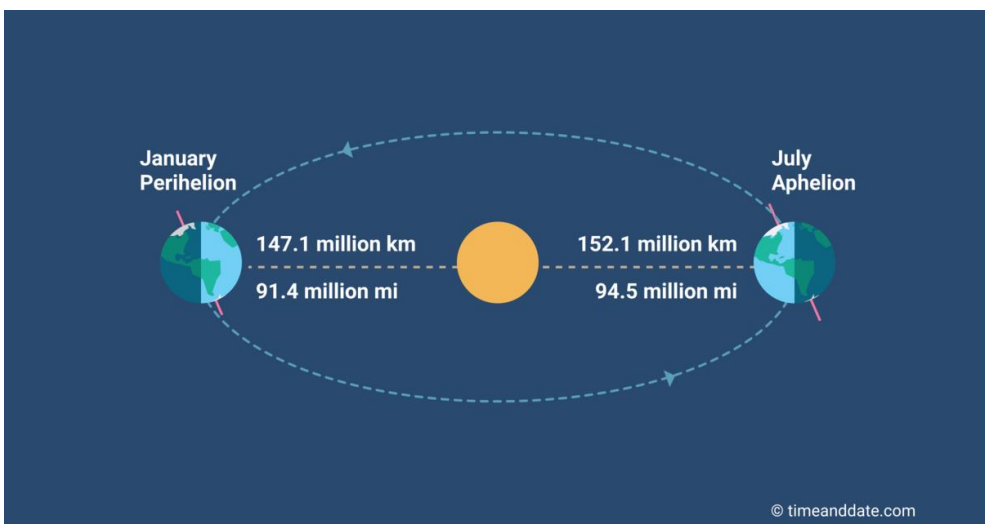



Figure 1

The reason for the difference in temperature between the summer and the winter actually has to do with the tilt of the Earth's axis. The Earth is tilted 23.5° on its axis (Fig. 2). If the Earth were not tilted on its axis, there would be no summer or winter seasons.

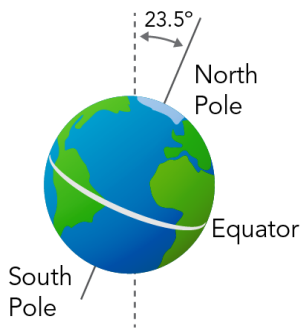



Figure 2

In the summer the northern hemisphere is tilted toward the Sun resulting in the Sun's rays, which carry energy from the Sun to the Earth, striking the Earth's surface more directly (Fig. 3&4). Since there is more direct sunlight, more of the Sun's energy penetrates the atmosphere and is absorbed by the Earth's surface. As a result, the kinetic energy in the atmosphere and on Earth is higher resulting in a higher temperature. Depending on where you live in relation to the equator, if you look up towards the Sun at noon (12 p.m.) in the summer you will see that the Sun is higher in the sky than it is in the winter.

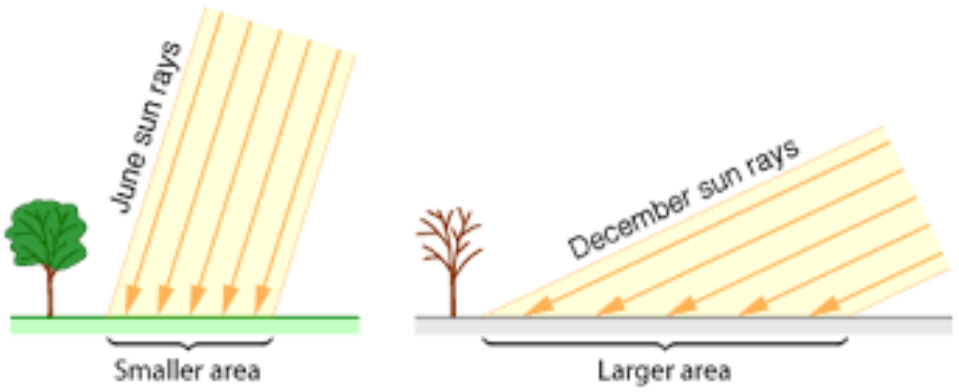



Figure 3

In the winter the northern hemisphere is tilted away from the Sun, which means that the Sun's rays hit the Earth in at a more oblique or slanted angle (Fig. 3&4). Since there is less direct sunshine, less energy is absorbed by the atmosphere and the Earth's surface resulting in less kinetic energy and therefore, a lower temperature. If you look up towards the Sun at noon in the winter, you will see that the Sun is lower in the sky.

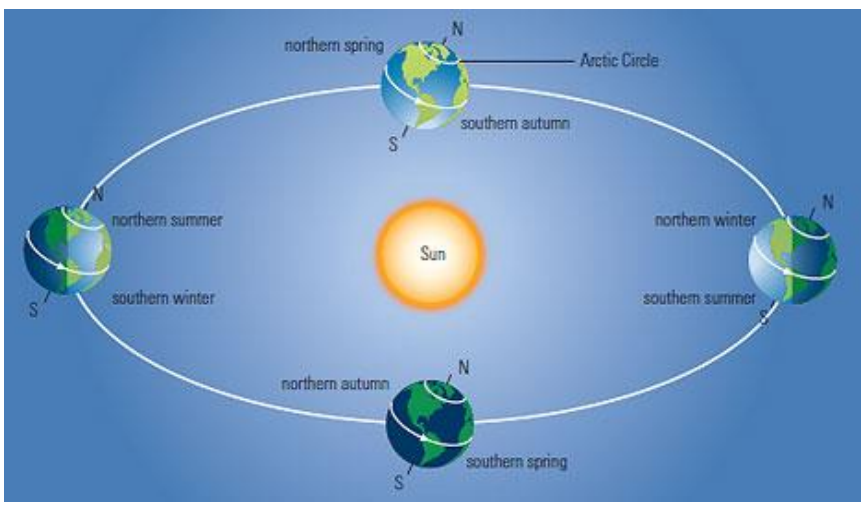



Figure 4

The southern hemisphere experiences the reverse of the northern hemisphere. When it is summer in the northern hemisphere, it is winter in the southern hemisphere and vice versa (Figure 4). So remember, seasons are all about the tilt of the Earth's axis, not the distance between the Earth and the Sun!

By: Tahoe

# Fun in the Sun!

By: Ariel

This time of year, I miss those warm, summer days and that nice heat from our "summer" Sun! Maybe we should give our Sun more of the recognition it deserves? Did you know:

10) The temperature of the Sun's core nears 15,000,000 (that's *15 million!)* degrees Celsius which is hot enough to sustain nuclear fusion- its energy source derived primarily from hydrogen and helium gas.

9) The Sun's gravitational pull holds our *entire* solar system together and everything in our solar system- from planets, comets, asteroids and even space debris revolve around it.

8) The Sun is 150 *million* kilometers from earth, and yet its energy is crucial for most life on Earth.

7) The diameter of the Sun is about 1.4 *million* kilometers. This means that almost 1.3 *million* Earth's could fit inside the Sun. Here is a picture to help illustrate this:


6) It takes 8 minutes and 20 seconds for the light emitted by the Sun to reach our Earth.

5) The Sun creates weather in space, known as "solar wind". Giant explosions of energy, such as solar flares and coronal mass ejections, can sometimes even knock out power here on Earth. The Aurora Borealis (also known as *Northern Lights)* are formed when energy from solar wind approaches the Earth and meets the Earth's magnetic field.

4) Our Sun is thought of as "middle aged" (at <u>just</u> 4.5 *billion* years old) and generally considered larger than the most common stars in the universe, but much smaller than the largest known stars, known as Red Giants.

3) The Sun rotates on its own axis, just like Earth. However, the Sun orbits the center of the Milky Way galaxy while the Earth orbits the Sun.

2) The Sun doesn't have any moons, but 8 planets (and thousands of asteroids) orbit it.

1) The Sun accounts for 99.8% of ALL mass in our solar system.

Want more incredible facts about our Sun and our Solar System? Visit: solarsystem.nasa.gov

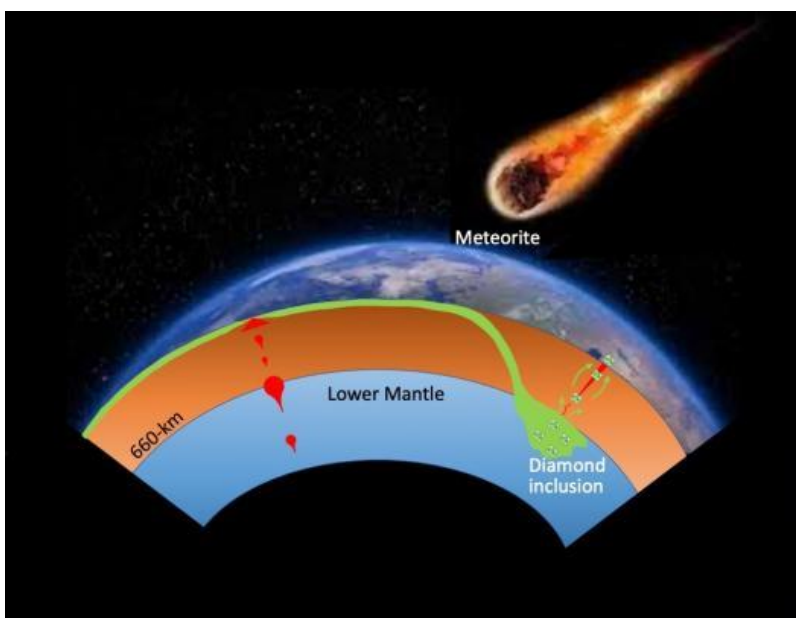
# A New Mineral Discovery

On November 11, 2021 geochemists from UNLV published their report to the journal, Science, about the existence of a new mineral that never was expected to be found on the Earth's surface. It was encased inside a diamond that was discovered in Botswana's Orapa mine in the 1980's (pictured to the right). In 1987 the diamond found its way from a jeweler to a mineralogist. Jewelers want their diamonds to be clear of any dark specks but mineralogists see those dark specks as gifts full of minerals.

They used a specialized X-ray to study this mineral, they discovered it is a calcium silicate compound, $CaSiO_3$-perovskite. They named the mineral Davemaoite after Ho-kwang "Dave" Mao (pictured to the left), an experimental geophysicist who developed many of the techniques that were used to study this mineral.

Tschauner believes this mineral originated between 410 and 560 miles below the Earth's surface and that further study of this mineral will help us learn more about the evolution of the earth's mantle. Davemaoite is also believed to play a key role in generating the heat flow in the earth's mantle.

The amazing thing about Davemaoite is that it is created in a high-pressure environment. Without the diamond around this mineral, it would have fallen apart. The only other mineral that is similar was found inside a meteorite. The picture to the right shows the two high-pressure environments where minerals like this can form. Davemaoite was added to the list of minerals by the International Mineralogical Association before the study was published and the diamond itself is now in safe keeping at the Los Angeles Natural History Museum.




By Magic

Resources: https://epl.carnegiescience.edu/news/introducing-davemaoite-groundbreaking-mineral-discovery-named-after-trailblazing-carnegie
https://www.unlv.edu/news/release/research-brief-first-ever-interior-earth-mineral-discovered-nature
https://www.npr.org/2021/11/17/1056397181/rare-mineral-discovery-davemaoite

Have you ever heard that honey is bee poop, spit or vomit? If you think this is true you would be wrong, technically. Honey is made from nectar that has its moisture reduced. The bees do store the nectar inside a pollen basket near their stomach where unwanted particles are filtered out and once back at the hive it gets regurgitated (not vomited) while worker bees fan it with their wings to further reduce the moisture. Once the moisture content is between 13-18% it is considered honey and it gets stored inside honeycomb.

This past summer we had a swarm of bees about the size of a volleyball that made a temporary home in a bush out on the farm I grew up on. We called a bee keeper friend who made the trip out to collect the bees and keep them in one of his hives. He estimated there were 25,000 bees in this particular swarm. As he was scooping them up and placing them in his box he shared some knowledge about honey bees. We were amazed at how complex this tiny insect really is.

Here are some incredible facts about honey bees according to Mark Roberts (bee keeper) and https://honeybeenet.gsfc.nasa.gov/Honeybees/Basics.htm:

Bees have 5 eyes
Male bees in the hive are called drones and cannot sting.
Bees fly about 20 mph
Female bees in the hive (except the queen) are called worker bees
The queen bee lives for about 2-3 years.

Worker Drone Queen

Number of eggs laid by queen: 2,000 per day is the high
Losing its stinger will cause a bee to die
Bees carry pollen on their hind legs in a pollen basket or corbicula
The Honey bee's wings stroke 11,400 times per minute, thus making their distinctive buzz
An average beehive can hold around 50,000 bees
Foragers must collect nectar from about 2 million flowers to make 1 pound of honey
The average forager makes about 1/12th of a teaspoon of honey in her lifetime
Bees have 2 pairs of wings
Worker bees will travel up to six miles per day
It takes one ounce of honey to fuel a bee's flight around the world.
The principal form of communication among honey bees is through chemicals called pheromones

We watched as the bees did their dance to send the pheromones out to let all the worker bees know where to find the queen and return the pollen. After lifting the majority of the swarm into the box he simply put the lid on and left it overnight. This allowed all the bees that were out to find their way back to the queen. Our bees were busy over the summer making honey. We now have a standing offer to refill our honey bear whenever we run out. Nature is so cool.

By: Tomahawk