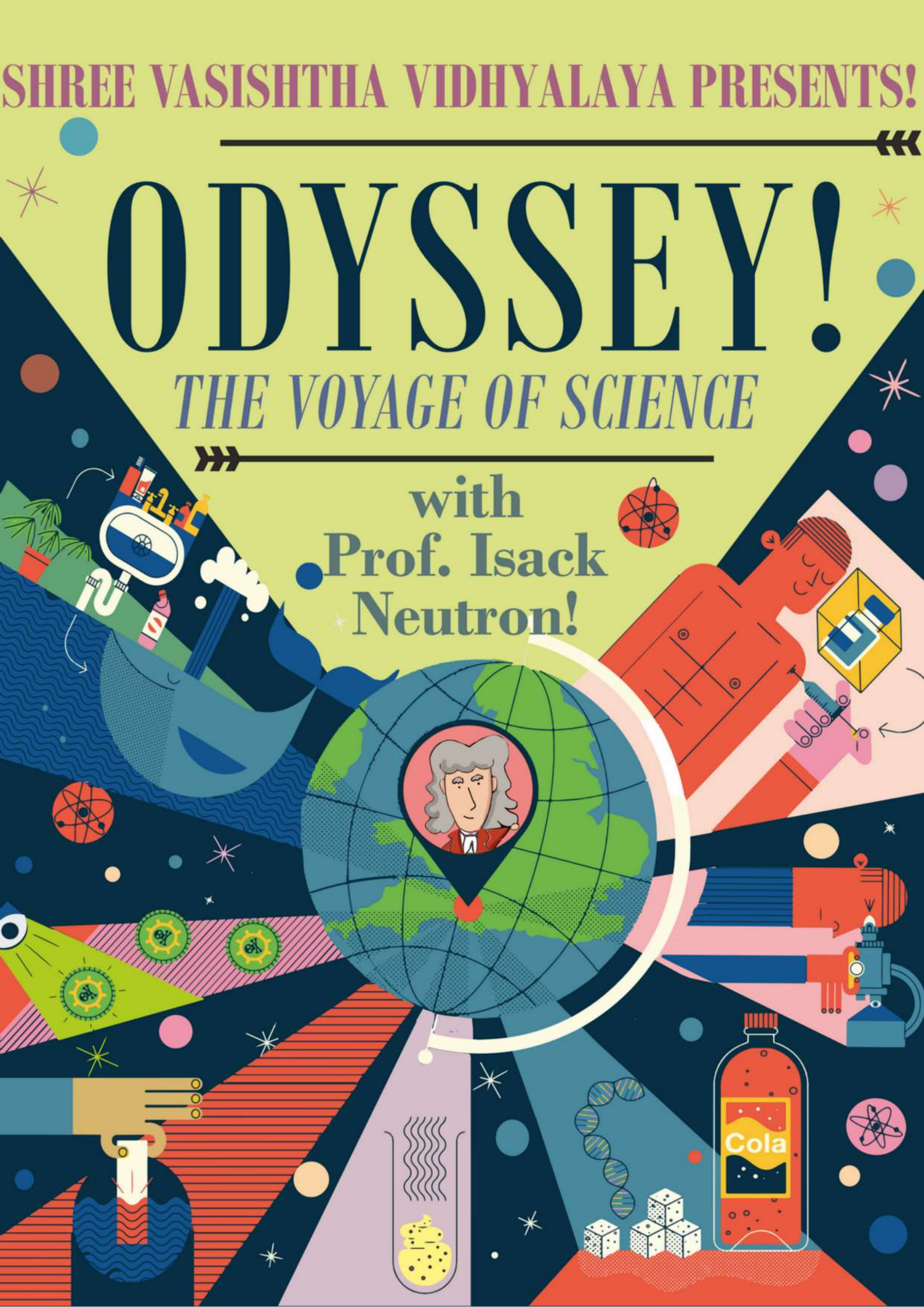
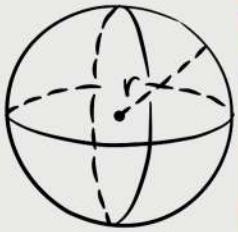
SHREE VASISHTHA VIDHYALAYA PRESENTS!

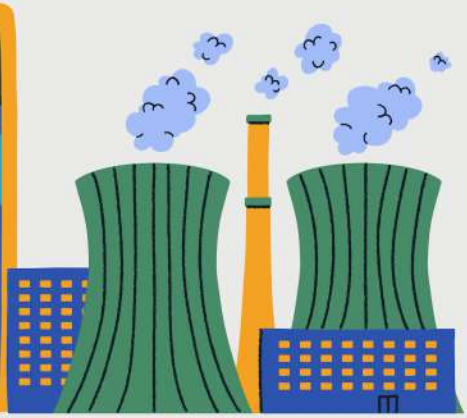
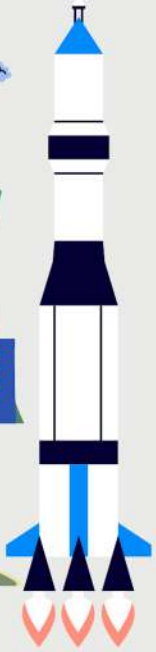
ODYSSEY!

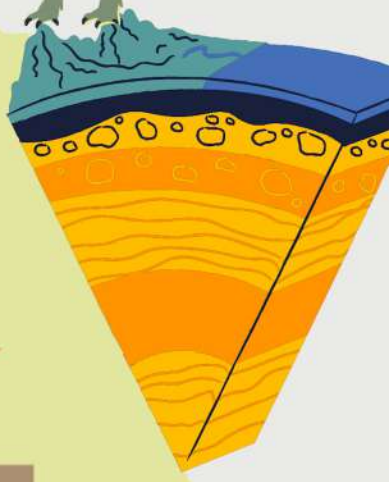
THE VOYAGE OF SCIENCE

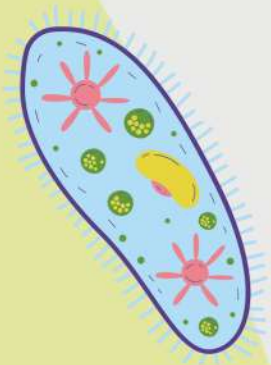
with
Prof. Isack
Neutron!



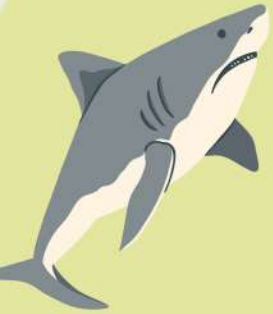



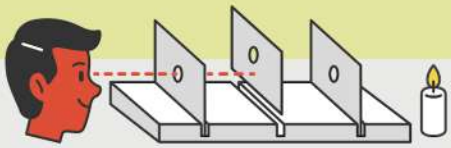


SVV PRESENTS

ODYSSEY!

First Edition



MESSAGE FROM ADVISOR SIR

Dear Students, Faculty, and Readers,

I am delighted to introduce the first edition of our school's science magazine, Odyssey, entirely crafted by our remarkably talented students.

Odyssey serves as a window into the innovative and imaginative minds of our young scientists. As you flip through its pages, you will encounter thought-provoking articles, insightful research, and captivating visual representations of various scientific disciplines. It is evident that our students have invested countless hours into researching, writing, and designing each piece, showcasing their unwavering commitment to learning and discovery.

In today's rapidly evolving world, the significance of scientific knowledge cannot be overstated. Our students' contributions to Odyssey reflect their understanding of the critical role that science plays in shaping our lives, our environment, and our future. Through their work, they inspire us all to embrace curiosity and to continuously seek solutions to the challenges that lie ahead.

I encourage all members of our school community and beyond to engage with the diverse array of articles within Odyssey. May this magazine inspire you to delve deeper into the wonders of science and to embrace a lifelong journey of discovery.

With warm regards,

Dr. A.K. Gaur
B.Sc.(Hons.), M.Sc.(Zoology), B.Ed., Ph.D
Shree Vasishtha Group of Schools
Advisor

MESSAGE FROM PRINCIPAL MA'AM

Dear Esteemed Readers,

As you hold the first edition of Odyssey, our school's remarkable science magazine, expertly created and curated by our students, I hope you are as proud of their achievements as we are.

Science, with its power to inspire and transform, is at the heart of innovation and progress. The fervour of our young scholars and contributors for science and the collaborative effort that has gone into producing Odyssey is a testament to the nurturing environment we provide at SVV, one that encourages intellectual growth and fosters a love for learning. Through Odyssey, our students not only showcase their mastery of scientific concepts, but they also ignite a spark of curiosity in the minds of their peers.

I invite each and every one of you to immerse yourselves in the world of science that Odyssey unveils. May this magazine kindle a lifelong passion for learning and a deeper appreciation for the wonders of the universe.

With great pride and excitement,

Mrs Shubhra Srivastava
M.Sc. in Mathematics(Gold Medalist), B.Ed
Principal
Shree Vasishtha Vidhyalaya

WHO ARE YOU, ISACK NEUTRON?

I come from a land, far from the ocean and sea!

Is your homeland clum-sea(clumsy)?

Isack, is the land that of idio-sea? (idiocy)

Err, um.. I am ISACK.

Isack Neutron.

When I was younger, my father lifted me high into the sky and proclaimed-

He shall follow the footsteps of
THE GREAT! ISSAC NEWTON!
and become a SCIENTIST!

But alas;

Issac Knew-ton, Isack knows none!

I STUMBLE MORE,
SUCCEED LESS!

I AM CLUMSY MORE,
CLEVER LESS!

I AM IDIOTIC MORE,
INTELLIGENT LESS!

That's me! The Clumsy Lumsy Isack!

But Isack never fails,
he just falls!

I attempt to rise again by coming to you, dear students of SVV!
With my big bag of lessons, and your curiosity as the blessing, we shall unfurl the mysteries of Time, to explore the Sun, to gaze at the Polar Stratospheric clouds, and everything else,
together on

ODYSSEY!

The Voyage of Science!

TABLE OF CONTENTS

TABLE OF CONTENTS

Blackhole and Spaghettification

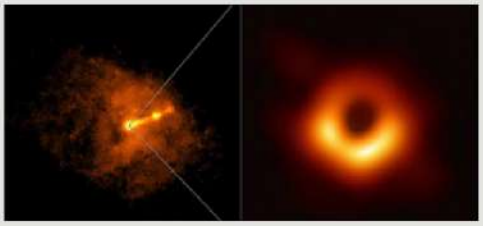
-Magdhi Patel and Panthi Ahir

WHEN DOES SPAGHETTIFICATION OCCUR AND UNDER WHAT CONDITIONS?

Introduction:

BLACK HOLES are objects from which even light cannot escape. They are massive but small in size relative to their mass.

There is a general belief that **when an object ventures too close to a black hole's event horizon, it get torn into spaghetti like shreds.** This is because the object's proximity to the singularity that lies within a black hole. However, we show here that this can only happen if the *mass of the black hole is relatively small.* When the black hole is *classified as supermassive* this 'spaghettification' does not occur. In addition, we will also outline different methods for detection of black holes with a special focus on so-called ' gravitational lensing' methods.



DO YOU KNOW HOW THE BLACK HOLES ARE FORMED?

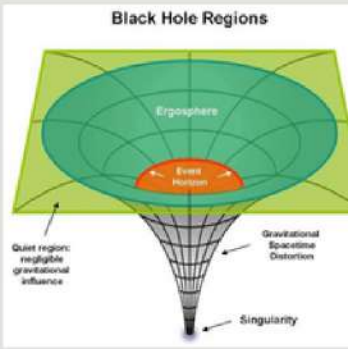
Black holes are formed when a massivestar undergoes supernoverexplosion. The stars collapsing in itself and its gravitybecomes infinitely strong that nothing can escape it.

SUPERNOVA: A SUPERNOVA IS A POWERFUL AND LUMINOUS EXPLOSION OF STAR.

- SPAGHETTIFICATION DEFINED:

Spaghettification is defined as ***"...the vertical stretching and horizontal compression of objects into long thin shapes..."*** which is caused by extreme tidal force from a black hole.

When an object ventures to close to a black hole, the significantly greater pull of the material closest to the black hole makes that material fall significantly faster than the farthest material leading to a '***stretching***' effect.



However, such an extreme difference between the tip and tail depends on the mass/size of the black hole with smaller black holes leading to more extreme cases because such a large amount of mass being compressed into a small area creates a greater gravitational gradient.

Size classification:
Black holes are classified by their size and whether or nor spaghettification will occur has to do with the size of a black hole. If the black hole is classified as supermassive, you could pass through the event horizon without being spaghettified. This, however, is not the case if it is classified as a stellar or micro black hole.

Class	Approx.Max	Approx radius
Supermassive	105-1010 Mass of Sun	0.001-400 Astronomical Units=1.5 10^8 km
Intermediate-Mass	103MSun	103km=REarth
Stellar	10MSun	30 km
Micro	Up to Mass of Moon	Up to 0.1 mm

Methods of detection:

Researchers use two main methods to detect blackholes:

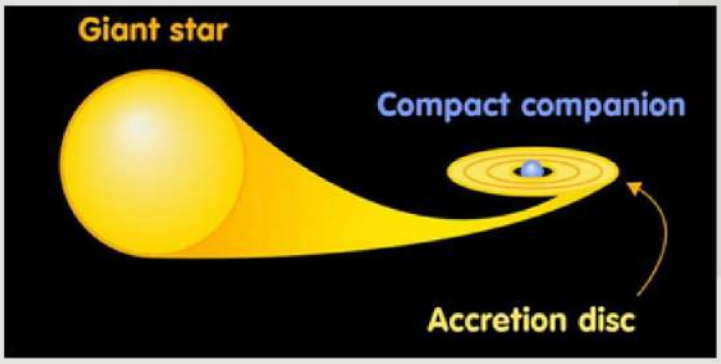
1. Gravitational Lensing:

it is particularly difficult to spot a black hole without an accretion disk. Through gravitational lensing we are able to spot a black hole by its immense gravity distorting the light coming from objects it is passing in front of(i.e., a galaxy)

2. X-Ray Emission from Binary Star System:

In a binary star system, if one of the stars becomes a black hole, it will slowly begin tearing the gas away from its sibling star.

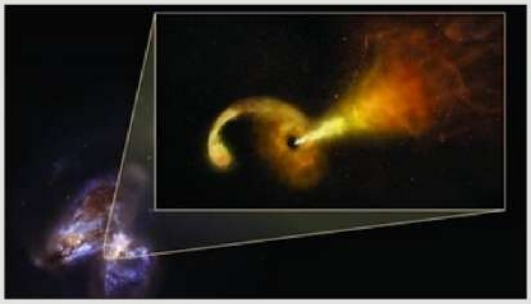
As the gas spirals toward the event horizon, it is heated by the **tidal forces of the black hole** and the friction of the gas molecules rubbing together. This forms an **accretion disk** that emits light and X-Rays making it easier for scientists to spot.



DO YOU KNOW HOW SCIENTISTS RESEARCH ABOUT IT??

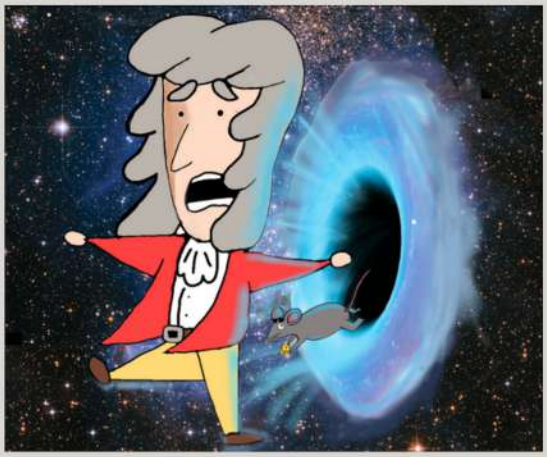
In order to observe spaghettification taking place, scientists must find a black hole using one of the methods referenced above. Scientists will then collect data on how the black hole interacts with the matter around it. **When a black hole comes too close to another celestial body**, spaghettification occurs.

The tidal forces from the black holes singularity are so strong that they will pull massive star into spaghetti like strands. How quickly this happens depends on the tensile force of the star. Black holes have a **gravitational force** that nothing can escape, whether it be an astronaut, an entire star, or even light itself.



-This is the closest known spaghettification event happening at **just 215 million light-years** from Earth.
-Scientists were able to observe the spaghettification for about six months.
-Methods used to view this occurrence took place in **ultraviolet, optical, X-ray and radio wavelengths.**

FACT: Black hole mass can be upto 20 times or even more than that as compared to sun.



THE MYTH OF SPAGHETTIFICATION BY BLACK HOLE:
It is a common misconception that no matter the size of the black hole, any object that wanders to close will be spaghettified . This is not the case.

Illustration of what this event may have looked like:

The spaghettification is dependent on several conditions:
1.The tensile strength of the object.
2.The size of the black hole(Schwarzschild Radius)
In conclusion, it is possible to enter a supermassive black hole's event horizon and return without being spaghettified however, if the black hole is classified as **stellar or micro**, the objects probability of being spaghettified before it even reaches the event horizon is very likely.

MAGDHI PATEL
11 - D
Head Girl 2023-24

PANTHI AHIR
12 - D

THE SOLAR DYNAMO

-Nandani Desai and Krishika Thakor

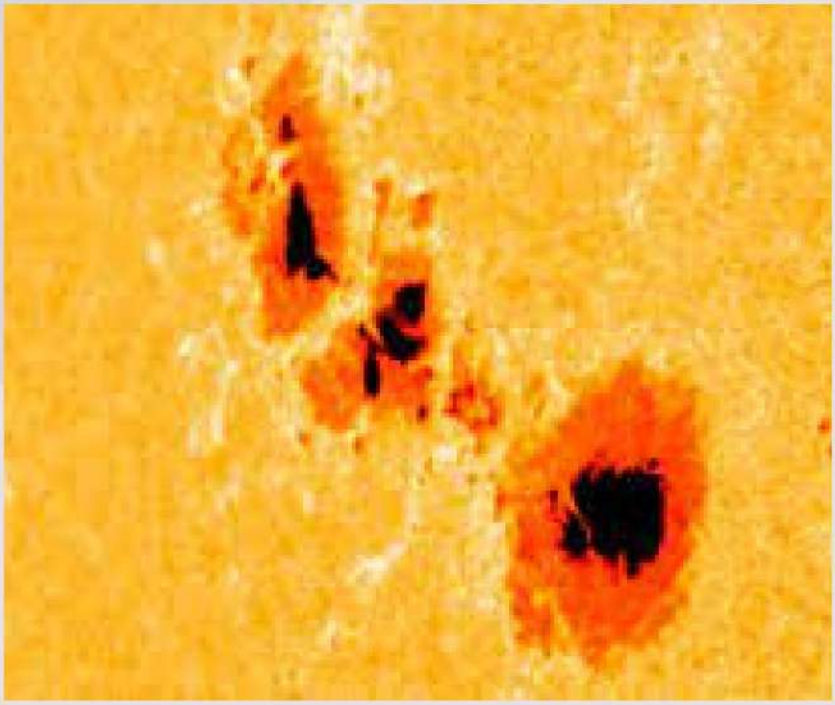
Have you ever thought that the hottest ball of the solar system Yes! The Sun could have temperature just contrasting to what it should be?

Books always taught us that sun has very high degree of temperature, but the reality is that it also has some areas where it's quite cooler than the rest.

If you are a keen observer, you might have noticed many such things with spots on it, let's say jaguar has rosettes, moon has craters...could you ever think of sun to have such spots!? Our little Isack Neutron once thought of it that if the answer to the above Q is yes! then **why and how does it exist!?**

SOLAR ANALYSIS

The Sun is not just a Source of Light for Earth, but much more than it --- a **Dynamic** and complex star, with storms, flares, and movement causing it to have **persistent changes**. Normally, we observe many solar activities which are regulated by magnetic field lines but the point to deal is that how they do this?

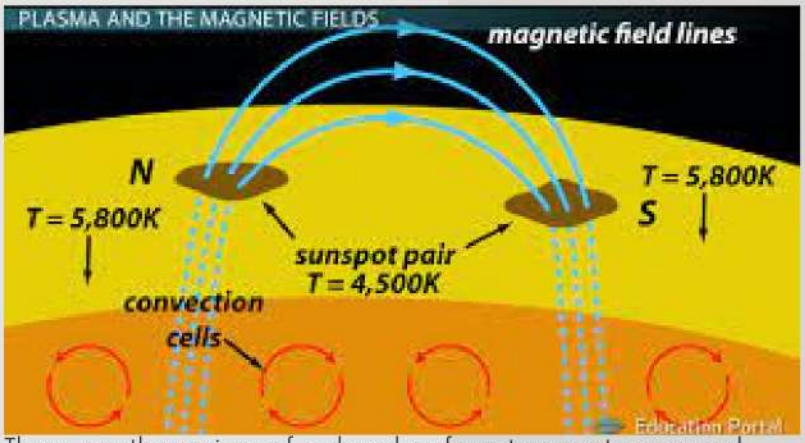


NASA has recently tracked the most prominent magnetically-driven solar features ---- **A Cycle of Sunspot Formation known as a "Torsional Oscillation."**

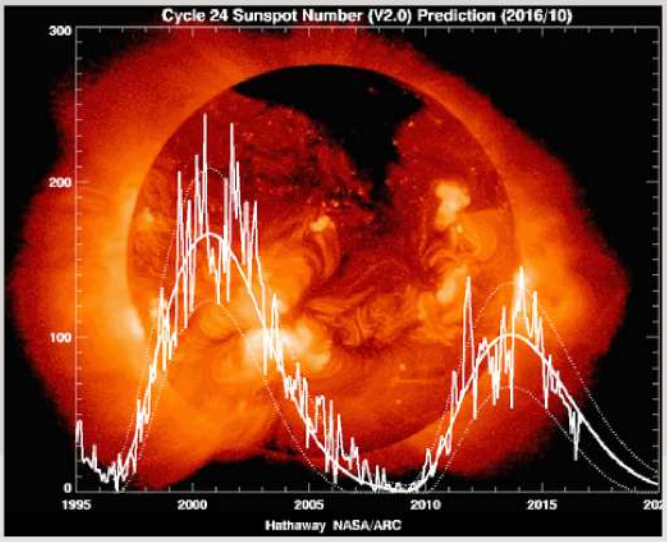
WHAT ARE THESE PORES?

Solar pores, also known as Sun Spots, are the dark spots which are visible on the surface of the Sun in the photographs. It was in seventeenth century that Galileo, using his telescope which he himself had fabricated Observed sunspots and found that these dark spots are in motion. This led him to suggest that the sun was spinning in space. He kept an observatory eye on the activities of these spots. His vision concluded that the sizes and shapes of the sunspot kept changing as they rotate with the sun.. Its temperature is **4000 - 6000K**.

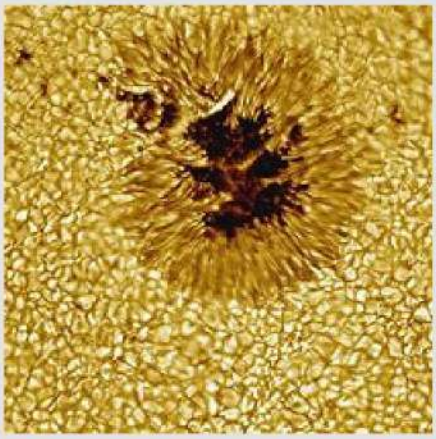
FACT: Solar pores are crucial for predicting and understanding the solar storms.



These are the regions of reduced surface temperature caused by concentration of magnetic flux.



There **areal magnetic pressure is high** as compared to that of their relative surroundings which have decreased atmospheric pressure. **Due to the atmospheric pressure difference, these regions temperature decreases**, and hot gas travels from inside of the sun through these relatively cooler areas. These cooler areas are represented as dark spots, which can be as big as planets.



CLOSE-UP VIEW OF SUNSPOT

SOLAR ANALYSIS

The **formation of sunspots** due to disturbance in magnetic field is **cyclic in nature**. 11 year-long cyclicity is the one which explains the continual formation of pores.

In the start of each cycle, **sunspots appear close to the 30°N and 30°S latitudes**, then they gradually reside towards the **equatorial area** as the cycle advances.

NANDANI DESAI
12 - C
The Sports Prefect
(2022-2023)

KRISHIKA THAKOR
11 - B
Yellow House Captain
(2023-2024)

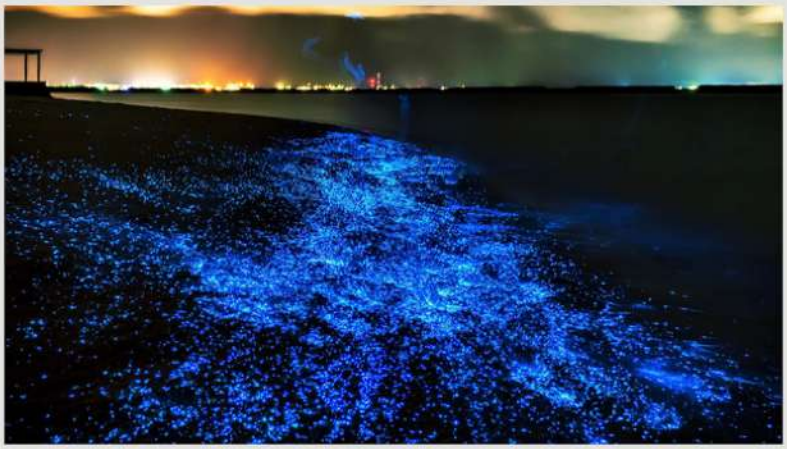
1. POLAR STRATOSPHERIC CLOUDS

This picture, taken in **Kilpisjärvi, Finland**; it is a Type II Polar Stratospheric Cloud. Don't allow these mesmerizing **POLAR STRATOSPHERIC CLOUDS** deceive you, for they play an important role in destroying ozone layers at the Antarctic, now the Arctics as well!

While the clouds we see form at the troposphere, these **clouds form at the stratosphere** (altitudes of 15 to 25 kilometers) where generally, clouds aren't formed! At veryy low temperatures, crystals of nitric acid, sulfuric acid and water are formed at this region and these crystals diffract light to form captivating colours.

They provide surface to **chlorine**, to form compounds that react with ozone to destroy it. At the same time, **nitrogenous compounds** are released from the clouds that intensify the destroying effect of chlorine.

2. SEA OF STARS



This is not graphically designed!
The sea of stars ,found in the **reefs of Maldives**, occurs during the late summers. Taken in the **Vaadhoo Island of Maldives**, It is caused by a **bioluminescent phytoplankton**; in simple words a autotrophic organisms found in water bodies which produce and emit light; called as **Lingulodinium polyedrum.** This island is filled with this plankton and as the waves move, the microbe glows.

Aha! Now I know, the mystical nature of the Earth has no boundaries!

FACT: Christopher Columbus had trouble finding a crew because many people believed that the earth was flat and that the ship would fall off the edge of the world.

3. RAINBOW MOUNTAIN

No, we didn't play Holi on this mountain and click a picture!

Found in **Peruvian Hills** is the **RAINBOW MOUNTAIN**, which looks trippy as it contains six colours - pink, white, red, brown, mustard and green. The existence of whom is from sedimentation of rocks of **calcium, sandstone and quartzose** over thousands of years to form this colourful landscape. This landscape was at juncture of crisis as changing weather patterns and climate change has taken a toll on the mountain. *Just like tourists all over the world are fascinated by the site, mining companies are too - for a greedy reason.*

4. METHANE BUBBLES IN LAKE BAIKAL

This is, **the Lake Baikal of Russia.** The storehouse of largest, oldest and deepest freshwater lake at **around 20% of world's freshwater.** When, on the ocean bed, the dead organisms decompose due to microbes feeding on it, which releases methane. **Methane** floats on the surface in the form of bubbles. During winters, when water on the surface freezes, these bubbles trap in to produce a stunning view. Methane gets released when temperatures rise or water level decreases.

*Methane as we know, is a **Greenhouse gas.** The heat-trapping effect of methane is 35 times stronger than CO2, making it detrimental to our climate.*

- **FACT: Lake Baikal is the largest freshwater lake by volume (23,600km3), containing 20% of the world's fresh water.**

UNDERSTANDING THE TELESCOPE

by- Ms. Jiya Desai

What comes to your mind when you think about space and the other astronomical events ? galaxies , stars , nebulas, various planets etc. RIGHT ?! Ever wondered how these pictures were clicked or how we came to know about them ?

Well , if you are wondering the same things and want to know more , LOCK YOUR SEAT BELTS FRIENDS !! the space is all yours to explore – SWOOOSH ~

The simple answer to all of this is "THE TELESCOPE"

So before jumping onto detailed stuff , lets know the basics first, as to how the first prototype of telescope was made and it's relation back in the history ....

HOW IT WAS INVENTED?

There are many evidences that show use of ancient astronomical tool, potentially used by prehistoric humans for stargazing rituals . The earliest such **devices emerged about 400 years ago**. Astronomers are exploring ancient tombs in Portugal that they believe may have been used by prehistoric humans to enhance specific views of the night skies.

Going back in time , during the **early 1600s** , a dutch spectacle maker **HANS LIPPERSHEY** is said to have filed a patent for a lens based instrument that made distant objects appear closer . His vision of telescope had a **concave eyepiece aligned with a convex objective lens** .

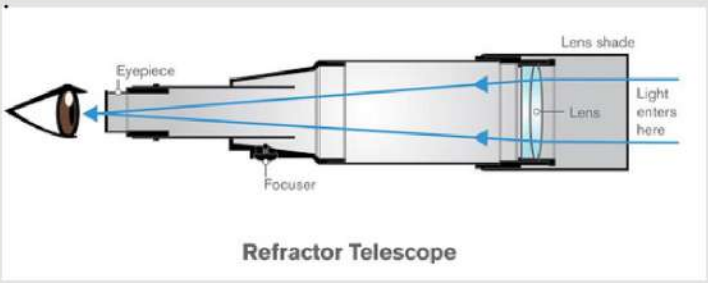
Later his ideas were turned to reality by **GALILEO GALILEE** where he made some improvements such that his version could **zoom upto 20 times** than the original one.

Eventually in Europe, scientists began improving the telescope , **JOHANNES KEPLER** studied the optics and designed a telescope with **two convex lenses**, which made the images appear upside down. Working from Kepler's writings, **ISSAC NEWTON** reasoned it was better to make a telescope out of **mirrors rather than lenses** and built a reflecting telescope in 1668.

Centuries later the reflecting telescope would dominate astronomy.

WORKING OF THE TELESCOPE

In early telescopes , light was focused by using curved glass surfaces , commonly known as lenses . However , in present day telescopes , curved mirrors are used to concentrate light from night sky .

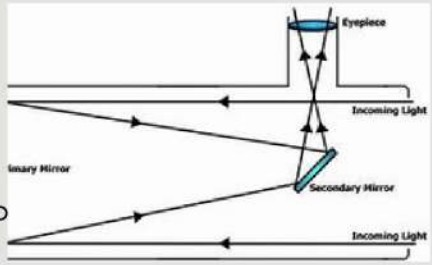


Simplifying things out , here's how a simple telescope works :-

A simple telescope called **refractor telescope** has 2 lenses , the large one collects the light from distant objects and amplifies it so that its much bigger than the actual object and the viewer is able to see it . This is called the **objective mirror**. A second lens is placed at the focus of the objective and provides the magnification you need to study the objects. Both the objective and the eye lens have their own focus points . Now the common thing to do when viewing objects at a far distance , we should use a larger lens to capture more light ,

HOWEVER some of the light which falls on the lens often gets reflected rather than being refracted which creates a problem in viewing those distant objects . what's the solution to this you may ask ? In the refractor telescope we used a CONCAVE LENS to capture light , instead we **use a CONCAVE MIRROR** now.

How this telescope works is, *instead of refracting the light, it REFLECTS the light* to the secondary mirror. The image received however is an inverted one, that is not a matter of concern given the space has no direction about up and down. and this telescope's structure is more convenient as the eye piece is not in the way of the light entering the telescope.



Another problem faced from telescopes was atmospheric distortion that makes the images a bit wibbly wobbly due to refraction through earth's atmosphere . What most scientists did to combat the situation was to place them at the **top of a mountain where the air is thinner - so less atmospheric distortion** .Other scientist took a different approach and decided to send their telescope into space! (SOUNDS COOL , DOESN'T IT ?).

One such telescope is " **THE HUBBLE SPACE TELESCOPE " launched in the 1990s** . what makes this telescope special is that it has provided us with many first glance images of nebulas and galaxies .

To wrap it up , we can observe that ***evolution of telescope leaped from a crude 3X magnification to being able to seeing unbelievably distant things so clearly with remarkable details*** .

This picture was captured by the James Webb telescope and said to be 13 million light years far!

Keeping the topic of telescope aside, did a question a rise how the measurements of the distance of stars was done?

Worry not as I'll also share this with you! it is a well-known fact that light is the fastest thing known to the human kind ! It's so fast that we measure it not by distance but by the time it takes to travel a distance. In *one year light can travel 6 trillion miles* ! This distance is referred to as **one LIGHT YEAR**.

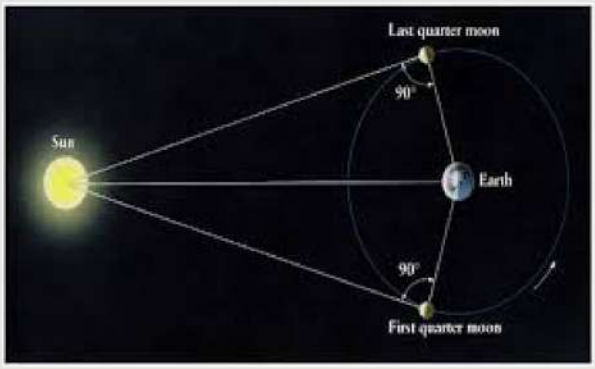
FACT: The supernovas when burst are able to out shine a whole galaxy !

SPACE IS MIND BLOWINGLY WAST !! And to measure these wast distances we use 2 methods:-

1.TRIGONOMETRIC PARALLAX

2. STANDARD CANDLES

Trigonometric parallax is used to measure distances close to earth such as a few thousand light years away . In this method of measurement , we look at the change of the apparent position of the stars over six months . How it works is , that looking from a difference of 6 months changes the apparent position of the star. But as mentioned earlier, **only works for shorter distance** .



For farther distances, a method called STANDARD CANDLES is used. Standard candles refers to those objects whose luminosity (the amount of light given by them) is known to us . Consider the example of a light bulb , it's luminosity is known by us , so we can how much far we are from a light bulb by calculating the decreasing light that reaches to us as we move far from it

In astronomy , the light bulb are special types of stars called the CEPHIED VARIABLE . these stars are internally unstable, i.e. their luminosity keeps changing . we can measure their luminosity by tracking the cycle of their changing luminosity

The universe is always sending message in form of light and we only need to decode it!

JIYA DESAI
11 - B
Literary Prefect 2023-24

The Time Traveller

- Nehil Patel and Parita Medhat

Andrew Carlssin

time traveller skips the town!

SPACE TRAVEL, COMMERCIALIZED

The beginning of popular space travel means?

In March 2003, FBI 44-years old arrested Andrew Carlssin. Newspaper reported that this man was extraordinarily lucky, in the history of stock market, he had earned like no other.

He invested $800 in stock market and made $350 million in just 2 weeks.

FBI suspected that he was running a scam or that he was an insider trader.

When Andrew was questioned, he answered that he was a time traveller from the year 2256. He claimed that he was traveller from 250 years in the future and that he knew how the stock would perform so he invested in them and got the extraordinary results.

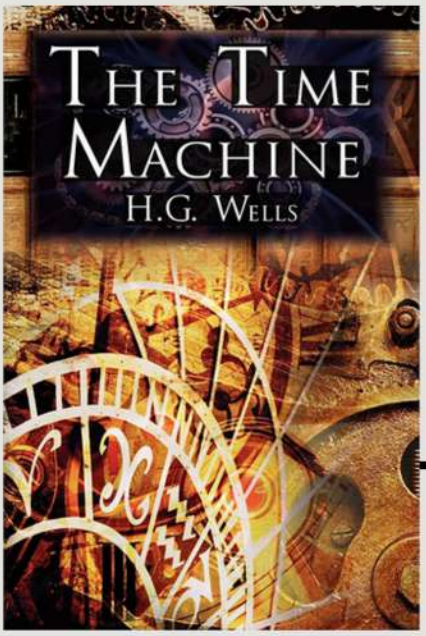
FBI was surprised at this, and they took it upon themselves to prove that he was lying. When they investigated in depth, further they found that before December 2002 there was no record of Carlssin. Even more surprising was that on 3rd April, Carlssin had to appear in court for his bail hearing but he had disappeared, never to be found again!

was he really a time traveller?

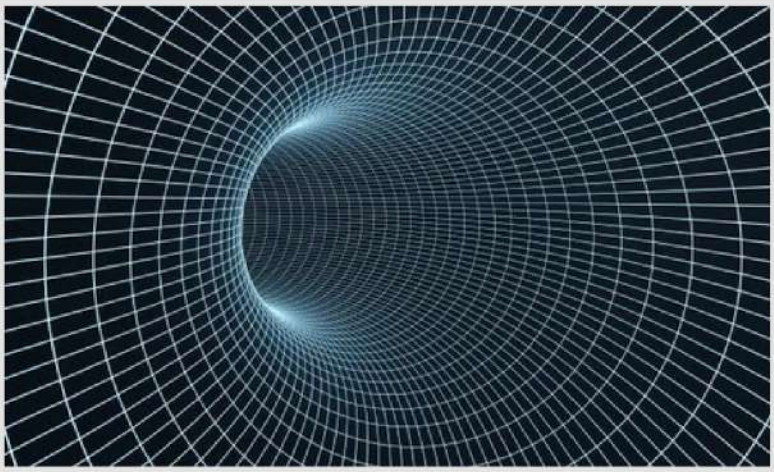
is it really possible to travel through time?

or is it only fiction for novels and films?

UNDER THE SCOPE



In 1895, writer H.G. Wells wrote his groundbreaking novel **"THE TIME MACHINE"**. It was after this that the phrase "TIME MACHINE" became popular. Machine that can take you into the future as well as in the past, with it you can travel through time. Although this novel was science fiction novel, but several philosophers and physicists were inspired by it. Not only serious research papers were written on time travel but many films were also cast on it.



TYPES OF TIME TRAVEL

2. Instantaneous time jumping

The traveller travels from one point to another point in spacetime instantaneously using a time machine, some portal or warmhole etc.

3. Time travels through a body

The time traveller stands still and it is time that is moving around the traveller. This was depicted in the film **Harry Potter: Prisoners of Azkaban.**

1. One-way travel to the future

The traveller leaves home, but the people he or she left behind might be aged or be dead by the time the traveller returns.

4. Travel with speed of time

Travelling at the speed of light to travel through time, was filmed in **Superman (1979)**. In this, superman flew faster than light and travelled back in time.

5.The BOX

As shown in 2004 film **Primer**, where a time traveller gets inside a box, with every minute spent in the box, he goes back into the time by a minute. So if he wished to go back a day, he had to remain in the box for a day.

NEHIL PATEL
12 - C

PARITA MEDHAT
11 - E

MATHEMATICS OF MUSIC

- Nishtha Domadiya

"There is geometry in the humming of strings, there is music in the spacing of the Spheres".– Pythagoras

The Relationship between Mathematics and Music has been a subject of investigation for Thousands of years. Around the years 530 BC Pythagoras discovered that the lengths of vibrating strings for notes which harmonized musically were in simple numerical values.

In effect he produced the Pythagorean ratio and Mathematical Model for Musical harmony and Hence was the forerunner of many scientists who Have studied music from a mathematical view point.

How does Mathematics and Music Relate?

- Rhythm is to Music as Numbers are to Math!!

Rhythm measures time.

Measure is the space between two bar lines that represents the division of time by which air and movement are regulated.

- Music Theory and theorists explains how can we make different pitches (sound) on stringed instruments by lengthening or shortening the strings by different proportions.

Music and Maths

When we listen to music, we don't think much on why some different notes sound Good together and why some don't, but there is actually an interesting Explanation to it!!!!!!

It's all to do with frequencies of the wave.
Each note has its own wave frequency and this is calculated by doing some complicated maths.
You can roughly see that frequency doubles up each octave and so that means that when you put 2A's together, they create a simple fraction.
This is why the notes sound pleasing together.

Conclusion:- Two notes sounds pleasing together when they have similar pattern in the wave frequencies.

When you play different notes together or even repeat the same note, you create something called Rhythm.

"**Mathematics** is the music of reason."

–James Joseph Sylvester

That simply depends on the equation– Speed (S) = Distance (D) / Time (T)]

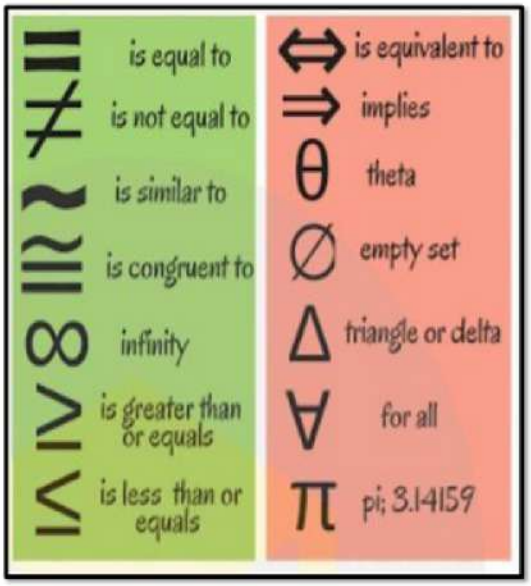
The Speed of the Sound totally depends on the distance between the strings/ bars and the time taken to produce it.

Note name	Frequency
A1	55.000
A2	110.00
A3	220.00
A4	440.00
A5	880.00

How would Music be if Mathematics didn't Exist??

- Music would not have any structure.
- There would be no way to measure rhythm.
- Musicians would not have the ability to compose and read Music.

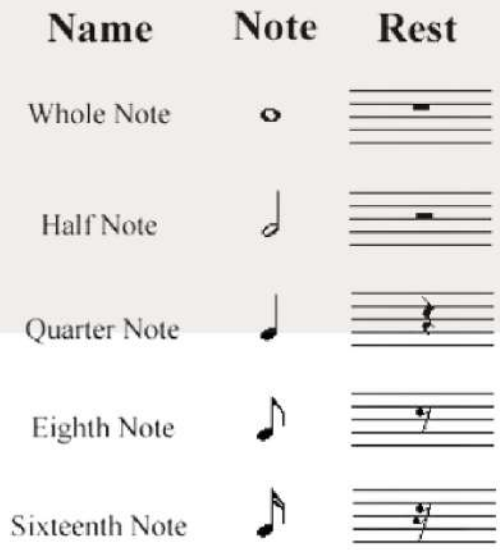
Music and Mathematics both use symbolic representations to communicate ideas.



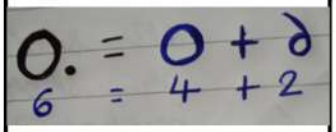
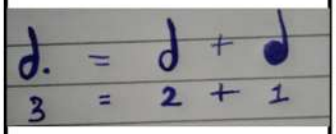
Math helps in reading Music:-

Music is divided into sections that are called measures, where each measure has equal amount of beats. This is comparable to mathematical divisions of time. The notes in music are signified using mathematical numbers and fractions (even decimal is used sometimes).

How fractions are used to read music:-



Dotted notes:-A dot after a note increases its value by half.

Name	Note	Time value
Dotted Semibreve		6
Dotted Minim		3

NISHTHA DOMADIYA
11 - C
Discipline Prefect : 2023-2024

Meet DR.ATREYEE GHOSH, PhD in Biotechnology from IIT Indore. From being a student of sciences in Surat, to being a impact-creating researcher at IIT Indore; she is a righteous and an inspiring person. Her experiences stretch from IISER in Pune, Institute of Nanoscience and technology at Punjab, many more to being a research fellow at Oregon State University in United States. She says, what intrigues her is how people come out of their struggles.

In an interview with Mahashweda Sundarrajan, she shares insights into her decisions, her experiences, her beliefs and more.

Q. You've been researching with IIT Indore's Drishti CPS foundation for a while now. What is the issue that you have been researching upon, and why did you decide that 'Yes! this concern is what I wish to address'.

I started my research career during my *PhD at IIT Indore*. It has been almost **6 years** of working, mainly in the field of **environmental biotechnology**. During my PhD, I worked on ***Carbon dioxide Sequestration***. The rising level of carbon dioxide in the atmosphere poses a threat to the entire ecosystem. I always had the thought to bring solutions to the issue.

During my BTech and M. Tech in Biotechnology I decided to take this as my further research objective. I started investigating, and found that there are **certain Microalgal species** which can themselves be a ***biological way of Carbon Dioxide sequestration***. I investigated on the efficiency of these microalgal species which have the ability to reduce the load of carbon dioxide from the atmosphere.

Interestingly, they also manufacture Biofuels in this process!

I got interested in *finding alternatives to our current fuels* which are eco-friendly and sustainable.

This work led me to where I am today, working with a **technology hub of IIT Indore; where we are trying to build Industry Academia Interface**. Which means, that we need to link the research done in eminent institutes of our nation to the right kind of industry, and industry partners, so that the technology can create impact between the citizens. This is what I am trying to build now.

Q. We want you to debunk some myths about PhD. One example being that being a PhD student doesn't pay well, also that your research does not end up getting implemented in the society.

During 11th and 12th- I think the teachers can help with this – *to help you realise what you want to achieve in life.*

There is no alternative to hard work and nothing called quick money or success. Hence, we need to realize where we want to put our hard work into. If Money matters to one, there are many other ways of making money quicker. When one is concerned with PhD, the path is long, the journey is wonderful, hence our thought process needs to be clear. If you are interested in this, I assure you the process is very enjoyable.

As far as money is concerned, the *government is paying a PhD student just enough that the scholar can bear minimum expenses.* Govt is also giving us **grants** to conduct our research. It depends on how well we use that money.

You are eventually going to make good money. But it is important that you learn good skills; make yourself worthy enough, and money will follow! Nothing comes easy. But if it needs to be permanent it has to be a gradual process.

Look around you, at the MNCs, huge organisations, no matter what industry, all their technologies are built by a researcher.

THE BUD OF RESEARCH COMES DOWN TO WHAT YOU EXPERIENCE AROUND YOURSELF, I FEEL WE NEED TO KEEP OUR EYES OPEN AROUND THE LITTLE PROBLEMS AROUND US, THAT CAN BE ADDRESSED THROUGH RESEARCH. THAT'S THE BEAUTY OF RESEARCH. ~*Atreyee Ghosh*

Q. What are the qualities does one need to possess to stand out amidst the people in order to pursue PhD?

Perseverance. *PhD is not a bed of roses.* I do not mean to scare the youth, but in order to get an honourable degree, we have to put a lot of effort.

We may have to give up on sleep for certain days, conduct experiments in a lab 24/7. But eventually one falls in love with the process and the body gets trained! Everyday won't be the same. Some days experiments would fail, or on some it will turn out just the way you want. **Consistency** is important. **Planning** is important, to have a plan A, B, C for any circumstance is important. Having a clear understanding of your mistakes and what I can do to rectify them. *Little things, everyday, adds up and caters after 5 or 6 years.*

Q. Your major lies in Biotechnology. How did you become inclined to this subject, and what are other such emerging fields in India which students should keep an eye on?

That's interesting. Biotechnology, is a very broad field which incorporates multiple courses. It is an integration of Genetic Engineering, Molecular Biology, Biochemistry, Biopharmaceutical, Bioinformatics, Biostatistics! The scope is huge and there is a LOT TO EXPLORE. Through biotechnology I explored, Microbiology and through this I got exposure to **Environmental Microbiology.**
Many times during our 11th and 12th class **we feel lost in understanding where else our career can be pursued**, apart from the fields that are commonly known.

For me, Biotechnology, opened up a lot of opportunities. I got the chance to work on **Nanocarriers,** which is a **part of Nano Biotechnology.** It is a very interesting subject; where, you will develop a nano carrier if for example you want a medicine to reach the only to the muscles of your heart.
Another example is of Environmental Biotechnology, where you study about how different species of bacteria, algae interact in a surrounding and they help us solve many problems of society! Such as wastewater treatment, treating industrial effluence.

Q. What is it that drives you amidst challenges? Share us a fun part in your research process.

When I was working with different bacteria and algal species during the journey,

The bacterias don't care about what you want them to do. They have a life of their own! you put them under a certain condition and they decide I don't want to function this way! It was really interesting to observe that, even if I create a same growth condition the very next day, they don't grow in the same pattern they did a day before! We have to understand that they will behave the way they want. That's the beauty. To understand their mechanisms.
Strangely, this is something my guide told me. I was working with a microalgal species, keeping them under an condition, and *they were just adapting and adapting,* and **weren't entering the exponential growth phase at all!**
One fine day I go up to my guide and say that 'It isn't growing!'
She says, **'Sit with them and talk to them!'**
This wasn't something I was expecting!
She shared her experience, and said that sit with your flask (the microorganisms are grown in a flask), talk to them, share your problems! That is what she advised me!
I realised that I cannot have an answer everyday.

We thank the dearest ma'am for sharing her valuable time for us! We at SVV hope you achieve great success.

Q. How would you ignite a research temperament in an 11th standard student?

I feel *students are already so inquisitive right from their childhood*. By the time they enter 11th 12th, I feel we need to develop a connect between theoretical concepts to practical approach.

Knowledge is fine, but when you are trying to address a problem in the society, you then need a connect with the world. For an 11th standard student, I feel they should **spend more time in labs.** We learn those **beautiful equations and mechanisms in organic chemistry but applying them is very important.** Just learn by doing **trial and error! Replace one particular reagent with another, what would happen?** I feel this beautiful way of learning can ignite a research-oriented mindset. Also visiting industries, if that can be incorporated, say a waste water treatment plant or a pharmaceutical.

They should question themselves on a daily basis, what interests them, concerns them.

Q. What is it that an 16 year old Atreyee would want to know?

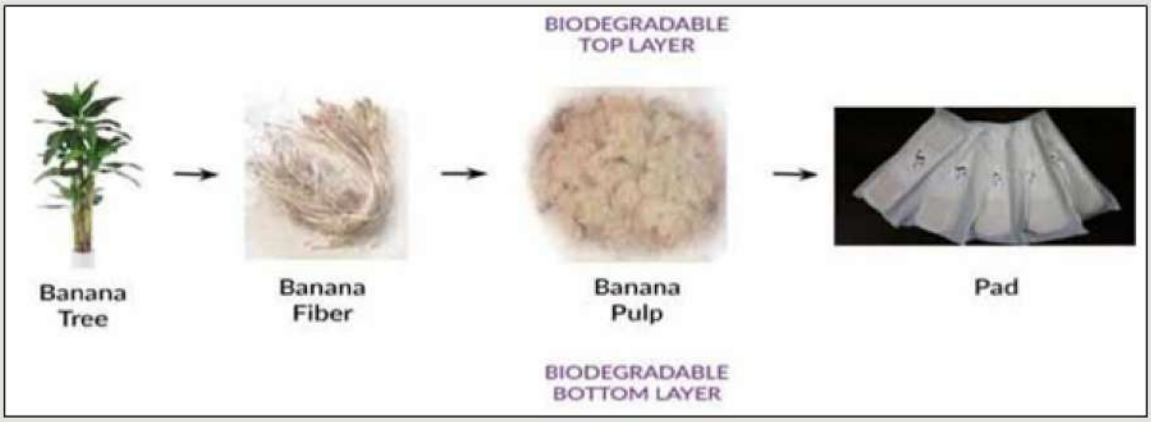
Being flexible is very important. When I was in 11th standard *I had a very fixed mindset regarding my career or the way I wanted my life to be.* I would like to go back and tell that there are so many opportunities that knock your door on a daily basis. **If plan A doesn't work it may not be meant for me, or I may be built for better opportunities.**

Opportunities are knocking everyday, and I would tell her that take a deep breath, relax, work on a daily basis and grab every opportunity **and not take too much time in judging every decision.**

- *Mahashweda Sundarrajan*

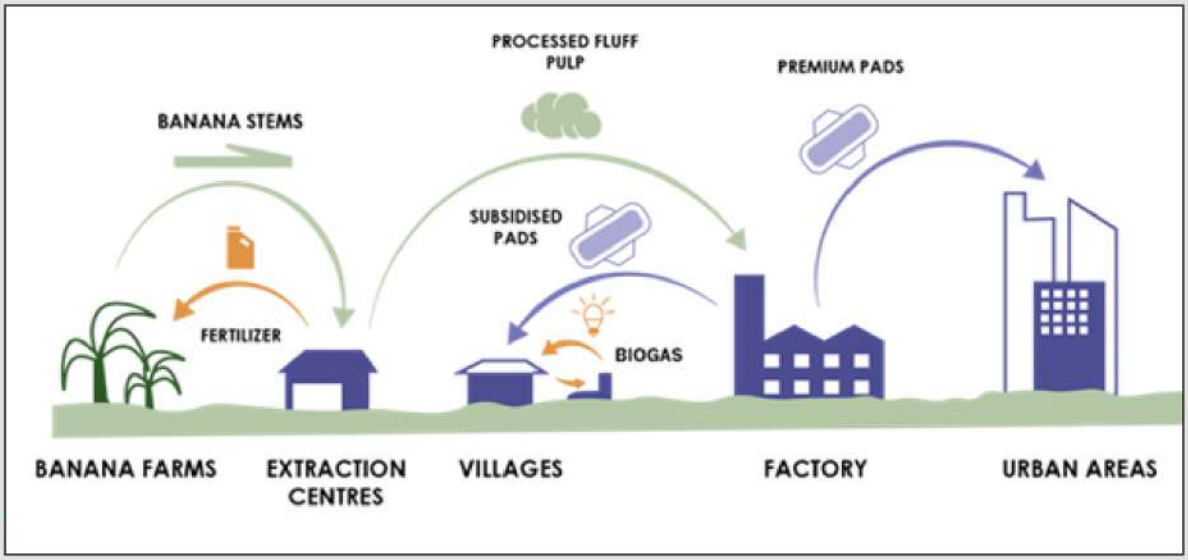
REFORMS IN RURAL INDIA STEM OFF THE STEMS OF BANANA!

India grows more bananas than anywhere else in the world. But about half of each banana plant goes waste. Adoption of sanitary napkins is **only among 35.2% of women in India** and the plastic, non-biodegradable pads are discomfort to women and is not eco-friendly. To bring a solution to both of these issues, a company is turning the **banana stems**, which goes to waste, to **biodegradable sanitary pads.** They say, that just **one banana plant stem can yield up to 3,000 PADS!**



Saathi is regularly working with **18,000 farmers,** setting up machines in their fields so that they themselves can *shred the layers of every banana stem into fibre like strings*. This provides an **additional income to our farmers.** These fibres come to the factory, where they are turned into **cotton like fluffs** which involves their secret patented methods. this will be pressed into thinner and thinner sheets and then different layers are stacked and then **sterilised to make a pad.**

The company sells their products at a standard price of a sanitary napkin to an urban woman, which helps them give **subsidies to a rural woman**. This company not only sells products, it spreads awareness about menstrual health and usage of sanitary napkins in rural areas.



THE CIGARETTE BUTT BUDS OFF THE STREETS!

Nearly **4.5 trillion cigaratte butts get thrown out into roads and our waters** every single year. People mistake thinking these cigaratte butts are *just cotton*. But, a cigaratte butt is a small chunk of plastic having formaldehyde, nicotine and plenty of other chemicals. They inhibit plant growth and destroy sea life. They leech nicotine, cadmium, chromium and lead into soil and sea. They degrade into microplastics, again a massive problem. **A Noida based company CODE EFFORT has found an innovative solution, to turn these tiny demons into teddy bears, pillows, and mosquito repellents.**

A network of hundreds of people collect these cigarette butts from the streets of Noida. A company called **CODE (Conserve Our Depleting Environment) EFFORT**, pays these people about *300 rupees per kilo*. This company sends it to homes of contractors where filters, paper and tobacco is separated.

The paper, which contains nicotine is treated with organic binder and turned into sheets which gets sold as **mosquito repellents.**

Tobacco is sent to nearby farms to be used as **compost.**

Naman Gupta, Founder (left) with Products of the company

The *plastic filters are soaked, sterilised* with their secret but certified method which leaves them looking like cotton. Then, the *cotton is fluffed and carded*. This gets stuffed into toys, pillows, keychains.

We salute the efforts of Code Effort, and Saathi, to serve with the spirit of techno-revolution in our country!

MAHASHWEDA SUNDARRAJAN
12 - C
Head Girl : 2022-23

The Manhattan Project

- Parth Darveshi

As it is known, Science has always been an integral part of development and had been a boon to us! But once in the history, Science was also the reason of the utmost destruction and devastation ever happened!

So, let us dive into some glimpse of the history! In 1933, Hitler became Chancellor restored the military power in Germany and started expanding his territory, provoking countries like the UK and France. Japan also continued territorial expansion. Countries such as Germany, Italy and Japan formed the **Axis powers** whereas Great Britain and British colonies unitedly formed the Allied powers.

During the war, it was proposed that **'Whoever builds the Bomb first would win the war!'** Therefore, the US secretly started the secret project at the earliest.

Let's learn about the foundations of the project.

In 1938 some German physicists discovered an idea of 'nuclear fission'. Next, famous physicists Otto Hahn and Fritz Strassmann bombarded **uranium atoms with a stream of neutral particles**.

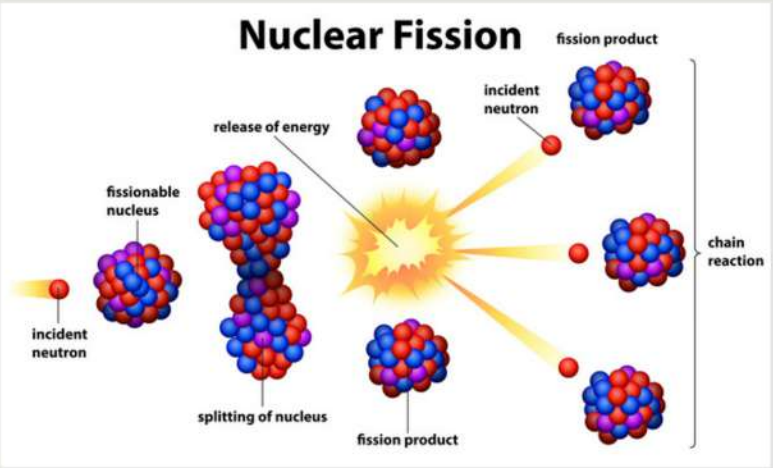
The collision developed lot of energy. He found that particles of lower atomic weight that of Barium were formed. **He concluded that this experiment produced high energy with formation of atoms of lower atomic weight of some other elements due to fragmentation.**

This process was termed Nuclear Fission and a field named Nuclear Physics emerged!

Seeing advancements in Germany, America activated the, **'Manhattan Project'**, headed by **Robert Oppenheimer.** There was an Advisory Committee set up in Washington named OSRD. Laboratories were present in Oak Ridge, Hanford in Washington and Los Alamos in New Mexico. Later, USSR joined the hands of Allied forces. In Asia, Japan attacked Pearl Harbour on US Naval base which forced the US to enter WW2!

Understanding the fission process [The Basic Mechanism of Nuclear weapons]:

Uranium is a heavy element with 92 protons. **When this atom gets big it becomes unstable and energy influx produces fragmentation forming several smaller atoms. This process of atoms decaying and losing energy is termed Radioactivity.**



When the nucleus of an atom absorbs the bombarded neutron, its energy gets increased and the atom reaches an **excited state** causing it to change shape and oscillate due to vibrational energy, when the vibrational energy crosses the energy barrier, the atom no longer retains original shape and **loses energy** in the form of Gamma rays.

Making and Testing:

Due to the uncertainty in making weapons out of uranium and extracting plutonium from uranium, the process of creating an atomic bomb was challenging! Scientists were figuring out how to isolate uranium to create a chain reaction. A lot of dollars were spent on 'how to extract Uranium 235 out of Uranium 238' and find its appropriate amount. In 1942, project was approved by President Roosevelt. **In the Los Alamos project lab, the two Nuclear weapons named 'Fatman' made of plutonium-239 and the Bomb 'Little Boy' filled with uranium-235 were made.** On 16th July 1945, at 5:29 am, the nuclear bomb was tested in Jornadda del Muerto desert, Los Alamos, code-named 'Trinity Test' and the first ever Nuclear weapon was built and tested ever, **forming a large mushroom cloud extending 40000 feet, signifying the dangers of the new nuclear age!**

The Ultimate bombing:

Allied powers defeated Germany while the war with Japan still continued. **Later, at Potsdam conference, Germany was held by the allies and there was a demand of unconditional surrender of Japan** else they would have to face the consequences, and they responded with 'No Surrender'.

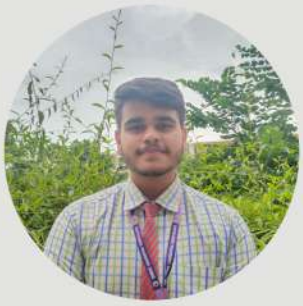
Therefore newly made **President Truman** authorized the use of the nuclear bomb on Japan, on the **6th of August 1945 at 8.15 a.m.** the first ever nuclear bomb drop took place on Japan, dropped by titled 'Little Boy' and hence the first ever infamous bomb drop took place at the **Hiroshima city with killing 75000 to 126000 civilians** and destroying large area, marking one of the greatest destruction ever happened in Japan!

After the Hiroshima bombing, Truman again called for the surrender of Japan, but **they again refused, resulting in a second atomic bomb drop on 9th August 1945, namely 'Fat Man'** which was dropped over Nagasaki and produced a blast equivalent to 21000 tons of TNT, leading to the death of **180000 people.**

In 1945, **Signing the Official Instrument of Surrender, Japan officially surrendered, marking the End Of World War 2** and also the first-ever use of Nuclear weapons! The two infamous bomb drops in Japan were the most painful incident to mankind, leading greatest destruction and widespread death which still has deep remarks on the people of Japan.

In this way, Science' contributed to the development of humans by this invention in physics and assisted in the end of WW2 but sadly caused the greatest and unforgettable devastation in all humanity.

FACT: It began in 1939 and grew to employ more than 130,000 people and cost nearly US$2 billion



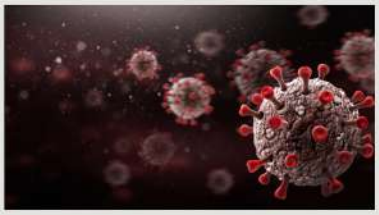
PARTH DARVESHI
11 - C
Red House Captain: 2023-24

Biological Weapons

- Pal Patel

Introduction

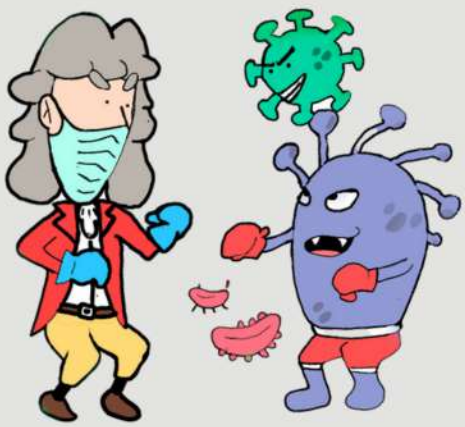
During **World War 2** the whole world saw the circumstances of **Hiroshima and Nagasaki**. It took decades for Japan to recover from this attack after that every country became aware and conscious about the atomic bomb but in 2019 the world has witnessed **COVID-19** and for that Every country criticized China for intentionally spreading COVID-19 in whole world but Scientific evidence suggests the COVID-19 virus spilled over from animals to people. Virus like COVID-19 can be the new, easy and **destructive weapon** for warfare but after witnessing COVID-19 every country is spreading awareness and increasing men power in medical sector as some experts already said that if in future world will face the world war then it will be fought by **Biological Weapons** and it can do **mass destruction**.



*Atomic Bomb is **hard to assemble** and Biological Weapons are **unstoppable**, destructive, **easy to use** and any country can intentionally spread it.*

What is Biological Weapon ?

Biological weapons are either **virus**, **bacteria** or **fungi**, or **toxic substances** produced by living organisms that are produced and released deliberately to cause disease and death in animals, plants and humans.



Biological weapons form a **subset** of a larger class of weapons sometimes referred to as **unconventional weapons** or weapons of mass destruction, which also includes *chemical, nuclear and radio-logical weapons*. The major concern is the use of biological weapons and the risk of using biological agents in a **terrorist attack** is thought to be increasing. Biological Weapon programme introduced by **France** to the world. They Initiated their own biological weapons programme in the *1920s*. It was led by **Auguste Trillat**, an *inventive German-educated chemist* who envisioned and tested the sustained virulence of airborne pathogens. Also, one of the first recorded uses of biological warfare occurred in *1347*, when **Mongol Forces** reported that the Atomic Bomb is difficult to assemble and Biological Weapons are unstoppable, destructive, easy to use and any country can intentionally spread it. have catapulted **plague-infested bodies** over the walls into the **Black Sea port of Caffa** (*now Feodosiya, Ukraine*), at that time a Genoese trade centre in the **Crimean Peninsula**.

World must be prepare for biological weapons coming the the future.

The disadvantages of biological and chemical weapons are much more evident than the advantages. One of the many drawbacks of biological weapons is their **unavoidable lasting effect**. Once it's out, the weapon has the potential to unleash **massive epidemics** of deadly infectious disease.

Examples of Biological Warfare

During the past century, more than **500 million** people passed away due to this infectious diseases. Several thousands of death were caused by the deliberate release of *pathogens or toxins*, mostly by the **Japanese** during the Second World War and it's attack on China. Two international treaties outlawed biological weapons in *1925* and *1972*, but they have largely failed to stop countries from conducting offensive weapons research and large-scale production of biological weapons. And as our knowledge of the biology of disease-causing agents— **viruses, bacteria and toxins**— increases, it is legitimate to fear that modified pathogens could constitute devastating agents for biological warfare. To put these future threats into perspective, I discuss in this article the history of biological warfare and terrorism.

During the [Second World War], the **Japanese** army poisoned more than **1,000** water wells in Chinese villages to study *cholera* and *typhus* outbreaks.

Biological weaponry has managed to enter the **realm of terrorism** with the *anthrax attack* in the US in *2001*. It was delivered through the country's mail system and affected citizens in various states. All in all, there were *27 casualties*, with *5 people dead* and *22 others in critical conditions*.

Conclusion

I want to conclude that biological weapons are called the **"Lazy Man's Atomic Bomb"** because of their *ease of production*. Any country with a reasonably advanced medical and pharmaceutical industry would be capable of **mass-producing** biological weapons. Bio-weapons are a *big threat* for every creature in the world as it can not only harmful for humans but also for each and every creature.

PAL PATEL
11 - B

Stealth technology

- Keshav Singh

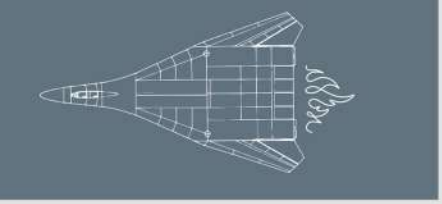
The history of fighter planes can be traced back to **World War I** when they were first introduced as a means of air combat. These early fighter planes were primitive by today's standards and were primarily made of wood and canvas. However, they represented a significant advancement in military technology at the time and paved the way for the development of more sophisticated fighter planes in the years that followed.

In the early days of air combat, pilots would **simply shoot at each other with pistols and rifles** while flying through the air. **This was obviously not considered the most effective method of air to air combat,** and so the development of fighter planes with built-in weapons quickly became a priority and Companies which were already producing arms and weapons for The Defence Field got into this!

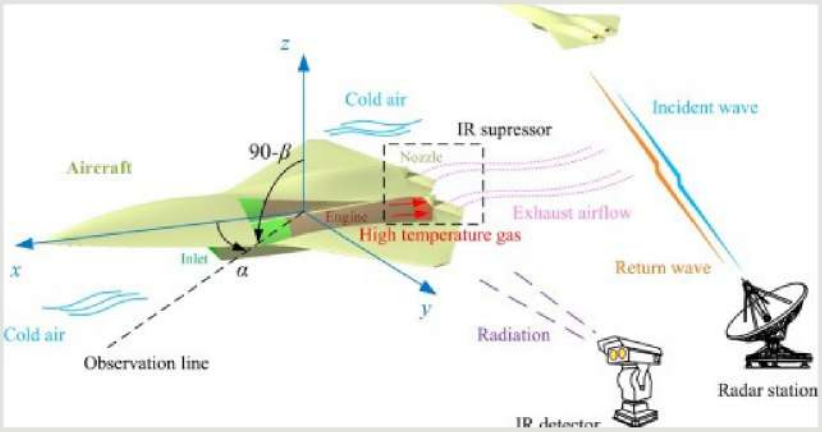
B-2-Spirit Bomber

During World War II, fighter planes evolved significantly, Fast forward to the present day, fighter planes have evolved even further.

FACT:The B-2 Spirit is a multi-role bomber capable of delivering both conventional and nuclear munitions.



So, you might be wondering what actually is "STEALTH" is!! In very simple terms **Stealth technology is what that prevents an aircraft detection in an enemy Radar,** Stealth Equipped aircrafts are designed to avoid detections as stated earlier using a variety of technologies that reduce infrared visibility and radio frequency of the aircraft! The material used in making this kind og Aircrafts are very reflective (infrared radiations) and Highly Aerodynamic.



The F-117 Nighthawk was the first operational aircraft specially designed on STEALTH TECHNOLOGY. These aircrafts attack with *better precision* than the traditional fighters and are **incredibly difficult** to track even by the most advanced radar systems andddd we are not over yet! Another mind boggling Fact about Stealth fighters is that **they can achieve a TOP SPEED of about 4-5 mach which if calculated in km/h will be roughly about 5000 kmph.** However Technology comes at a Cost, These Aircrafts Costs Several Hundred Million Dollars,

F-117 Nighthawk

FACT:The maximum speed is 623 mph (1,003 km/h; 541 kn) at high altitude

KESHAV SINGH
11 - D
A Writer for the website '*Honourpoint*'

SCIENCE IN HEADLINES!

- Team Odyssey

INDIA AIMS THE MAJESTIC SUN, WITH 'ADITYA-L1' !

ISRO along with few leading institutes of our nation are set to list a new milestone, to study the Sun 1 million miles from Earth through the spacecraft Aditya L1.

India going for Aditya L1 missions in August, 2023, says ISRO Scientist Dr V Narayanan

Jul 15, 2023, 01:28AM IST | Source: ANI

As Chandrayaan-3 mission by the Indian Space Research Organisation (ISRO) successfully lifted off from the Satish Dhawan Space Centre in Andhra Pradesh's Sriharikota a few minutes ago on

...Read more

News / Cities / Bangalore / Largest payload of Aditya-L1 spacecraft handed over to ISRO

Largest payload of Aditya-L1 spacecraft handed over to ISRO

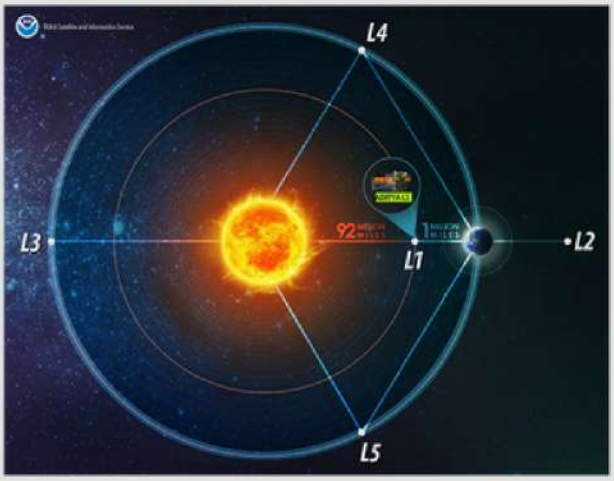
IIA has built the VELC at its Centre for Research and Education in Science and Technology (CREST) campus in Hoskote.

SUIT: Special telescope to track Sun's magnetic field ready for India's first solar mission

The spacecraft will travel a distance of over 932,000 miles over 100 days to reach Lagrange Point 1, which will provide unobstructed views of the Sun.

Ameya Puleja

Created: Jun 19, 2023 06:56 AM EST



What and why is L1 in Aditya L1?

Lagrange point (L1) of the Sun-Earth system which is about 1.5 million km from earth and has the advantage of continuously viewing the sun without any eclipses.

What does the spacecraft Aditya L1 carry?

The spacecraft carries seven payloads to observe the photosphere, chromosphere and the outermost layers of the Sun (the corona) using electromagnetic and particle and magnetic field detectors.

What is a payload in a spacecraft?!

ISRO defines a payload as a scientific or technological instrument carried on board a satellite for the specific purpose is termed as a payload.

What is the significance of Aditya L1 to research in our country?

Aditya L1 payloads are expected to provide most crucial informations to understand the problem of coronal heating, coronal mass ejection, particle flux emanating from the Sunand their characteristics, dynamics of space weather, propagation of particle and fields etc.

Caught in action

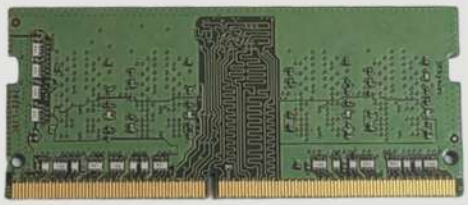
- Prietesh Patil
Krisha Shah

2005 SURVEILLANCE CAMERA

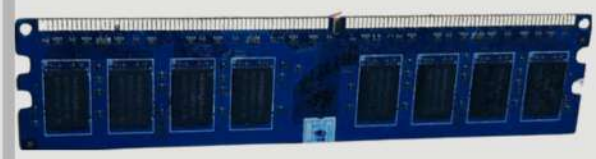
SURVEILLANCE CAMERA TODAY

SATA 1 POWER 2 HDD 2008

NEW GEN SATA 2 POWER 2 HDD



DDR 2 740MHZ RAM 2011



DDR4 16GB 3200 MHZ

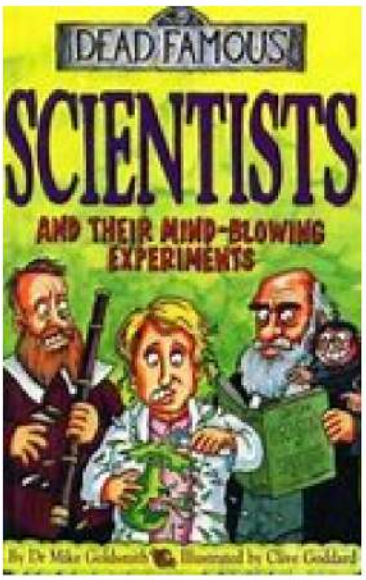
INDUCTION STOVE

ELECTRIC GAS STOVE

Book Review

SCIENTISTS AND THEIR MIND BLOWING EXPERIMENTS

Heer's Review



I would highly recommend this book as It has some intelligent humour packed with stories of world class inventors. It has many funny illustrations also .This is a fun to read with all its trivia, explanations and cartoons of some of the famous scientists who are now no more.

After reading the book **SCIENTIST AND THEIR MIND BLOWING EXPERIMENTS**, you will find it has many surprising experiments. It contains inside stories from their personal notebooks, news, reports, their mind blowing experiments and how those experiments changed the world .This book provides comedy, information and has some secrets of the dead famous scientist.

For example "You have heard Galileo Galilei and his telescope but have you heard Galileo Galilei was sentenced life in prison for his shocking ideas about the solar system. You must have heard about Charles Darwin and his theory of evolution but have you heard that Darwin wrote a book about his pet worms. You have also heard about Isaac Newton and his apple but have you heard that Newton wasn't all that keen on science sometimes it got on his nerves". It gives an insight about how life was when they were around. Some of those famous scientists mentioned in the book are Galileo Galilei, Charles Darwin, Marie Curie, Albert Einstein, Isaac Newton and others.

This is a kind of book that will be well-liked by youth as well as children. You learn about the interesting unknown facts with humour and fun.

HEER PATEL
12 - D

Fact-astic!

Earth's oxygen is produced by the ocean

Have you ever stopped to think where oxygen comes from? Your first thought may be a rainforest, but here's a cool science fact for you: We can thank plant-based marine organisms for all that fresh air. Plankton, seaweed, and other photosynthesizers produce more than half of the world's oxygen.

Animals use Earth's magnetic field for orientation

Lost land animals may not be able to find their way home, but sea animals might. There is evidence that some animals, like sea turtles and salmon, have the ability to sense the Earth's magnetic field and can use this sense for navigation. This may sound like a science fiction but it's actually a fact.

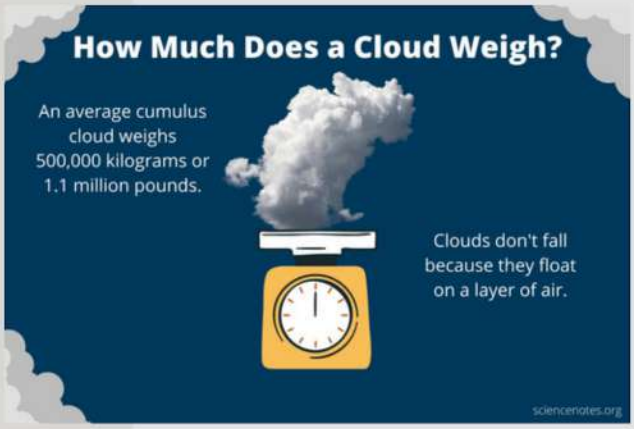
Bananas are radioactive

Here's a random fact about one of your favorite foods: Bananas contain potassium, and since potassium decays, that makes the yellow fruit slightly radioactive. But don't worry—you'd need to eat ten million bananas in one sitting to die of banana-induced radiation poisoning.

There are more trees on Earth than stars in our galaxy

Here's a cool space fact (and an Earth fact) we bet you didn't know: NASA experts believe there could be anywhere from 100 billion to 400 billion stars in the Milky Way. However, a 2015 research paper published that the number of trees around the world is much higher: 3.04 trillion.

A cloud can weigh around a million pounds!



Your childhood dreams of floating on a weightless cloud may not withstand this science fact: The average cumulus cloud can weigh up to a million pounds, That's about as heavy as the world's largest jet when it's completely full of cargo and passengers.

It's impossible to burp in space

When you burp on Earth, gravity keeps down the solids and liquids from the food you just ate, so only the gas escapes from your mouth. In the absence of gravity, the gas cannot separate from the liquids and solids, so burping essentially turns into puking.

Bats don't get sick from most viruses

And yup, that includes coronaviruses. Bats can, of course, contract and spread viruses, but they also have plenty of genes responsible for anti-viral activity, keeping them out of harm's way. One exception to this is rabies, while bats occasionally get sick from rabies, it rarely kills them.

Humans are capable of producing venom!

Believe it or not, while humans do not currently produce venom, technically, we could. In fact, all reptiles and mammals have that capability. Basically, we have all the tools we need, and it's up to evolution to get us there.

CREDITS AND ENDINGS

The advancement of science can be attributed mainly to the curiosity of human mind. The question of **how, when, what and why** are the main reasons which help humans to push over the boundaries of science.

This magazine is the product of the hard work, determination and creativity. This *showcases the intellectual and creative ability* of the students of our school.

With this magazine, we aim to **generate and nourish the curiosity** of young minds of every Vasishtian!

Regards,

Mrs Sapna Trivedi, PGT Biology

Mahashweda Sundarrajan

EDITOR IN CHIEF

Nandani Desai

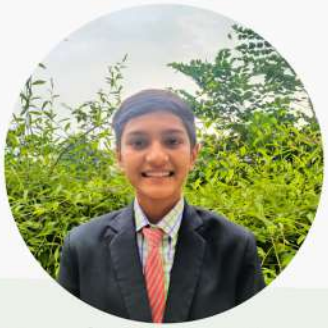
MANAGING EDITOR

Maahi Sachdeva

MANAGING EDITOR

Dev Bhede

THE ILLUSTRATOR



Aditya Patel

THE DESIGNER

Dev Patel

THE DESIGNER

THE WRITERS

Oops! I fell again! Why did you make me so clumsy, master? (sobs) It is....so tough to see the silver lining when I keep stumbling over my own feet!

It makes you charming, Issac! You are heartwarming and entertaining. We should learn perseverance amidst failures through you!!

It is your imperfection that makes you special, Issac! Don't you worry, I am by your side through your clumsiness as well as your glory! (Smiles)

(Puppy-eyed) Nobody like you, Master! How has your experience of bringing me to life been?

It has been an amazing experience of being the core member of The Odyssey, Isack. I enjoyed a lot, especially drawing you.

All practices were full of fun and I did research for you and found many good ways to improve my art according to the theme and also the result, which is you, Isack Neutron is magnificent

Can you help me meet Isaac Newton in the next edition, master?!

No way, Isack!! BUT you will definitely have a bigger adventure next time.

Shree Vasishtha Vidhyalaya,At. & Po. Vav, N.H. 48, Ta. Kamrej, Dist. Surat.-394326