



# ALGORITHM

NEWSLETTER - DEPARTMENT OF MATHEMATICS, JMC

## ODYSSEY IN TIME: WHY THE FASCINATION WITH TIME TRAVEL?

It's been an age long fantasy for people who never lived during a specific period, it is the opportunity to try and do so. For those that did and missed it, it's a chance to return. It's that sense of nostalgia, of escape from reality that intrigues us...Due to the very fact that we're obsessive about time, time monitors our lives. It starts our day and ends it. It creates possibilities for us while simultaneously terminating them. Time is a harsh mistress that we struggle with on a daily basis, sometimes crying there's too little, sometimes sighing it's too much. And the answer to the question lies within this itself.

Maybe it is a fascination that sprung from video games, that lets us in, in a virtual reality where we can control time so easily that makes the concept so exciting, or through books, like H.G Wells's 'The Time Machine' that lets us set a world we haven't ever seen before.



Yet it is not simply our attachment to what-ifs, regrets and maybes that empower it, but our memories. Memory allows us to psychologically travel backward in time as well as into the future.

Chronesthesia is a hypothetical mind ability acquired by humans through evolution that enables them to be constantly conscious of the past and therefore the future. It permits people to update information critical to surviving, thriving and handling changes. It aids long-term memory by means of attaching non-public stories to facts, giving humans' stories temporal and emotional dimensions, which makes them more plausible. Over time, humans observed that recalling past occasions helped them study what to stay off from, and the way to behave in the future.

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And maybe that is where our answer belongs. Our memories are a reflection of our mistakes and desires that let us know how our life could be shaped better. Yet, it is not only ordinary man fascinated with this concept. Time being the most complex dimension, scientists have toyed with this idea forever. Scientific interest in this arena can be seen in 1905 with Einstein's unique Theory of Special Relativity. The theory is itself about how speed affects time, mass, and space. This is the theory that led to the classic equation  $E=mc^2$ .

James Gleick in 'Time Travel: A History' deals with a core question of this concept, answering whether time is an illusion or not. The book - a junction between art and scientific discovery on the topic, delves into philosophical arguments to answer this.

Gleick explains time's existence as something that exists simply so that everything doesn't occur all at once. He argues how science inspired creatives like H.G. Wells to make worlds and stories around this concept, which are retold and inspire more- in so many ways, from theatres, films, novels to more.

If time is our construct, no wonder we are in awe of it- ready to play with it until we can shape it around our life instead of the other way around. It is not only one man who wants to relive a past experience or just another who wants to look into the future, but all of us who want to live our lives better by simply travelling through time. It is an obsession that can only be explained when we address our emotions, our desires, our minds, as well as what time means to us.

ILLUSTRATION BY: AAN MARIA JAMES  
CONTENT BY: VASUNDHARA  
& ANOUSHKA SINHA



Greeting Readers,

As another session comes to an end, it's a chance to reflect back on the past year. The pandemic is still around, Maldives is the new Mumbai and we are all travelling in time. The last one seems absurd, but it's true. As the pandemic's hold on our life has increased manifold with each passing year, it has been inevitable not to turn back to a happier time or look forward to a brighter future to escape from the harsh reality. And that's what has captured the theme for this year's edition, " Expedition with Time"

Time travel is deeply interwoven into the fabrics of our mind, with its appeal traversing over centuries, amassing the interest of scientists and novelists alike. But what lured me to the concept as a child was envisioning a future with all the luxuries of life or magically transporting to a period to witness the Mughal dynasty. We are all obsessed with time, aren't we? Why is it so difficult to strike the right balance between the past and the future? Simply because time is the most important factor in our life. Every day, it generates and eliminates numerous options for us.

The cover story of this issue focuses on our long-lasting fascination with time. Inside, you'll find articles crafted to challenge your outlook of time travel as just a geeky pursuit.

If you've ever wondered how time tourism would come into action, we have got the perfect article for you deconstructing the concept. More explanation is provided on the scientific element of how time travel may become a reality in the future. Immerse yourself in the conversation piece between figurines from different eras discussing the changes and progress of an era. How a mathematical notion came into being and how useful it is in the present era is also talked about.

So with that read on, and find out what time travel means to you.

Cheers!

*Sagrika Mathan*  
Editor-in-Chief



# CULTURAL TRANSFORMATION

*c u l t u r a l*  
*t r a n s f o r m a t i o n*

## THE ROAD TO THE MODERN WORLD

Mankind revolves around thoughts, reflections, and innovations which leads to continuous cultural evolution which consequently gives identity, hope, strength, and purpose to people's lives. As a part of this ongoing transformation, the world today has become a borderland where things that are possible now could not even be imagined a few decades back. Let us take a trip down memory lane and look at the significant events which took place from the 1950s to the 2000s.

# 1950s



Diners Club  
INTERNATIONAL

While referred to by some as the Golden Age of Television, this period experienced all the events which never fail to give us goosebumps to date. The coronation ceremony of Elizabeth II as the Queen of England in 1953 was broadcasted to the entire world. This was an exceptional era. Right from the Civil Rights Movement to establishment of the McDonald's restaurants chain to invention of the polio vaccine to declaration of India as a sovereign democratic republic nation-with its constitution coming into effect-this was the time of economic growth in the world. The Diner's Club began issuing the first credit card. Iconic film "Mother India" was also released.



# 1960s

This was the time of introduction of The Beatles' to the world. The comic book character of Spider-Man made his debut along with the first episode of the television show "Star Trek". The era also became witness to one of the greatest feats of mankind when Neil Armstrong and Buzz Aldrin became the first men to arrive on the Moon during NASA's Apollo 11 mission. Martin Luther King Jr. delivered one of his most impassioned speeches, "I have a dream" and later got awarded the Nobel Peace prize. The ultimate tale of doomed love, "Mughal-E-Azam" was released in Indian cinemas in 1960. In the year 1964, the Ford Motor Company began to produce and sell the Ford Mustang. It was a decade that broke many fashion traditions and witnessed the introduction of drainpipe jeans to the world.



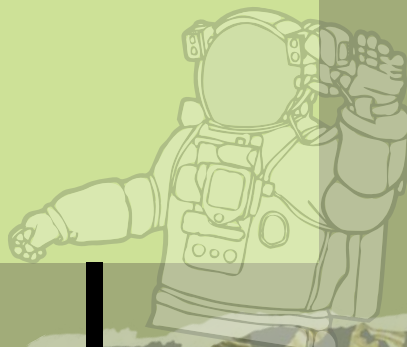
# 1970s

The era is regarded as the 'pivot of change' in world history. Bill Gates and Paul Allen founded Microsoft and Steve Jobs and Steve Wozniak created the Apple Computer Company. Indian cinema saw the rise of megastar Amitabh Bachchan to stardom with the film Sholay becoming the highest grossing movie ever in India at the time. The 'King of Pop' Michael Jackson began his solo career with the album "Off the Wall" in 1979, the same year as Mother Teresa was awarded the Nobel Peace Prize for her undying kindness. Martial arts films reached the peak of their popularity due to its greatest icon, Bruce Lee. By the late 1970s, Margaret Thatcher, became the first woman prime minister of Britain and fibre optics that transformed the communications industry forever was found.



# 1980s

This decade saw the beginning of the ever increasing craze of Rubik's cube as the first batches of the puzzle were released in 1980. It was the time of celebration in India as it won the ICC Cricket World Cup in 1983 by defeating the West Indies. Astronaut Sally Ride became the first American woman in space.



In 1984, the Motorola DynaTAC 8000X became the first commercially available mobile phone model. Beloved tv show, The Simpsons, was launched. Global warming became well known to the scientific and political community in this era. "The Computer" was named Time Magazine's Man of the Year in 1982. The fashion industry transformed tremendously with colourfully-dyed hair, ripped jeans and neon clothing becoming popular.

# 1990s

This decade shaped the modern world as we see it today. In 1991 the Internet became available for unrestricted commercial use. The Global Positioning System(GPS) became fully functional. In 1995, the online auction website eBay was founded and the first full-length Computer Generated Imagery movie, Toy Story was released, revolutionizing animated films.

In 1997, the first Harry Potter book was published by author J.K. Rowling and Titanic became a cultural phenomenon throughout the world along with 'The Lion King' and 'The Beauty and The Beast' becoming immensely popular. The search engine Google (without which life cannot be imagined today) was founded in 1998. The decade saw the discovery of dark matter and dark energy, and the first confirmation of black holes.



# 2000s

Influential websites such as Youtube, Facebook, Wikipedia, Twitter, and Google Chrome were launched and digital media through Amazon Kindle brought revolution against the printed books. The television show 'Friends' became the most-watched telecast of the 2000s. Hip Hop reached a commercial peak by dominating the musical landscape and Beyonce became one of the most significant cultural figures and best-selling artists of the decade.



Apple introduced the iPhone in 2007. Usain Bolt dominated the male sprinting events at the 2008 Beijing Olympics, in which he broke three world records. Japanese comics (Manga) became popular among the international audience. The fashion industry witnessed the global mash-up of vintage styles, global and ethnic clothing.



# "JAB THEY MET"

A conversation between two women from different times...

Before scientists could design a time machine, individuals were making use of spiritual forays into the inter-spaces between time. Such explorers met in a room with random elements from both their earthly time, with conversations centered around them. In such a context, two Indian women, from 1980 and 2021 met.

Doordarshan's intro score played in the background. Parchas were scattered on the floor, that read "Fund Ritu's Education". The T.V screen shifted to duck tales, Iphone's ringtone played, shaking the sanitizer along with the table on which it was kept. On the ceiling was a white banner that read "Feminism for Humanity", hanging above a Hazmat suit.

**2021:** They brought my phone here. I came into this realm for a break.

**1980:** Hi! What's the thing that just lit up?

**2021:** It's a smartphone- a world at our fingertips. I can access information from around the world and call anyone, but I suppose your phones do that too. (comments on Looney Tunes playing on old tv) So you're a Disney fan!

**1980 (laughs):** No, my kid's watching that. Do you watch cartoons?

**2021 (snorts):** Once in a while, on news channels.

**1980:** Why the sarcasm, doesn't news and cartoons come on Doordarshan itself?

**2021:** Not anymore. News, music, cartoons all come on separate channels.

(she picks up a parcha) What is this?

**1980:** It's a plea for rich city men to fund girl child's education.

**2021:** Oh, so you work for an NGO?

**1980:** No, I'm working for the women's struggle. We go to villages and rouse women to take charge of their lives. By the way, is that (Hazmat suit) a fashion trend?

**2021:** I wish. In the present time, a pandemic is going around. And that suit comes the closest to protecting us from it.

**1980:** Oh, I once met an Italian woman from the 1340s. She had a similar suit on, though the face-covering resembled a bird's snout. She couldn't tell me much except that people were dying in huge numbers.

**2021:** Something similar has struck again. But (waves her smartphones) with this, at least some of us can distract ourselves and live our lives virtually.

**1980:** I suppose humans are developing faster than nature wants. (looks over her) Those heels aren't for protection like the Hazmat suit, are they?

**2021 (chuckles):** No no, I like wearing them. Though, I can use it for self-defense. My lifestyle, fashion sense - everything revolves around city life.

**1980 (scrunches):** Those colours, those lengths. If I step out wearing something like that, my community will throw me out... When will our choices be just choices for their own sake?

**2021 (pauses):** Because of the rights you are fighting for right now, we desire more and more. And we will keep fighting until we are all on equal footing. You can't, but I promise you, your daughter or your granddaughter will enjoy the fruits of your labor.

**1980 (smiles back):** The future sounds promising. And I hope in your next visit, you meet someone far into the future, enjoying the benefits you fought for.



# A PARALLEL EARTH



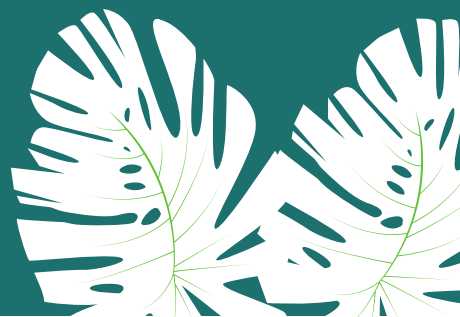
What if we told you, your actions can simulate climate behavior? The amount of meat you eat, fuel you burn, energy-efficient appliances you use are some of the ways you manage to create a real-time impact in shaping the future.

The truth is that if we don't make attempts to change our actions now, it might be too late and you can't press an undo button to fix the environment.

Travel through time to see how our planet will be:



ILLUSTRATION BY: SAGRIKA MALHAN  
CONTENT BY: SHRUTI OHRI



## WORLD OF WOKE BUT NOT AWAKE

World we created by not considering climate change to be alarming, and continuously ignoring the situation has led us here:

- The planet's average surface temperature has risen by about 1.18 degrees Celsius since the late 19th century.
- Experiments show Greenland lost an average of 279 billion tons of ice per year between 1993 and 2019, while Antarctica lost about 148 billion tons of ice per year.
- Glaciers are retreating almost everywhere around the world — including in the Alps, Himalayas, Andes, Rockies, Alaska, and Africa.
- The extent and thickness of the Arctic sea ice are constantly decreasing.
- There has been an increase in the number of intense rainfall events.
- The acidity of surface ocean waters has increased by about 30%.
- Warmer waters in the shallow oceans have contributed to the death of about a quarter of the world's coral reefs in the last few decades.

Temperatures would then plateau but remain well-elevated. With swift action to reduce greenhouse gas emissions, models project that global average temperature will only rise an additional 1° Celsius (1.8° F). With no further human influence, natural processes would begin to slowly remove the excess carbon dioxide from the atmosphere, and global temperatures would gradually begin to decline.

### What can you do ?

- Choose renewable energy options for your housing.
- Go solar! Sun-kissed photos are not the only thing sunlight can do.
- Say yes to carpools and public transport, you might eavesdrop into a gold mine.
- Compost! Remember the last time you saw two trash bins of different colours, turned a blind eye to it, and walked off? don't do that again.

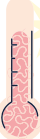
## WORLD OF 2 STEPS FORWARD, 1 STEP BACK

This is a world where people can understand the severity of the situation but are still not doing much to protect the environment. If we time travel forward in a world where we continued to live the way we're living:

- Climate models predict that Earth's global average temperature will rise by an additional 4°C.
- A warmer average global temperature will lead to an increase in the amount of water vapour present in the atmosphere - which will, in turn, cause greater amounts of rain, snow, and flooding risks.
- Summer in the Arctic Ocean will likely be ice-free by the end of the century.
- By the year 2100, models predict sea level will rise between 30 and 100 cm, threatening coastal communities, wetlands, and coral reefs.
- Scientists expect a warmer world to be a cloudier one.
- Warming surface temperatures are also predicted to increase the frequency of heatwaves and droughts, which can affect crop production and increase the risk of wildfires.
- The range of some species, such as mosquitoes which carry different types of diseases, may increase.

## A CONSCIOUS CITIZEN'S WORLD

If we travel through time in a world wherein we take conscious steps to contribute to the preservation of environmental resources, then the existence of our future generations won't remain a question. Prohibiting emission of greenhouse gases today, will begin to flatten the rise in global temperatures within a few years.



The 21 century can rightly be considered as the generation of extraordinary innovations. From digitalization, increased globalization, and technological revolutions, what has not been there in this time? But as we keep on progressing and developing, we realize that it's not the end. There will be even more sophisticated systems, techniques, and more efficient solutions. Some upcoming innovations are :

CONTENT BY : SANCHITA BALANI

## SOUND TECHNOLOGY FOR FOREST FIRES

With traditional methods, it takes weeks and or months to put out a massive fire, but researchers are working on a sonic extinguisher. Because sound is made up of pressure waves, it can disrupt the air in the fire, cutting off its supply around the fire.



## GENOMICS AND GENE EDITING

This involves altering the structure of the genes in living organisms. For example, correcting DNA mutations that may lead to cancer.

## DIGITAL TWINS

A digital twin is a digital copy of an actual physical object or product.



ILLUSTRATION BY : SUHANA DHINGRA

## SMART BRICKS

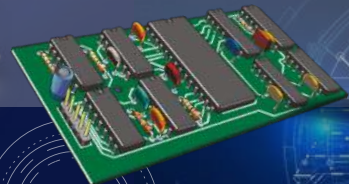
Scientists have found a way to store energy in the bricks that make houses. It can store substantial amounts of energy.



ILLUSTRATION BY : CIVIA MARY

## SILICON-CHIPS HAVING ARTIFICIAL NEURONS

This basically involves attaching artificial neurons on silicon chips which have similar electrical properties as that of human neurons. If this application becomes a success, this can treat heart failure and even Alzheimer's.



## HYPERLOOP

It involves a high speed propulsion system in vacuum. Hyperloop will become a global chain of transportation and will change the perception of people towards transportation.

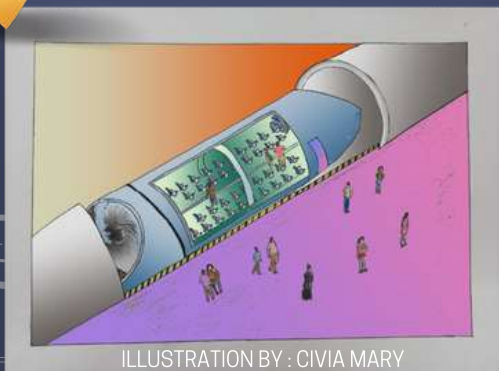


ILLUSTRATION BY : CIVIA MARY





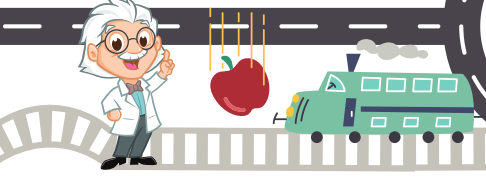
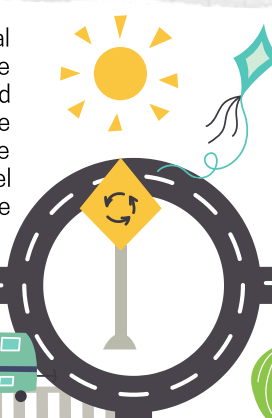


# How to Time Travel

Time travel, the ability to travel in time has long been accepted by science fiction and has been debated by many theoretical physicists. The debate still continues as to whether a person can travel through time. After decades of debates and research, scientists have come up with many ways of time travel.

According to Einstein's theory of special relativity, time travel occurs through time dilation i.e. if an object moves at a speed closer to that of the speed of light - time slows down for the object relative to the outside world. Thus, the closer you travel to the speed of light, the more extreme the time travel.

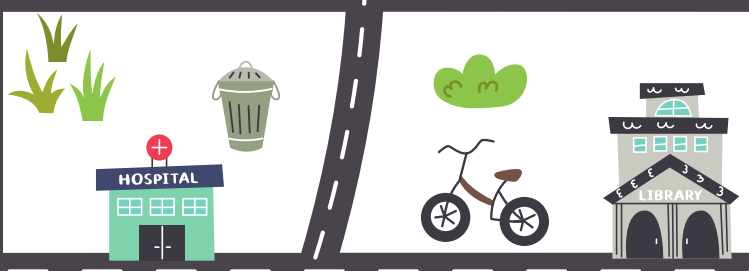
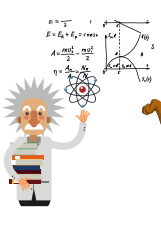
## TIME TRAVEL VIA SPEED



Einstein redefined space itself and coined the term "spacetime", combining the three dimensions of space and one dimension of time. Instead of thinking of space as a flat and rigid place that holds all of the objects in the universe, Einstein saw it as curved and malleable, capable of forming gravitational dips around masses that pull other objects in, similar to how a bowling ball in the centre of a trampoline causes any smaller object on the trampoline to slide towards.

## TIME TRAVEL VIA GRAVITY

As an object moves closer to the gravitational dip, the faster it accelerates and the centre of the earth's gravitational dip is located at the earth's core, where the gravitational force is strongest. Thus, the closer the object is to the earth's centre, time moves slower for the object.



## TIME TRAVEL VIA SUSPENDED ANIMATION

Another way of time travel is through suspended animation which is the temporary (short- or long-term) slowing or stopping of biological function so that physiological capabilities are preserved. Although completely stopping one's metabolism is probably far beyond current technology yet a few scientists are working on inducing a short-term hibernation that will last for only a few hours. However, there are many short-term and long-term side effects involved with this method.



Wormhole is a speculative structure linking disparate points in spacetime and is based on a special solution of the Einstein field equations. Einstein proposed that time travel to the past could be possible through an Einstein-Rosen bridge (a type of wormhole).

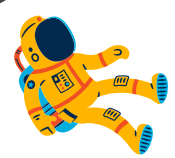
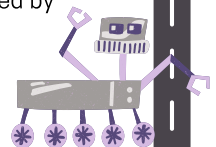
Light, as we know, is the fastest moving thing travelling at a speed of  $3 \times 10^8$  m/s, and using this American physicist Ronald Mallett put forth the idea of time travel using a rotating cylinder of light to twist spacetime. In this approach, if an infinitely long cylinder around its axis is fast enough, then an aircraft flying in a spiral path around the cylinder can travel back in time. However, ordinary matter is not strong enough to match the great amount of density and energy required to construct it. Physicist Ronald Mallett is attempting to recreate the conditions of a rotating black hole, to bend spacetime and allow for time travel.

## TIME TRAVEL VIA WORMHOLES

## TIME TRAVEL VIA LIGHT

They bridge two distant points in time and enable time travel. Even in this method time dilation has its effects and causes the moving end of the wormhole to be ageless concerning the stationary end as seen by an observer. Time travel through wormholes requires a lot of negative energy which is only possible theoretically and any attempts to do this have ultimately failed due to the incompatibility between general relativity and quantum physics.

Although new findings are quite enlightening, more evidence proves that time dilation allows us to take a peek into the future but we will never be able to visit the past. "The best evidence we have that time travel [into the past] is not possible, and never will be, is that we have not been invaded by hordes of tourists from the future.", as stated by late Stephen Hawking in his book, "Black Holes and Baby Universe"



# Book My Trip



French Revolution 1789



Draupadi's Vastraharan



Indian Rebellion of 1857

# INDEX

# INTRODUCTION



INTRODUCTION

WHAT TO EXPECT

GALLERY OF PREVIOUS  
DESTINATIONS  
AND OTHER DESTINATIONS

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A FINAL WORD  
FROM US



How many times have you thought about a memory or a future event and wished for a possible method to travel back or ahead in time? Perhaps, every single time you flipped through your history books or got struck by nostalgia owing to a certain set of pictures from the past that caught your eye. Would you believe someone if they told you that you could now literally travel back the memory lane, live through it - via the 21st century's newest innovation; time tourism. Living in a world that has reached the Moon and even Mars, time tourism comes forth as the perfect refuge from reality that offers you a chance to explore the unknown or even revisit eras of laughter and bittersweet memories. If that's what you're looking for, then welcome aboard on our hypothetical tour!

## WHAT TO EXPECT

Expect the unexpected! But if we had to divulge some information, well, you're in for a treat because -

- You get to escape from reality. We know you've only kind of been joking about how you wish you could just vanish somewhere - and this trip is the right fit for that!
- You get to experience up close, your choice of events from a host of mythological, historical, and political events. Apart from how truly magical that is, it will give you fresher insights, and who knows - maybe reveal some truths you have been seeking.
- Besides witnessing the chosen event, you will have the opportunity to explore the setting of the event - from roaming around the city to observing the people, you will get 36 hours to do it all!

An exclusive opportunity! And so much more!



## GALLERY/OTHER DESTINATIONS

Some of our popular destinations include -

- Draupadi's Vastraharan
- French Revolution
- Indian Rebellion of 1857

Other destinations:

- Stone-Age
- Christopher Columbus discovering America
- Any Yuga
- 1947 "Tryst With Destiny" speech by Lt. Pandit Jawaharlal Nehru
- Ancient Greece and Rome
- The past of ruins (any country)
- Famous wars
- Any Olympics Game

Please note: If you want to visit an event that is not listed here, please inform us two months in advance so that we can make the necessary arrangements. This also applies if you wish to visit an event in the future.




# ACCOMODATION

There is no specific accommodation as all types of arrangements will vary according to the time frames you choose to visit. You will be expected to seek shelter in similar housing as the people of the specific period you have chosen.



# TERMS AND CONDITIONS APPLIED

- 
1. You are not permitted to interact with anyone since that may lead to a change in the course of history.
  2. You're not allowed to buy any goods from the locations you visit because as we pass from one-time frame to another, the goods may get spoiled.
  3. You are expected to behave purely as a spectator at all times.
  4. You cannot be seen by anyone who has direct relations with you in the present timeline.
  5. You are not permitted to divulge any details of the past or future with anyone else, to maintain the authenticity of the experience.

\*Please note that in case of violation of any of the terms and conditions, you will be banned from any future experiences and strict action will be taken against you, due to meddling with history.



# COST

Standard cost for a trip: Rs 4,50,000  
These costs waver according to the choice of your destination and majorly on how long the stay will be for your tour. Aside from the expenditure in the travel, these costs also include the cost of your stay in the era, food, utilities, clothes, and most importantly discretion, to ensure that there is space for you in the timeline without it affecting any event.

While the following costs are not monetary, we advise you to consider them carefully before booking your trip:

- You will miss out on time in the present. We cannot and will not compensate for the same.
- Any belongings left at the site of the event will be irrecoverable.



# A FINAL WORD FROM US

Time Tourism has shaped its way as a once-in-a-lifetime opportunity, hence we hope that you understand the importance of all the rules that come along with it. However, we can assure you that despite the terms and conditions - you will enjoy your journey through the time frames of your choice and will find it quite educational. Having said that, we hope you have a wonderful journey irrespective of whether you choose the past or the future, so fasten your seatbelts, because you're in for an experience of a lifetime!





# TRAVEL LIKE DORAEMON!



CONTENT BY : CIVIA MARY

**Growing up, we've all wanted a robot friend like Doraemon for ourselves, to make all our troubles go away and to do anything we want, even travel in time!**

Doraemon is a 22nd-century robot who was dispatched by Sewashi Nobi into the past and stays to help his great-great-grandfather in an attempt to alter the horrendous future of the Nobi family, setting the entire series' events into action.

When Doraemon came travelling from the future on a time machine with a 4-D pocket full of amazing gadgets, every kid tried opening their drawers to see if their robot friend was here yet. The idea that we could go anywhere in the world, even our friend's house (because otherwise, mom won't allow it!), by just opening a door seemed incredible. Imagine having to never walk again and if we just had to put a small copter on our heads to fly away to our desired destinations. Sounds amazing, doesn't it?

But even with Doraemon and his numerous gadgets, Nobita tended to get in trouble more often than not. Paying no heed and shortcutting his way through the problem would eventually land him into a bigger issue. It's only now, as adults, that we can look objectively at the cartoon and conclude the moral of the story.

Somewhere along the line we grew up and realized that even with Doraemon, life would not all be rainbows and unicorns. If you think about it, would it be practical to travel as Doraemon does in the real world? Imagine the havoc it would create if everyone had a bamboo copter. There would be less traffic on the road but air traffic would be wrecked. We cannot have red lights or traffic control for individual humans with a whirring machine on the head. The birds will have to stay grounded for our sake! This emphasizes how, as humans, we should stay grounded while looking at the stars. In this case, quite literally!

Being able to go to the past or future at any time sounds exciting. But if today, as you go about your ordinary life, you see a person that looks exactly like you claiming to be your past/future self, you'd think you've gone mad!



ILLUSTRATION BY : DEEKSHA SHARMA

If the news of a time machine broke out, people would be clamoring to buy or use it for their selfish gains. It wouldn't do us any good to show up in front of the early humans in modern clothes and a smartphone, asking where we could find a signal (Satellites weren't invented then!).

Or worse still, imagine if people wanted to go back in time, so they could cut more trees for today's use and one of them was the apple tree under which Newton slept! Now, gravity would have to find other ways of discovery.

For all the good Doraemon's time, the time machine can do, it looks quite uncomfortable with no seats except for the driver and no support to keep from falling off the machine. Would we get lost in time forever if we fall off the machine? How do we know the time machine won't give us motion sickness?!

That being said, a world with Doraemon and his gadgets sounds wholly inviting, so much so that we are still opening our drawers with the hope he'll jump out!



SOURCE OF IMAGES: GOOGLE IMAGES

# TRENDING IN STEM

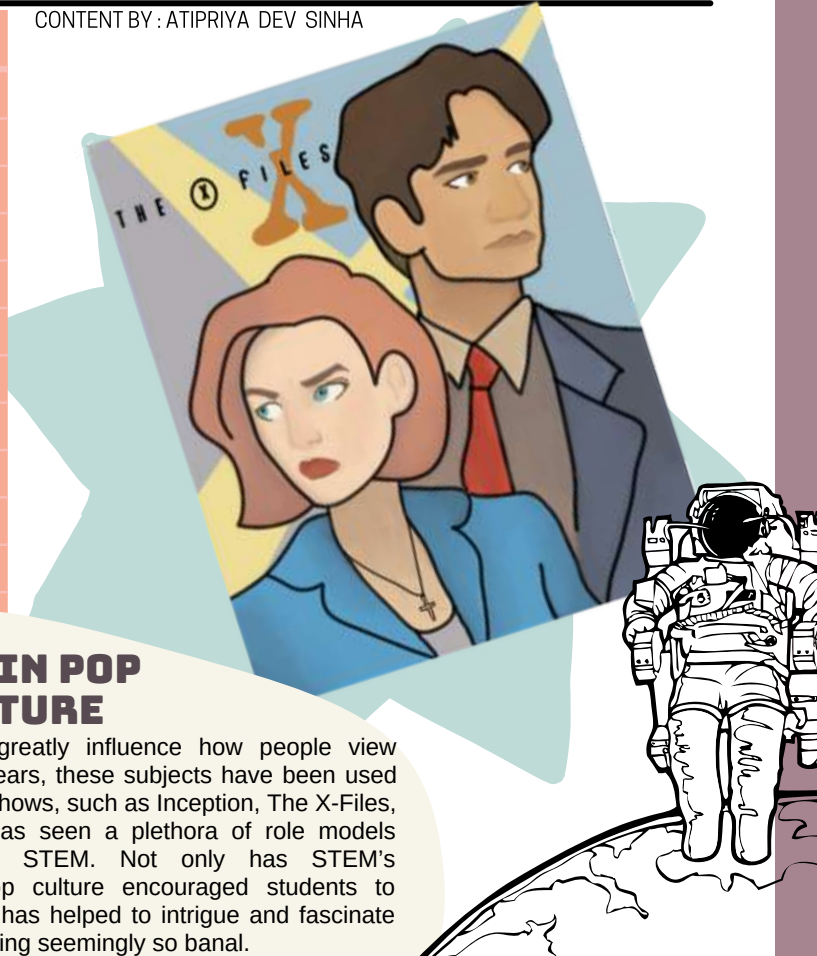


All across the globe STEM has seen rising popularity and has been getting immense recognition and acclaim. When you aim to work in a field as dynamic as STEM, it's extremely important you keep up with the trends.

## MILLENNIUM PRIZE PROBLEMS

Around the year 2000, the Clay Mathematics Institute announced seven unsolved mathematics problems with a reward of \$1 million to anyone who could provide a rigorous solution to them. The problems include the Birch and Swinnerton-Dyer conjecture, Hodge conjecture, Navier-Stokes existence and smoothness, P versus NP problem, Poincaré conjecture, Riemann hypothesis, and Yang-Mills existence and mass gap. The only problem to be solved to date is the Poincaré conjecture by Russian mathematician Grigori Perelman. Even though the problems were announced in 2000, they continue to baffle the minds of many mathematicians today and the existence of these problems indicates how much mathematics remains unknown.

CONTENT BY: ATIPRIYA DEV SINHA

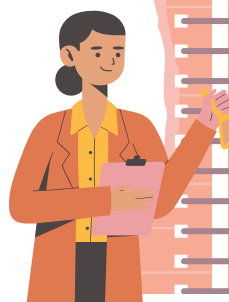


## STEM IN POP CULTURE

Pop culture can greatly influence how people view STEM. In recent years, these subjects have been used in movies and TV shows, such as Inception, The X-Files, etc. Pop culture has seen a plethora of role models foster interest in STEM. Not only has STEM's appearance in pop culture encouraged students to pursue the field, it has helped to intrigue and fascinate them about something seemingly so banal.

## DYNAMIC RESOURCE ALLOCATION PROBLEM

With our lifestyle, it's tough to predict what we desire, when we desire, and how much. Researchers evolve a range of mathematical solutions to allocate resources across industries to keep up with the daily demands our lives place on them. But dynamic resource allocation problems aren't just what humans want when they want it. These are also essential for dealing with some of the world's most fundamental issues, including climate change, as they help us distribute our planet's scarce resources in the most efficient ways possible. Advances in machine learning offer solutions to this problem to help evolve mathematical solutions for the distribution and allocation of these resources. And the constant growth in the field of Machine Learning only enhances this point.



ILLUSTRATIONS BY: KUSHMITA SHARMA

# MATHEMATICS:

## DISCOVERED OR INVENTED?

How do we know if five plus five is ten? Is it possible to tell whether numbers, polygons, equations, and geometry are real or created by humans? This question of whether maths is discovered or invented is still being researched and several ancient philosophers have offered their perspectives on this.

CONTENT BY : TANISHKA TALWAR



Plato contended that mathematics is as real as the universe itself, and, to put it another way, mathematics is independent of humans. Mathematics existed before our existence and will continue to grow even after we are extinct.



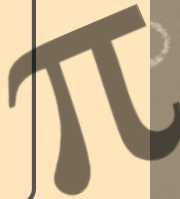
The Pythagoreans of the fifth century believed that numbers were living entities, and that number 1 was the source of all other numbers.



Euclid, the father of geometry, believed that nature was a physical manifestation of mathematical laws.



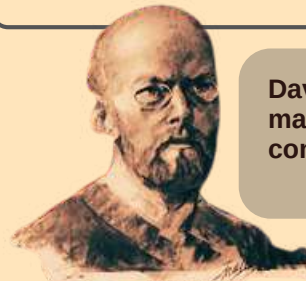
In 1960, Nobel laureate Eugene Wigner pushed the idea that mathematics is tangible and was discovered by humans. He emphasized that notions originally thought to have no universal application have been demonstrated to be vital in understanding how the universe works. For example, mathematical knot theory was later applied to explain how DNA unravels during replication.



Leopold Kronecker, a German mathematician, believed that "God created the natural numbers, all else is man's work."

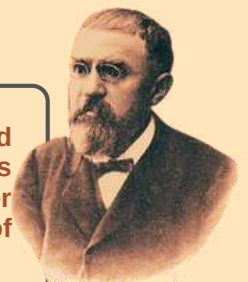


David Hilbert attempted to make mathematics a logical construct.

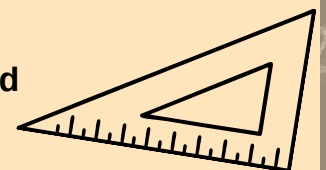


The Non-Platonist theory opposes the Platonic theory. They denied the existence of numbers and theorems in the universe. They instead claim that mathematics is an invention. We create models, our models fail, they are revised, and we invent new mathematics as needed. Intuition is another theory that supports the latter. It is built on the idea that mathematics is a creation of the mind.

Henri Poincaré demonstrated that Euclidean geometry was not a universal truth, but rather the result of a specific set of game rules.



This question has been debated for centuries, and great philosophers have sought answers to them.



So, do you consider mathematics to be an invention or a discovery? Is it divine or created? Is it man-made or natural? Is it a universal truth or made up?

# LETTER FROM MATHEMATICIAN

## From past to present Mathematician

CONTENT BY: CIVIA MARY AND SANCHITA BALANI

WHAT IF WE COULD FIND A WAY TO MAKE THE INFORMATION TRAVEL THROUGH TIME. WHAT WOULD IT MEAN FOR THE NEW DISCOVERIES IN MATH? HERE IS A GLIMPSE OF WHAT MIGHT HAPPEN IF TWO MATHEMATICIANS FROM DIFFERENT PERIODS CAN COMMUNICATE WITH EACH OTHER THROUGH LETTERS.

To  
Future Mathematician

Hello. I hope this letter finds you in good health. I, Thomas Baye, write this letter to a future mathematician, to share my ideas and have an opinion on this theorem.

The early need for probability was mostly felt during gambling, where problems arose while exactly dividing the stakes between two players before the game concluded. From there began the journey of probability as it spread across countries. Here in England, attention is mainly focused on the systematic recording of births and deaths and practical issues of insurance. I wished to know how exactly one can infer causes from effects. So the problem statement that I actually wanted to work upon is this:

How could I learn the probability of a future event occurring if I only knew how many times it had occurred or not occurred in the past?

A solution which I thought of is to guess a number and improve it after gathering more information. Guessing the side at which a ball might end up when dropped on the table was one such experiment. This approach didn't go well with the other mathematicians at first but it certainly helped me narrow down the answers to my problem statement. The mathematical statement of the theorem is:  $P(A|B) = P(B|A) * P(A) / P(B)$

Where:

- $P(A|B)$  - the probability of event A occurring, given event B has occurred
- $P(B|A)$  - the probability of event B occurring, given event A has occurred
- $P(A)$  - the probability of event A
- $P(B)$  - the probability of event B

Here, events A and B are independent events (i.e., the probability of the outcome of event A does not depend on the probability of the outcome of event B) and  $P(B)$  is not equal to zero.

This is a mathematical formula for determining conditional probability (the likelihood of an outcome occurring, based on a previous outcome occurring). This theorem provides a way to revise existing theories given new evidence.

In my opinion, the applications of the theorem could be widespread. The first application that I can think of lies in the financial realm, mainly in big firms and the other applications can be in medical areas where this theorem can be instrumental in predicting the effects of a disease and thus help in its diagnosis. Also, it can be useful in the preparation of important drugs and the pharmaceutical sector. I wish to know more about this from you, as you're from the future and thus can confirm if these predicted applications are in use or not. I also wish to know about other discoveries that may have arrived from this.

While I take my leave, I would like to mention that the area of statistics and probability might have reached much greater heights in your time, but it is imperative to remember that this is only the starting of whatever you have achieved or discovered so far as with more research work comes more precision. Hope to have more fruitful interactions like these.

Yours sincerely

Thomas Bay





# LETTER FROM MATHEMATICIAN

## From present to past Mathematician



To  
Thomas Baye  
18th Century London  
England

Dear Sir

As I write this letter, I realize what an astonishing phenomenon it is, to be able to write to you. I hope this letter finds you in the best of health, as it travels through time to reach you.

My name is Nagambal Shah and I am an American mathematician and statistician. I am originally from India, where I did my undergraduate studies in mathematics and earned a master's degree in statistics.

Today, the concept of probability and the Bayes Theorem as it is now known is of great importance in real life. It is an inseparable tool for all types of formal studies that involve uncertainty and probability is not only applied in business and commercial lines but also the scientific and medical investigations of everyday life.

As a young student, I often wondered the reasoning behind your experiment because why do we need to know what the chance of getting a blue ball is, given that the previous one was red? But as I grew older, I started asking the right questions.

If the conditional probability is about the chance that a positive test for cancer means you have cancer - that matters. If it's about understanding why a simplistic approach to probability leads to miscarriages of justice - that matters.

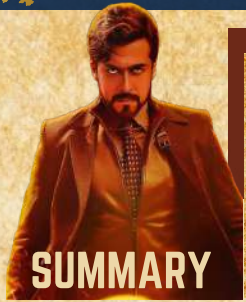
These are the questions that can have life and death implications. If 100% of patients with pancreatic cancer have a certain symptom, when someone has the same symptom, it does not mean that this person has a 100% chance of getting pancreatic cancer. Assuming that the incidence rate of pancreatic cancer is  $1/100000$ , while  $10/100000$  healthy individuals have the same symptoms worldwide, the probability of having pancreatic cancer given the same symptoms is only 9.1%, and the other 90.9% could be "false positives" (that is, falsely said to have Cancer). Since Cancer is a highly feared disease, the fact that Bayes theorem can be used to narrow down the probability of someone having it is a huge advantage in today's time. As you mentioned in your letter, this is just the beginning. We have only discovered the tip of the iceberg. This has been a wonderful exchange and as I reach the end of this letter, I once again thank you for your precious time to write to me and for discovering something that would help and amaze generations to come.

Yours faithfully

Nagambal Shah



# DEBUNKING 24



## SUMMARY

Sethuraman (Suriya), a scientist invents a time travel watch. Athreya, his brother, makes several attempts to steal the watch for selfish motives. In his pursuit, he kills Sethuraman and his wife but falls into a coma due to an unfortunate accident. Mani, Sethuraman's son, becomes a watch mechanic and, by chance, discovers the key to the box that houses the watch. After 26 years in a coma, Athreya awakens. A series of dramatic occurrences ensue when Athreya and Mani go back in time to find Sethuraman and his family safe. Athreya is killed here, and Sethuraman's family start their lives again.

SOURCE: GOOGLE IMAGES

CONTENT BY : JEFFY SABU

The watch, which has a gold case and a blue glass shield over its center, can travel in time for a maximum of one day, either in the past or the future. It can also pause time for up to 30 seconds. However, initially, it couldn't travel in time for more than a day, which Mani eventually fixed.

## WORKINGS OF

## THE WATCH

Einstein's Theory of Special Relativity says that speed affects time, mass, and space. Thus, space and time must be relative, which means that time passes at different speeds relative to how fast objects move. So for a person outside of a moving car and one inside it, time is essentially relative due to speed playing a factor. Thus, this journey can be compared to time travel despite the difference between the moving traveler and the resting observer being only a billionth of a second. Also, gravity is a consequence of how mass warps space and time — mass distorts space-time and this, in turn, influences the movement of mass. With all these consequences, it makes time travel a bit difficult to happen anytime soon, but it does possibly back up with how time works in the movie.

An issue that is at the forefront of this movie is that people can travel back in time to change their pasts for selfish motives. There were no rules given in the cinematic universe which followed what we know about time scientifically till now. Certain periods are being repeated multiple times, thus exploiting scientific laws. Laws state that if we step outside of the flow of time, we'd be stepping outside of the laws that keep our atoms together.

The repetition of periods and the blatant misuse while handling the past which could consequently affect the timeline they first traveled from, shows a loose groundwork for time travel rules in movies' universe.

# ALGORITHM RECOMMENDS!

CONTENT BY : ANOUSHKA SINHA & VASUNDHARA

SOURCE OF IMAGES: GOOGLE IMAGES

prime video Home Shows Channels

## The Handmaid's Tale

★★★★☆

Based on the bestselling novel by Margaret Atwood, this series is set in Gilead, an authoritarian culture. In a frantic endeavor to repopulate a crushed world, the remaining fertile ladies are constrained into sexual subjugation. Tormenting and distinctive, *The Handmaid's Tale* is an immersive watch, depicting how sexist attitudes have consequences.

PRIME ORIGINAL *The Grand Tour* JEAN-CLAUDE VAN LIEPPE TOM CLANCY'S *JACK RYAN* PATRIOT AMERICAN ORIGINAL *AMERICAN GODS* *GHOST RECON*

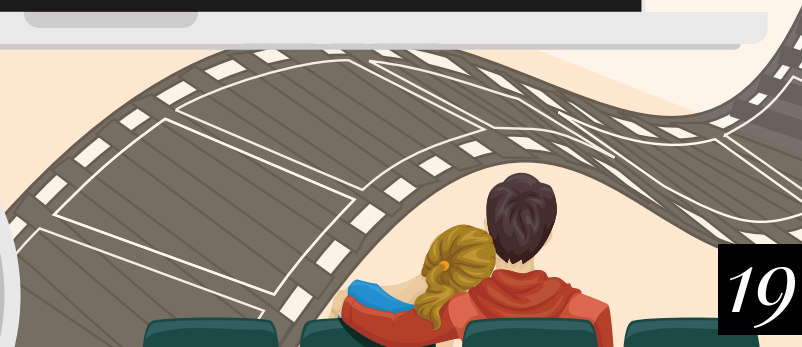


HBO SHOWS MOVIES PODCASTS SCHEDULE

## WESTWORLD

3 SEASONS | 28 EPISODES | TV-MA

Westworld isn't your typical amusement park. Planned for rich travellers, the advanced park is taken care of by automated robotic "hosts" that permits its guests to experience their dreams through counterfeit awareness. Rooted in the 1973 Michael Crichton film of a similar name, the habit-forming Westworld adjusts the wise, enchanting show against craziness. A mind-bender that'll keep you puzzled.



youtube.com

**YouTube** Search

**Ronnie & Barty** ✓  
285K subscribers • 94 videos

Check out how the husband-wife duo based out of Manali-Rohan Thakur (aka Ronnie) and Bharati Bahrani (aka Barty), create a captivating documentary of their slow-paced life in Manali's idyllic mountains, of travelling the mighty Himalayas to the exotic beaches of Goa. A few minutes into their vlog will reshape the way you explore places.

**SUBSCRIBE**

Relaxing Hiking Video - Into the Wild | 4K  
73K views • 13 days ago

prime video Home Shows Channels

**Source Code**  
★★★★★

Jake Gyllenhaal headlines this Sci-Fi time-travel thriller where he portrays a soldier who wakes up in someone else's body and discovers he's part of an experimental government program to find the bomber of a commuter train within 8 minutes. The film has an outlandish premise, but ensures you can follow it and never find yourself mixed up in the exciting bends.

youtube.com

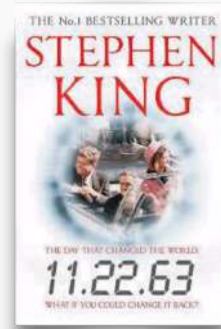
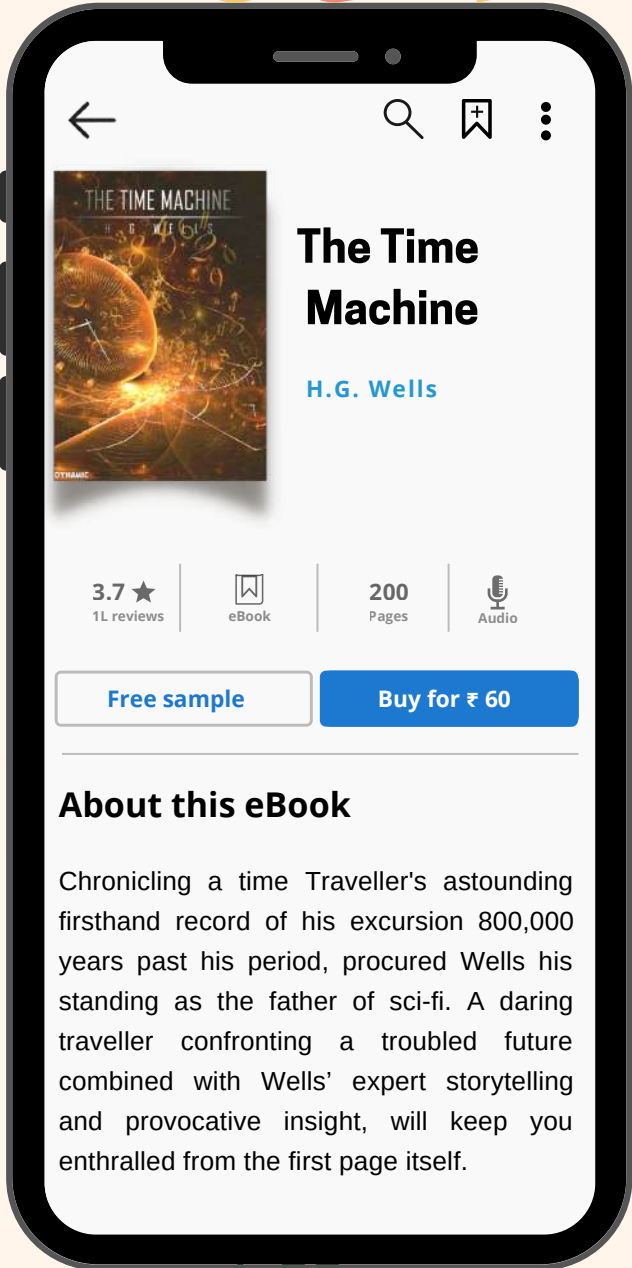
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15.7M subscribers • 1,877 videos

With superb animations and flipped-class illustrations, TED-Ed picks generally exhausting subjects and changes them into ridiculously captivating substances for audiences through the support of local masterminds and practitioners. Highly recommended to get your brains popping!

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MYTHIC S1 • E40  
The twins who tricked the Maya gods of death - Ilan Stavans  
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11.22.63

Stephen King

4.4 ★  
180 reviews

eBook

752  
Pages

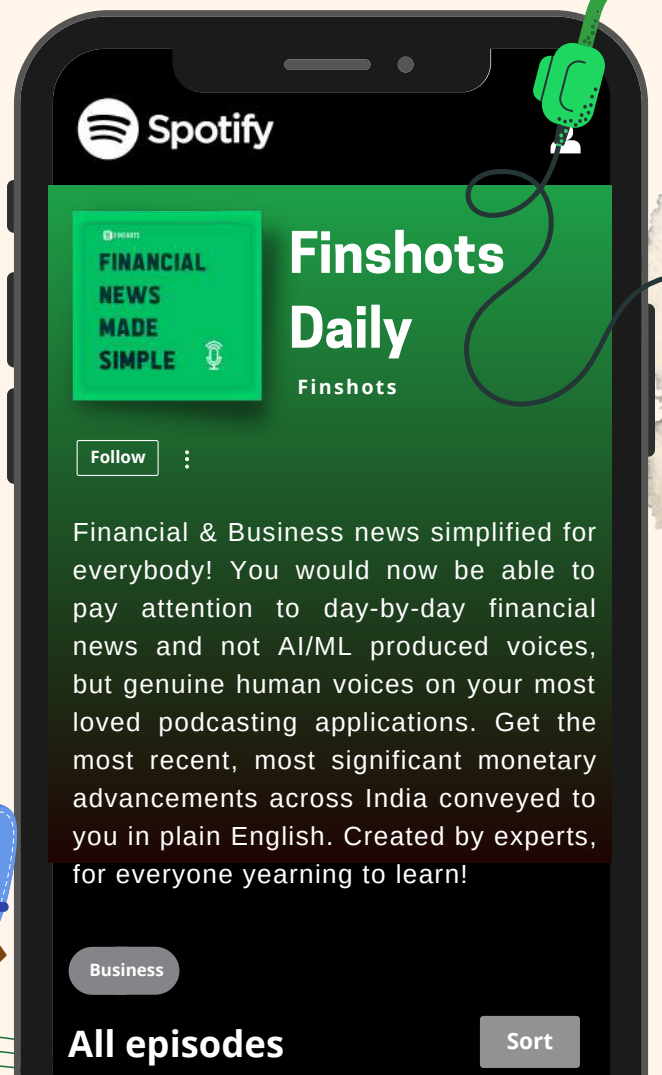
Audio

Free sample

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### About this eBook

On November 22, 1963, three shots rang out in Dallas, President Kennedy died, and the world changed. Imagine a scenario in which you could transform it back? Stephen King's heart-stoppingly sensational novel is about a man who travels back in time to prevent the JFK death — a 1,000-page masterpiece. A must-read if you're looking for some mind-bending adventure!



reated the Great Diastoc  
y and fell in love with it.



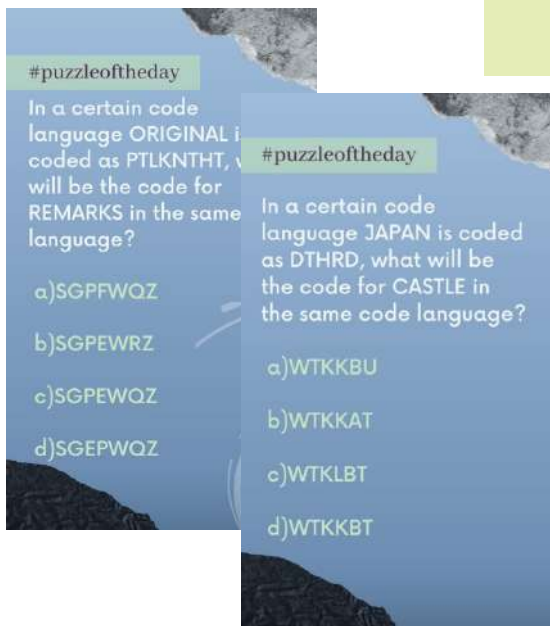
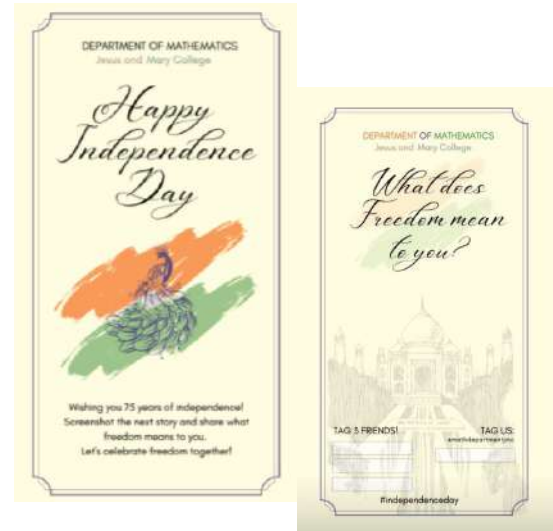
# The Department of Mathematics Report

COMPILED BY: EVENTS AND RESEARCH TEAM, DEPARTMENT OF MATHEMATICS

2021 AT A GLANCE

## INDEPENDENCE DAY CELEBRATION

On the 75th anniversary of India's independence, the department sponsored a "Freedom Campaign" on August 15, 2021, in which students explained what freedom meant to them. It was successfully carried out on Instagram and helped viewers develop a wider viewpoint, with over 30 different meanings of freedom, ranging from "being able to express feelings" to "having a choice."

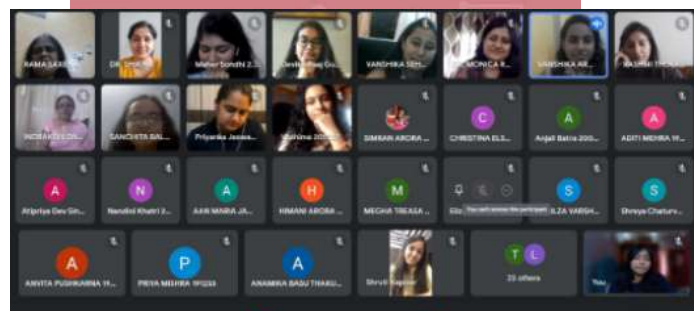
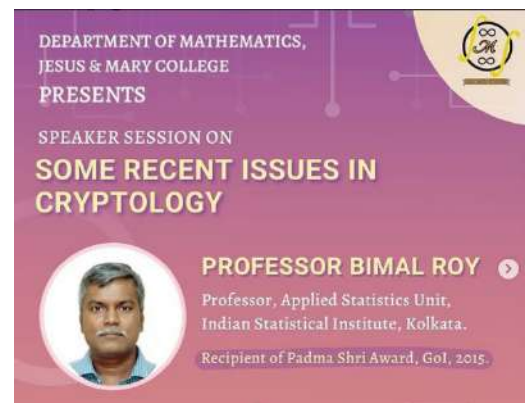


## THE CRYPTO PUZZLES

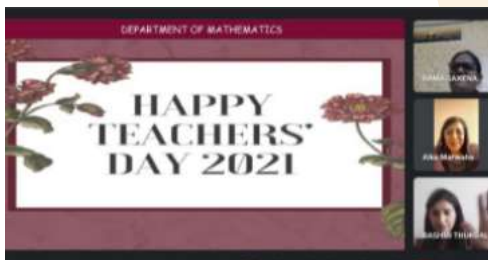
To highlight the applications of Cryptology, a branch of mathematics, the department came up with a fun and intriguing online event, and for the same, members of the department's Events & Research Team designed crypto puzzles. These were then posted on the department's Instagram handle at 10 a.m. from 20th to 25th August. All participants had until 11:59 p.m. to DM their answers with explanations. The contestants with the most correct responses were deemed the winners.

## LECTURE SERIES

Professor Bimal Kumar Roy presented a speaker session on "Some Recent Issues In Cryptology" on August 25th. He is a cryptologist from the Cryptology Research Group of the Applied Statistics Unit of ISI, Kolkata. The students gained a lot of insightful knowledge in this field of mathematics through the event.



# TEACHERS' DAY CELEBRATION



The department celebrated Teachers' Day on 8 September 2021, to thank the teachers, whose guiding hands have successfully mentored the lives of numerous pupils. Numerous dance and song performances were undertaken by the students to show their gratitude.

## ALUMNI SERIES

In continuation with the Alumni Series, the department organized a session with Ms. Sana Goel held on 11 September 2021. She went on to the London School of Economics to pursue her Master's degree in Risk and Stochastics after graduation and is currently employed with Morgan Stanley in London as a Counterparty Risk Manager. This seminar was beneficial in guiding students who wish to continue their education abroad.



## MANN KI BAAT FT. NRI SENIORS



This event lasted two days (24th and 25th September 2021) and featured three graduated seniors each day. Rimjhim Singh (London School of Economics), Pearl Gupta (Duke University), and Vidhi Vashishth (UCLA admit), all attended the session on Day 1. On Day 2, we had Neha Sam (Seoul National University), Additi Pandey (Imperial College London), and Manali Sethi (Bocconi University). All seniors shared information regarding the application process, funding, scholarships, living expenses, amongst other things.

## STUDENT COUNCIL

Ms. Vanshika Arora  
(PRESIDENT)

Ms. Vashima  
(VICE PRESIDENT)

Ms. Vanshika Sehgal  
(TREASURER)

## FACULTY

Teacher in Charge: Dr. Indrakshi Dutta | Association In Charge: Dr. Rashmi Thukral

Dr. Alka Marwaha

Dr. Anu Ahuja

Ms. Rama Saxena

Ms. Richa Krishna

Dr. Ambika Bhambani

Ms. Sunita Narain

Dr. Anu Saxena

Dr. Shruti Kapoor

Dr. Monica Rani

Dr. Shikha Singh

## ACHIEVEMENTS

**Shruti Ohri:** 1st position in Word Weaves 2021. Creative Writing Competition organized by Cauldron

**Maher Sondhi:** 1st Runner up in Enactus SRCC's flagship Social Entrepreneurship Summit

**Ananya Lohani:** 1st Runner up in Meme making competition (One on one with Trigonometry)

**Devika Raaj Gupta:** 3rd Position- Case Study Competition (Investment Plan) as a part of the International E-Summit. 2021 organized by the E-Cell of VIT-Bhopal University. Award- Most Innovative Marketing Member at Youth India Foundation (NPO). 1st runner up. Oh My Disney Event by Mercatus. Jesus & Mary College. DU

# MUSICINGS

COMPILED BY: AISHWARYA MOHAN



OJASVI KAPOOR, 2nd year



ANUSHKA CHHABRA, 3rd year



SHUBHANSHI MITTAL, 1st year

## Azaadi from fear

Walking around the ground,  
She found a broken hand.  
Terrified to sit and to stand,  
Full of blood covered with sand.

Moving on she stumbled,  
"Oh my papa", she fumbled,  
It was a cap which was red.  
Crawling ahead she found a head.

Screaming papa with top voice,  
Accepting the fate was only choice.  
Shouting "You promised a toy in return"  
Is this your courage and what you earn?

Asking for answer gazing the sky,  
Consoling her heart about to cry.  
Is it really of victory? or All are mad.  
Seeing this scene even God must be sad.

When will love and peace reign?  
Killing for victory is all vain.  
With folded hands I tend to bend,  
Stop The wars or the world shall end.

Repeat after me with all wisdom  
We want freedom , We want freedom,  
Free from fear and from terror,  
I pray this world to be more fairer.

We want peace and Humanity,  
We want love and charity,  
We want kindness and parity,  
We want honesty and "liberty".

ARUNI SAXENA, 2nd year





VASHIMA. 2nd year



SHREYASEE CHOWDHURY. 2nd year

## The Solitary Moon

A shade of black,  
A patch of grey,  
Taking all my light away.  
A cloud of gloom,  
A cloud of tragedy.  
Muting the noise of my life's rhapsody.

I vanished,  
Sheathed by the smoke of your jealousy.  
Yet, you couldn't block my light,  
So chaste,  
Sans a touch of malignancy.

Rejoicing in my praise,  
They sing of my selflessness,  
Never stopping to glance  
At the abyss of my loneliness.

They say I inspire them,  
They say I look so bright.  
They never asked me how it felt,  
To stand alone in the middle of the night.

Alone in the middle of the night,  
Surrounded by clouds,  
Trying to engulf me,  
Cover me with a shroud.

But that's the nature of nature.  
And maybe then it's mine.  
To succumb into darkness all alone,  
While brightening the world with my shine.

SHREYA. 1st year

# BEING ALONE, AND BEING OKAY WITH IT

Making friends never really came naturally to me. Even when I joined JMC, it always felt like I didn't fit. Sitting under the trees, browsing on my phone to not seem alone was something I was becoming particularly "pro" at. I remember looking at the faces around, always with friends, never alone. It never felt "wrong" to me for not having that. I rarely felt lonely, and sometimes I was kind of concerned why not. When I did meet the amazing people I have in my life now, I still couldn't hang out with them enough for craving college to reopen. But I still fell in love with Delhi, even though it was never my home. Don't get me wrong, I have cursed more than anyone for the long long metro lines. But Chanakyapuri was a different side to Delhi. Taking even forty minutes walk alone from college to PG while listening to the newly discovered Indie songs, guessing everyday which embassy I was going to pass by next, that made me enjoy being alone. Aristotle distinguished friendships into three kinds: of pleasure, of utility, and of virtue. In hindsight, I did have plenty opportunities, if you may, to make friends. But I knew better than being with people I knew wouldn't last, just to serve the void.

I may not miss attending college, but I still miss it, because it was the one place I started loving my peaceful company, and I'm finally proud not feeling guilty about it.

SHRUTI KEDIA. 3rd year

## Dead Dreams

Just a girl who had dreams,  
Often has to hear various screams.  
She once dreamt a career,  
Wiping her eyes full of tear.

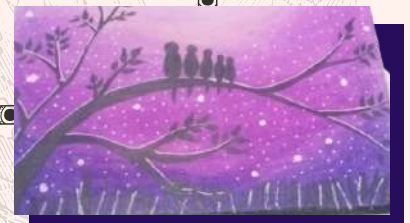
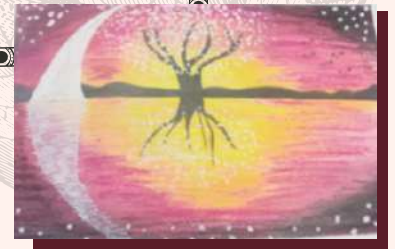
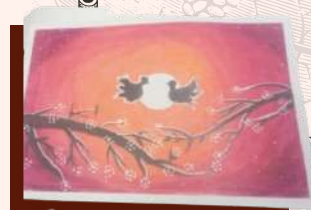
Thinking of the laurels she teared,  
Her family would see her she feared.  
Looking at her school the last time,  
Is she a girl was that her crime?

Asking for answer gazing the sky,  
Consoling her heart about to cry.  
Suppressed by the opposition,  
She quites her ambition.

Returning home with a heavy heart,  
Throwing the books into the cart.  
Exchanging them to clothes to Marry,  
Wishing in heart for time to Tarry.

Accepting the fate she surrender,  
But this was her one big "blunder".  
Time passed she is now grown,  
Thinking of the courage she could have shown.

She was growing guilty day by day,  
She had so much to shout ,And to say.  
Passing by her school she finally screamed,  
Why she was just a girl who only dreamed??



# The Editorial Board



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CHIEF ILLUSTRATOR



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PR & MARKETING HEAD



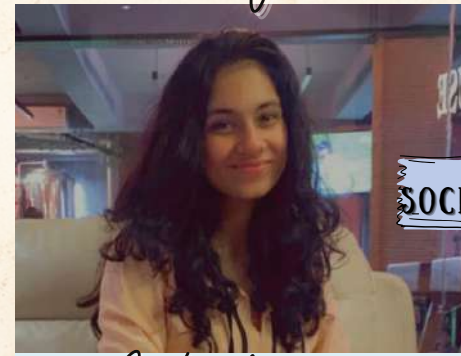
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SOCIAL MEDIA HEAD



Anamika Basu

SOCIAL MEDIA HEAD



Vashima



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JEFFY SABU  
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LAVANYA GROVER  
VANSHIKA SEHGAL



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GEETANSHI  
KUSHMITA SHARMA  
MEGHA TREASA JOSEPH  
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JEFFY SABU  
SANCHITA BALANI  
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TANISHKA TALWAR  
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## SOCIAL MEDIA MANAGEMENT



MAHER SONDHI  
PRIYANKA JESWANI  
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SANCHITA BALANI  
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## PUBLIC RELATIONS TEAM



ANOUSHKA SINHA  
GEETANSHI

