



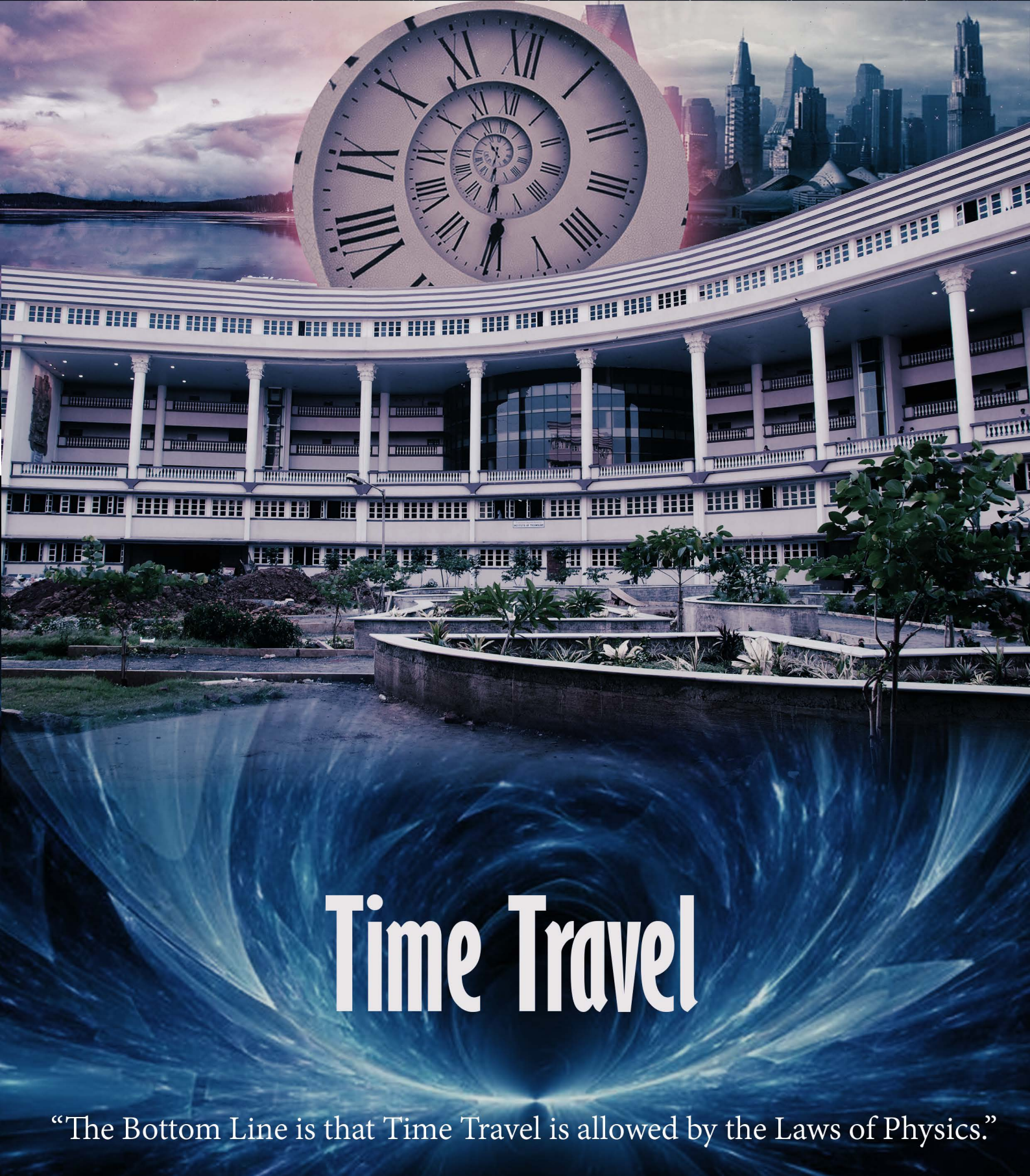
since 1962

INNOVATION

AN IEEE-VESIT PUBLICATION



IEEE-VESIT



Time Travel

“The Bottom Line is that Time Travel is allowed by the Laws of Physics.”



2016-2017

FROM THE EDITOR'S DESK

Watching an episode of Doctor Who has always been a joy. There is a clear reason for that. It has to do with the inherent allure of time travel. The Doctor's fantastical exploits across all of space and time are so good because they promise its viewers something that science cannot do yet, for an hour or so, the viewers can go anywhere in time. Pop culture's obsession with time travel is not new. Novels as old as H.G. Wells' *The Time Machine* have laid a rich foundation of content to build upon. This year Innovation takes you on a journey to understand the intricacies of time better. Presenting the theme for this year, Time travel.

Join our winners as they try to make sense of time travel and present their perspectives on it. Shrikumar Patil elucidates some ideas proposed by leading Physicists while Sagar Brijwani talks about travel into the future. Rohit Shreedhar examines the effects of Time Travel whereas Ajit Krishnamoorthy draws from the scintillating works of Douglas Adams. Sakshi Patil draws upon Stephen Hawking to ask a necessary question and Yogita Balani talks of a Race against Time.

The editorial cell, not one to be left behind, brings its own perspective on the topic. Madhu Raut pens the cover story, *Slicing the Time Melon*, and Deepa Narayanan draws on the work of Brian Greene to explain the complexities of Time Travel.

The Editorial cell would like to extend their thanks to all the people who sent in their entries, as Innovation is primarily a platform for the ideas of the people. Also we'd like to extend our heartfelt appreciation to our Staff Incharges for their support and guidance.

Wishing you a Future devoid of paradoxes,

The Editors,
IEEE VESIT

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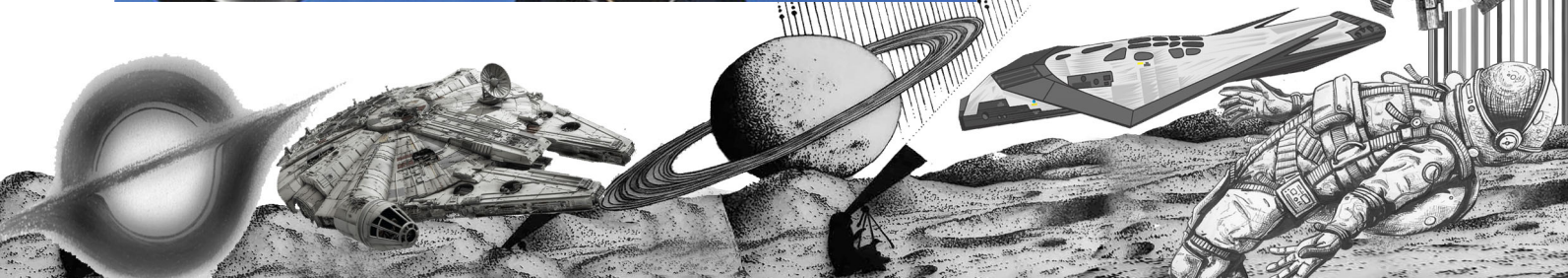
Vardhaman Roman



THE FOURTH DIMENSION

Sakshi Patil (D9B)
SE Second Prize Winner

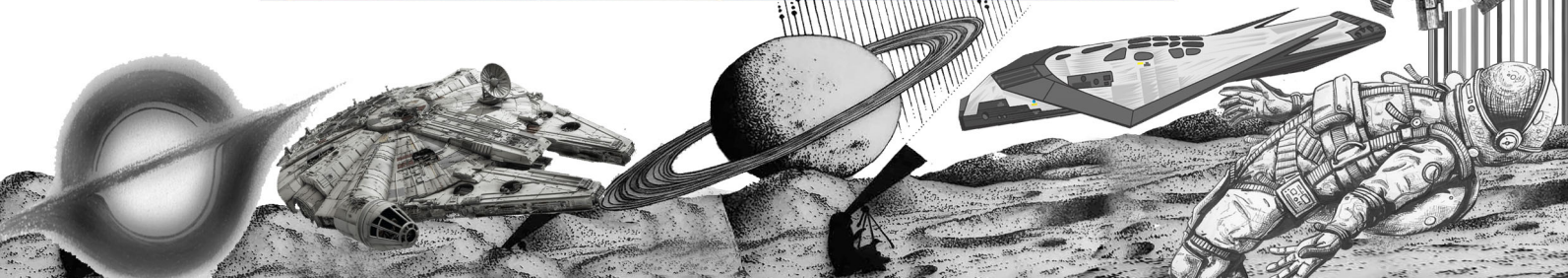
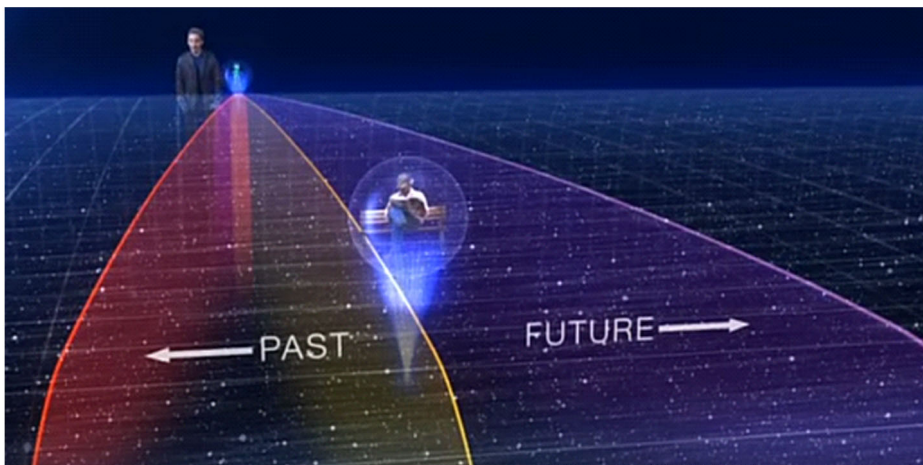
“I wish I could go back in time and do it all over again.” “I wish I knew how this would turn out.” Haven’t we heard people say this all the time? Clearly we humans crave the opportunity to do things over or foresee the happenings ahead, and that is why countless possibilities are being explored to make time travel a reality. But as rightly said by Michio Kaku, “Once confined to fantasy and fiction, time travel is now simply an engineering problem.” Einstein who views time as the fourth dimension first theorised that travelling into the space at the speed of light causes time to slow down. Basically in Einstein’s equation, time is a river; it speeds up, meanders and slows down. The new wrinkle is that it can create a whirlpool and fork into two rivers, causing a parallel dimension which brings us to wormholes, supermassive black holes, cosmic strings and many more possible ways devised all of which have the common problem of existing only in theory. But Stephen Hawking’s rightly posed question, “If time travel is possible, where are the tourists from the future?” puts a lot of theories to rest. Right from the “grandfather theory” to the “mad scientist” theory there are several contradictions indicating that time travel may be a sci-fi staple for us to loom upon wondering whether the Big If ever comes true.



Understanding Time

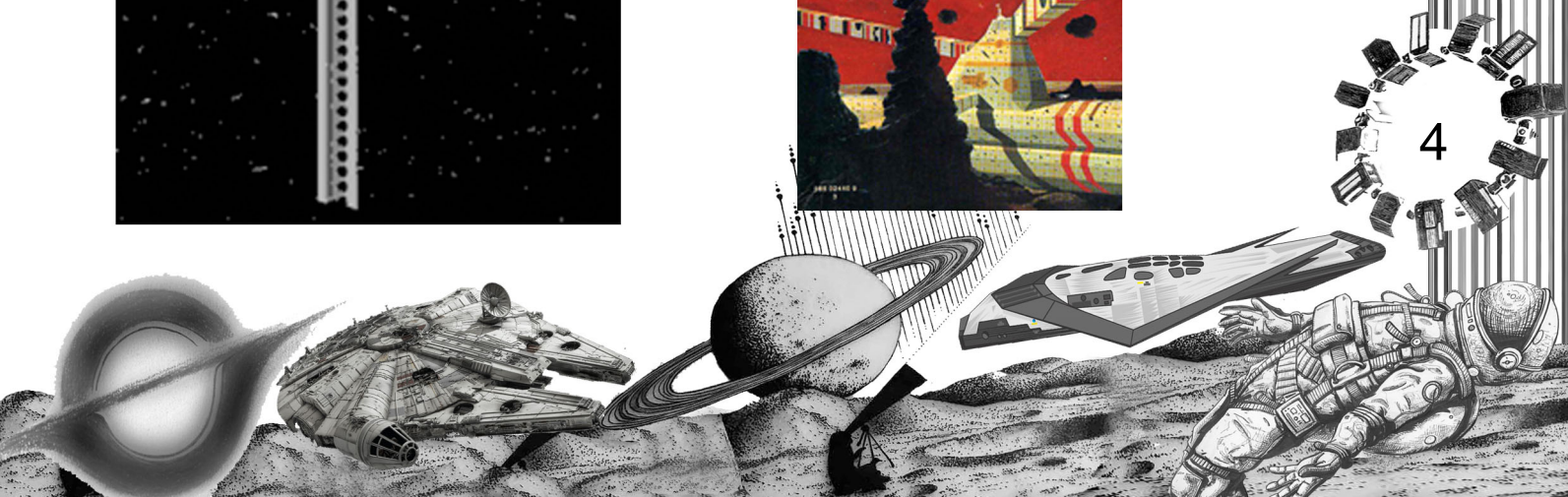
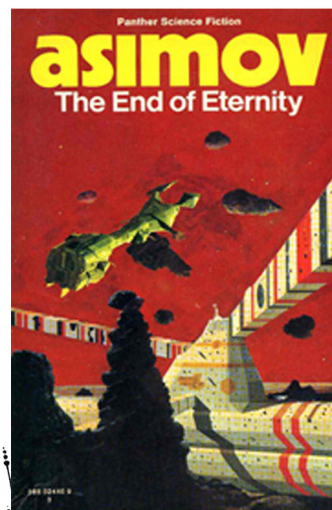
Deepa Narayanan
SE Coordinator

“With a twitch of bang and darkness, the mysterious, endless universe was unlocked under the sheath of a very perplexing and fascinating perception, time. Needless to say, Einstein’s theory of relativity has impersonated the anxieties of getting hold of this fourth dimension, time, in turn making past and future the ultimate vacation destination goals for our physicists. The urge to ride dinosaurs or see one’s great grandchildren has enabled the researchers to extend their boundaries of imagination to Closed Time Curves or transversable worm holes and beyond. The causality of time can be presumed to be a series of snapshots of events at one instance of stint. This is as good as freezing the entire universe for an infinitely small interval and capturing it. Now, consider a continuous series of such glimpses, you are awarded with a film that is called ‘present’. Just to muddle this it’s-so-simple image, let’s play this reel of captured snapshots in reverse manner. Are you travelling in past? Often the flow of time is exemplified to unidirectional flow of river. Maybe, the river of time is more like a frozen water body and we perceive the snapshots in consecutive order that deceive our eyes. We say time has elapsed for we can make out the distinguishing changes in the series of images. Time is mere distinction of past, present and future. It is an illusion but persistent! So if you want to travel into time, get hold of the projector! Brian Greene suggested the ‘loaf theory’ for the simplicity of explaining time travel. This theory postulates time to a loaf of bread and each slice perpendicular to the surface is one unique timeline. One slice consists of infinitely many activities at the same.

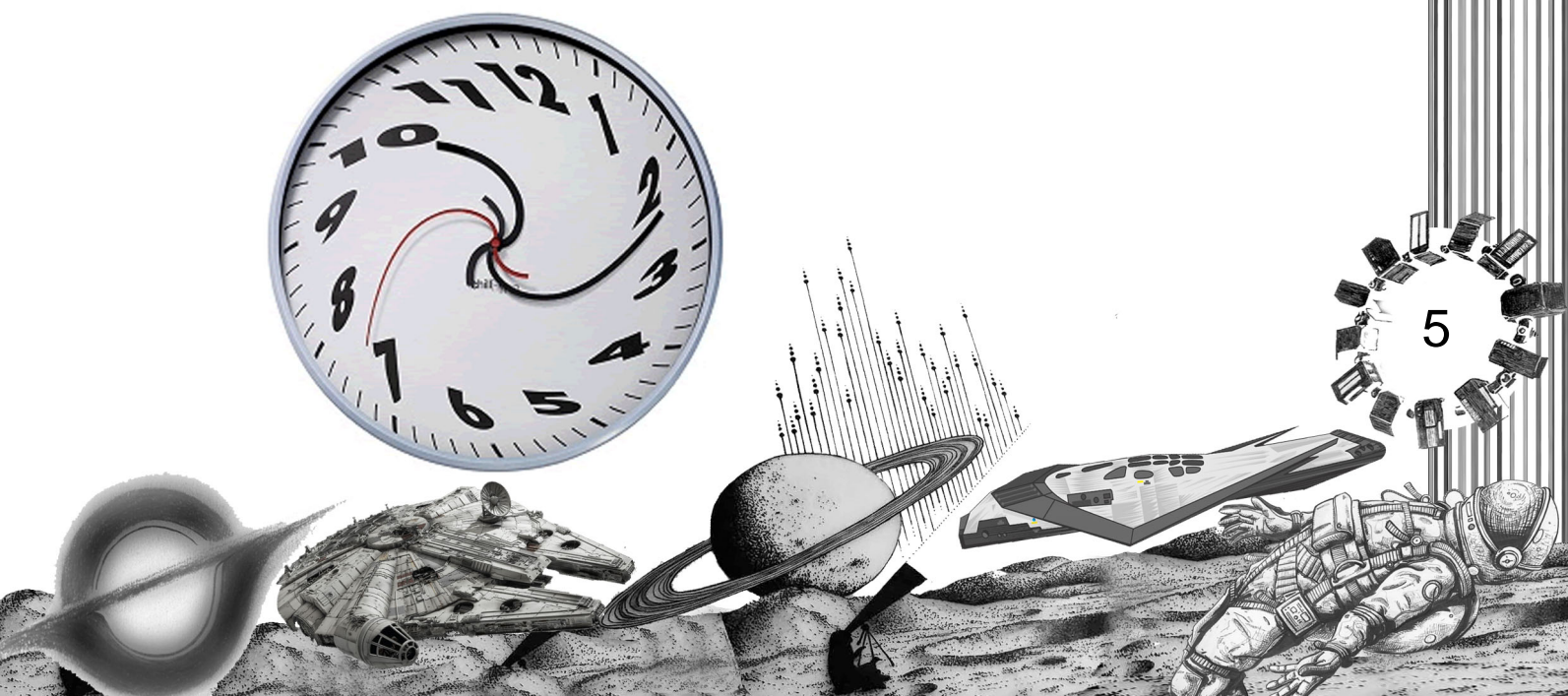


“'Imagination makes us aware of limitless possibilities. How many of us haven't pondered the concept of infinity or imagined the possibility of time travel? In one of her poems, Emily Bronte likens imagination to a constant companion, but I prefer to think of it as a built-in entertainment system.' --Alexandra Adornetto. We humans are driven by curiosity, whether it is discovering about the Big-Bang, gravitational waves or searching for extra-terrestrial life etc. We often are fascinated by fictitious imagination and thinking about a parallel universe. We have all enjoyed time travel stories, be it movies Back to the Future, The Time Traveller's Wife and Interstellar or the book End of Eternity by Isaac Asimov, which are considered as science fiction. But many argue that time travel is not just in theory or mere exaggerated phantasm. The inception of fresh new ideas, perspectives and theories due to extensive research have propelled the research into a whole new realm.

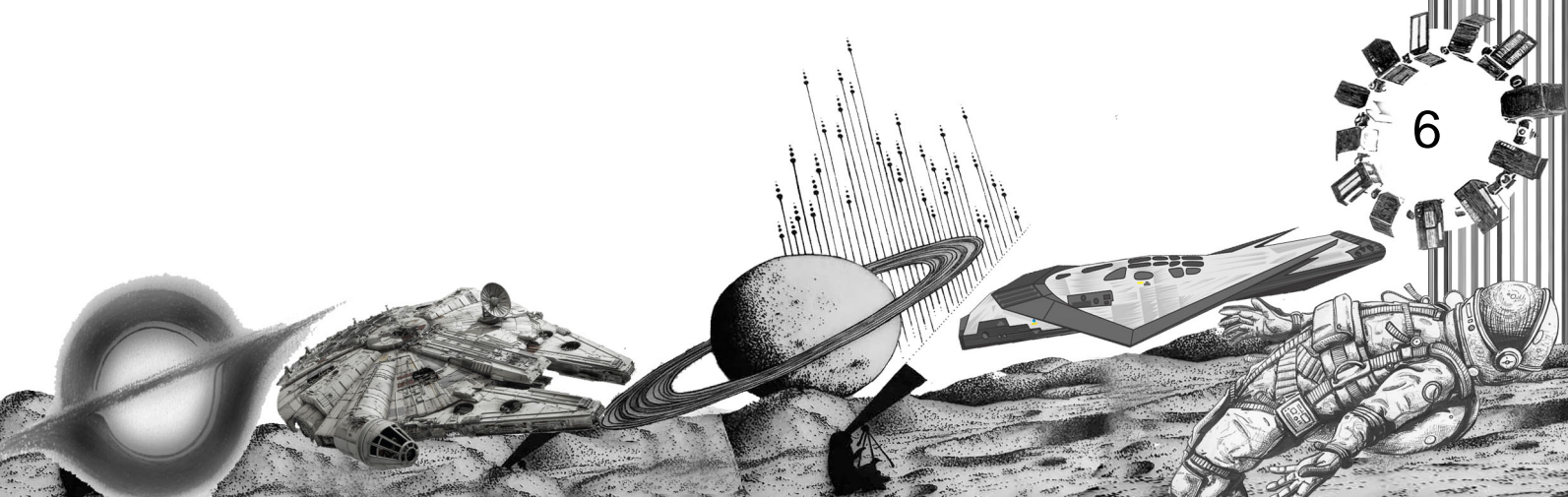
The concepts of relativity and space-time continuum are the most common ones. According to Einstein's theory, approaching the speed of light would theoretically slow time, traveling at the speed of light would make it stand still and traveling faster than the speed of light would reverse time. But how exactly time travel is possible? Although there are a lot of



happen before effects, and never the other way around. Things can't make themselves impossible. If at all this paradox is true, the whole universe would descend into chaos. Dilation is change in time due to relative velocity. It basically refers to the idea that time passes more slowly for a moving clock than it does for a stationary clock. The force of gravity also affects the difference in elapsed time. The greater the gravity and the greater the velocity, the greater the difference in time. The slowing down of time near gargantuan gravitational field influence, which is near a black hole produces massive time dilation. The phenomenon of time dilation is absolutely a real phenomenon which is proved experimentally. The experiment by Carol Allie in 1975, showed that when two synchronized atomic clocks, one placed on a plane and flown around for several hours and left the other left stationary on Earth. When the airborne clock was returned to Earth, she compared its time with the one that hadn't moved and found that time had moved a fraction of a second more slowly for the clock on board the plane. Also, the clocks on the International space station tick a tad bit slower than the ones on earth. Other proposed concept is the wormhole or Einstein-Rosen bridge concept. In the late 1980's Kip Thorne of the University of California at Berkeley suggested that objects known as wormholes exist in space. These objects would essentially be two connecting black holes whose mouths make up a tear in the fabric of space-time.



The proposed idea is that if one end of the wormhole is kept constant, and other end is accelerated approximately to the speed of light, there will be a relative time difference between the two ends. The concept of wormholes also has many problems as due to quantum mechanics, the forces in the wormhole would lead to immediate collapse of the wormhole, along with other anticipated problems such as high levels of radiation and contact with dangerous exotic matter. According to Stephen Hawking, "As soon as the wormhole expands, natural radiation will enter it, and end up in a loop. So although tiny wormholes do exist, and it may be possible to inflate one someday, it won't last long enough to be of any use as a time machine.", he explains. Also, many scientists believe that cosmic strings will help us navigate through time. "Cosmic strings are either infinite or they're in loops, with no ends", explains J Richard Gott, an astrophysicist at Princeton University. In theory, the cosmic strings could potentially influence time-space around them strenuously, they might make time travel possible. But yet again, cosmic strings exist only in theory. 'I myself believe that there will one day be time travel because when we find that something isn't forbidden by the over-arching laws of physics we usually eventually find a technological way of doing it.' said David Deutsch. The mere idea of Time Travel gives us hope. To search for something more, to explore something ground-breaking, which could outstandingly influence our lives or in this case, would possibly answer or further question all about our existence. All this theories and experiments give us some hope of the possibility to manipulate the fourth dimension.

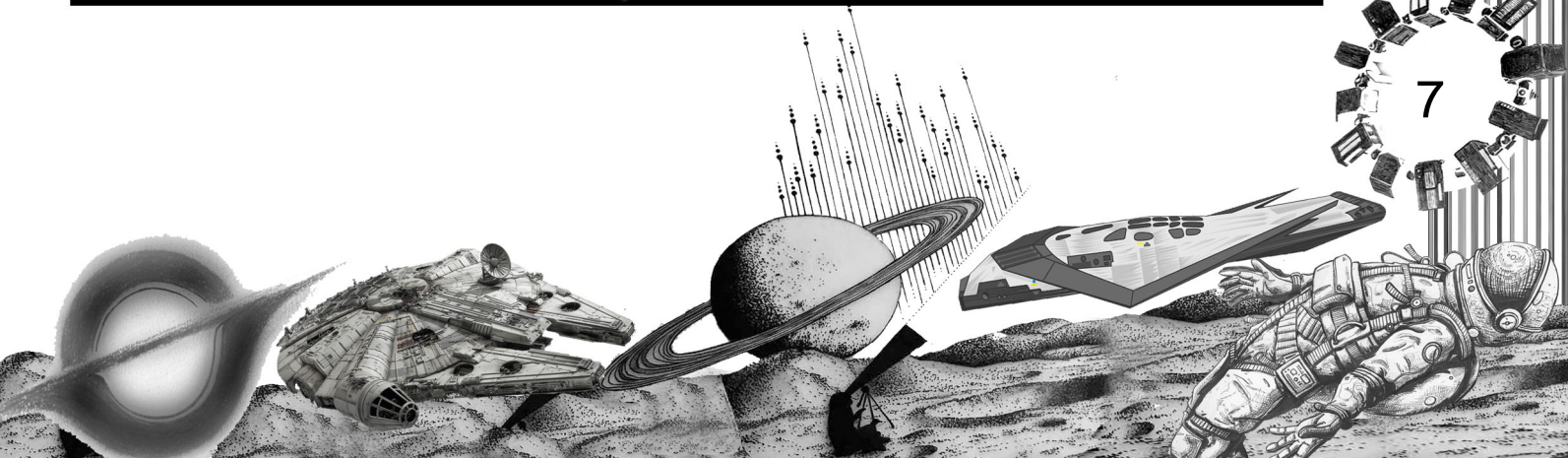
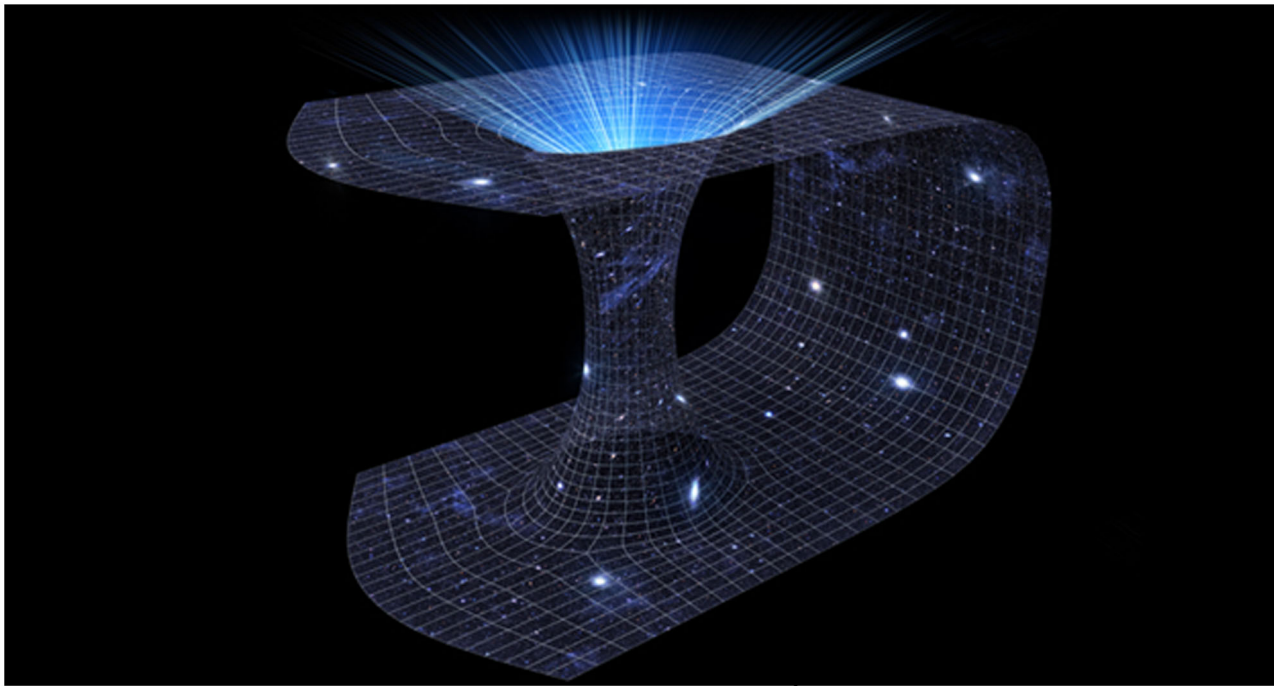


IN THE PAST OF THE PRESENT, INTO THE FUTURE

Rohit Sreedhar (D14A)
TE Second Prize Winner

Nibbling into the future to get on a shuttle to Mars and back or riveting into the past to Dandi march with Gandhiji. Time travel, well, has always brought in thrill to our tenses. Our fancies and imagination have always teleported us to not only significant incidences but also to stages of our own life we have crossed by or yet to reach. Science fiction has explored this to unmatched levels with its creative aspects. Literature also has used the concept in admiration and skeleton of its plots.

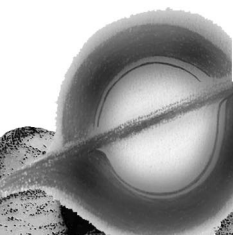
From the shelves of Charles Dickens novels, we have 'A Christmas Carol', which takes its protagonist back and forth through the timeline of Christmases. Though it didn't involve the actual teleportation of the character, it did lay the plinth of the idea of living out of the dimensions of the present. H.G Well's 'The Time Machine' was the one wherein the set mechanical time machine we think of was brought into the picture.



IN THE PAST OF THE PRESENT, INTO THE FUTURE

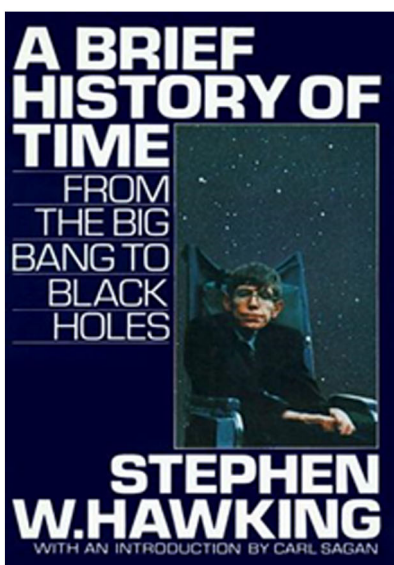
Rohit Sreedhar (D14A)
TE Second Prize Winner

Well though thoroughly erected by the pillars of imagination, time travel yet has the back of Physics. Racing against light would possibly grant the ability to defy time, is what the theory of relativity has to say. Some portions of quantum mechanics and wormholes also seem to aid its possibility. Time travel, however, stands out as a defiance to the laws of nature. The possible addition or deletion of an activity would put the present and the future upside down. Yes, it does wobble up the mind, for it may be interpreted as an allowance back in the past might able you to kill yourself which then contradicts your present existence! Enough to put the world upside down, isn't it? Coming back to hypothesis again, what if we were actually geared up to reverse or transverse in time? Could we have made up our world a better place to live in? Could we have possibly gone back to teach our boys that the women they were born of aren't mere living beings to subject their evils on? Nirbhaya would have ringed in 4 more birthdays until date. Could we have gone back to slap and apprehend the rulers whose divide and rule led to a partition whose repercussions we still bear? Kashmir would have been a heaven in every sense then. The list is and with the clock ticking will go on to be endless. bSadly, for life in reality isn't our Facebook timeline where scrolling will only take us to memories to smile back at. So as your eyes reach to this line wherein you'd realise that the 2-5 minutes you spent reading cannot be travelled back to! With the heavily light baggage of the past and the mystery of the unseen future, we walk the present as the clock steadily races until we realise that the whole world is a lap which is again going to reset at 00:00:00.

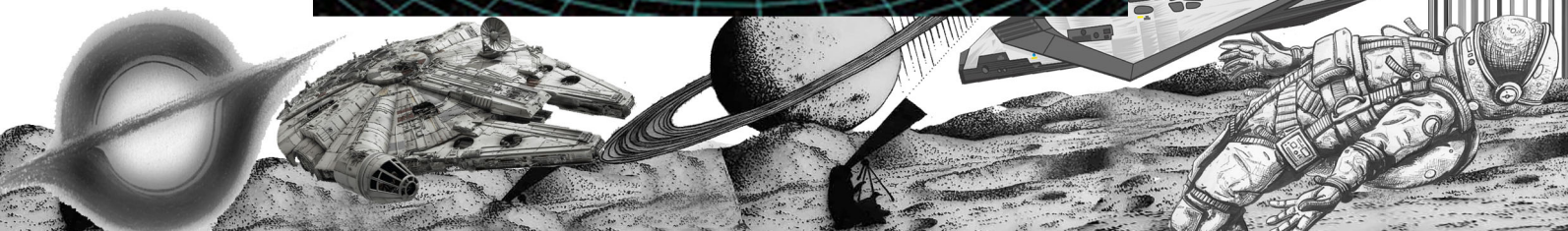
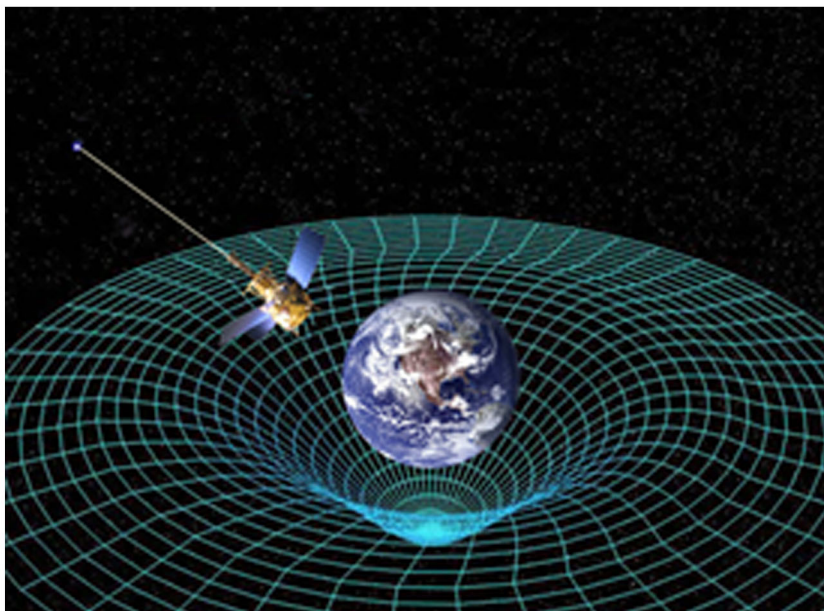


This is the century of time travel, just as the previous century was of air and space travel. I sat, curled up in my blanket, sipping coffee and watching another one of TED Talks, this one on “the real science of time travel” by Ronald Mallett. The first time, however, I decided to plunge into the scientific aspect of this subject, seeking authentication for all the sci-fi I ever encountered in life, was when I read Stephen Hawking’s *A Brief History Of Time*.

It was then, that I realized that Time Travel wasn’t subjective and fictional entirely, as I earlier perceived it to be. Stocking together the works of all the great scientists and years of their blood, sweat and tears into molding their own ideas of Time Travel isn’t really something I intend to do in this cover story. I’ve tried to compile the most popular conjectures, straining out the annoying physical laws and mathematical equations behind them, and sticking to the most basic notions that make up this highly fascinating subject. I’ve also added my own metaphors that depict my perception of certain axioms. Time Travel can be described as a discrepancy between time and time. What this essentially means, is that the difference between the time of departure and the time of arrival is not equal to the time of the journey. Talking of



Time Travel, the classic theory that strikes my mind is that of Einstein; The Theory of Relativity. Getting into the nuts and bolts of it would be too cumbersome and monotonous, so I'd like to explain it with the help of an example. The Theory of Relativity is based on two principles. The first principle states that when we consider two objects and nothing else, it is not possible to tell which object is moving and which object is standing still. This is true even if one of the objects is an entire planet. Now, consider James is floating in a spaceship over our planet. From his perspective, it's the spaceship that is standing still, and it's the planet that is moving. There's no means for him to know if he's moving; if he throws a ball up in the air, it will go straight up and down, just as if he were standing still. From the perspective of Lily, standing on earth, the ball is already moving with the spaceship, and keeps its forward momentum when James throws it up in the air. James' view that the spaceship is standing still is just as valid as Lily's view that the planet is standing still. After all, from the perspective of a third observer, it's the sun which is standing still and both, the planet and the spaceship are moving around it. From the perspective of a fourth observer, the sun is moving at a great speed through the Galaxy, along with the planet and the spaceship.



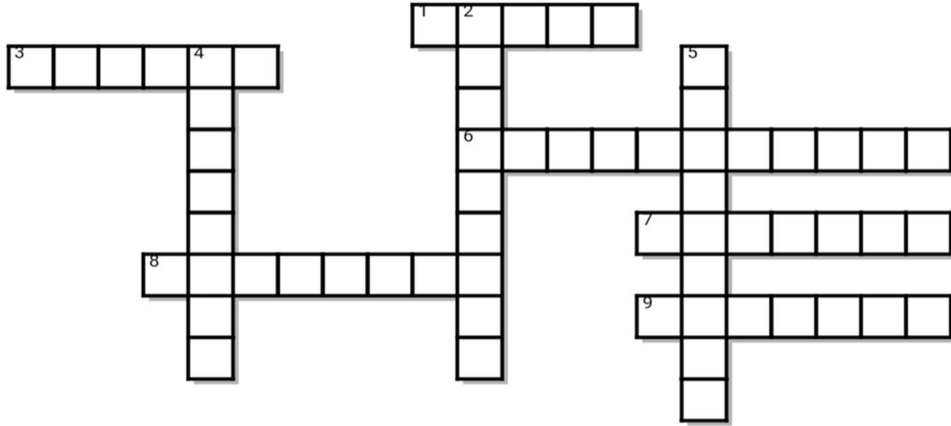
The second principle that determines the Theory of Relativity is: the speed of light is the same for all observers. If we consider a hypothetical situation in which a mirror moves perpendicularly below the spaceship on the surface of earth, and James fires a laser at the ground that bounces off the mirror and returns to his spaceship. He calculates the time taken by the laser for its round trip. From his perspective, the laser light goes straight up and down. Lily, standing on earth, observes it to follow a V-shaped path, which is longer than the straight up and down path. Since the speed of light is the same for all observers, from Lily's perspective, it takes a longer time for the laser light to return to the spaceship. When she, however, looks at James' clock, she sees that less time has passed between when he fired the laser and when he received the reflected light back. This means that Lily will see James' clock running slower than her own clock. The closer that a spaceship approaches the speed of light, the slower the time inside the spaceship will flow. If the speed of the spaceship were equal to the speed of light, then time inside the spaceship would stop altogether. The closer a spaceship approaches the speed of light, the shorter it becomes. Now, to James, the length of the universe passes in a few seconds because it has shrunk to almost zero. The age-old equation that has dominated most of our school lives, $E=mc^2$, implies that since the speed of light is constant, as an object moves with more energy, its mass increases. This is precisely why nothing can travel faster than light. Since light must be the same speed for all observers, even though it is affected by gravity, gravity must also affect the rate at which time flows. If James travels in his spaceship with the speed of light, time will flow extremely



slowly for him. When he returns, only a few minutes will have passed for him, but many years will have passed for Lily. I'm sure you're reminded of the movie *Interstellar* here. The most practical example I can think of here, is that of the GPS system. It is based on the fact that the clock in your car runs slower than the clock onboard the satellite sending signals to it. A lot of scientists do not regard space and time as separate entities; they consider space-time to be interwoven. Imagine a heavy steel ball placed on a trampoline. Comparing the space-time with a mammoth trampoline and a planet or any celestial body with the heavy steel ball, we can say that the curvature produced in the trampoline is a result of gravity. In the case of a black hole, this curvature becomes infinite. When you Google 'black hole', the search results describe it as "a region of space having a gravitational field so intense that no matter or radiation can escape". Owing to the fact that even light can't escape a black hole, near a black hole, time stops altogether. If you were to hop into a spaceship, put yourself into an orbit around a black hole, maybe for an hour that might seem drab at the moment, but when you return to your base on our planet, they tell you six years have passed! So, in essence, you've time travelled. It's kind of the boring, not very sexy, forward time travel, but it sure is. The coolest kind of fiction we've often stumbled upon when it comes to time travel is the one that involves travelling backward in time; taking revenge on someone who betrayed you in love, altering the past to avoid some mistake, and so on. A major issue that crushes all the popular imagination is that of cause-and-effect, which can be encompassed in the Grandfather paradox. If you're haunted by the fact that your grandfather left all his



Time travel



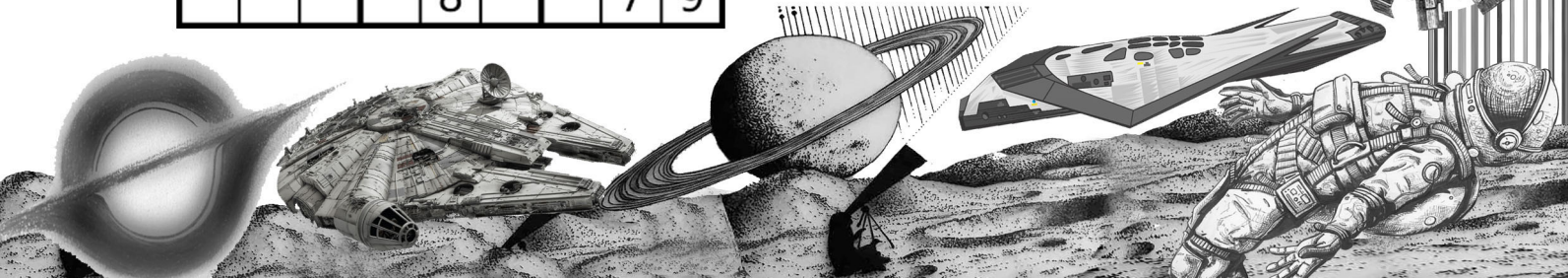
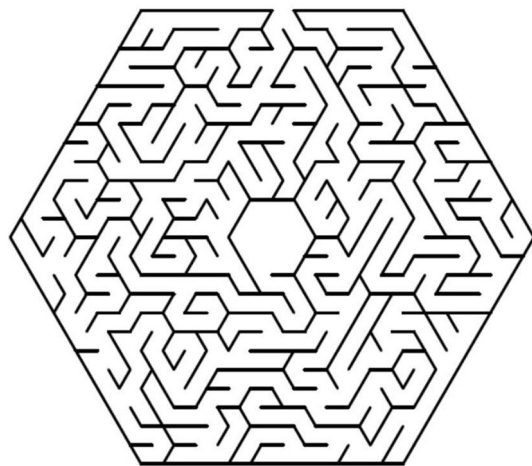
ACROSS

- 3 Point directly above your head in the night sky.
- 6 Concept developed by US chrononaut Andrew D. Basiago to describe the type of Mandela effect that seems to arise from the percipient of the effect detecting information that has permeated his timeline from an adjacent timeline
- 7 the leading explanation about how the universe began
- 8 A "handle" in the topology of space, connecting two widely separated locations in our Universe.
- 9 The branch of mechanics that governs the realm of the small (atoms, molecules, electrons, protons), and that also underlies the realm of the large, but rarely show themselves there.

DOWN

- 4 is a region of the globe that observes a uniform standard time for legal, commercial, and social purposes.
- 5 a continuous extent, series, or whole.

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ANSWERS

Wormhole/A "handle" in the topology of space, connecting two widely separated locations in our Universe.

Quantum/The branch of mechanics that governs the realm of the small (atoms, molecules, electrons, protons), and that also underlies the realm of the large, but rarely show themselves there.

Continuum/a continuous extent, series, or whole.

LightYear/

The distance which a ray of light would travel in one year. This is about 6,000,000,000,000 (6 trillion) miles.

Zenith/Point directly above your head in the night sky.

Bigbang/the leading explanation about how the universe began

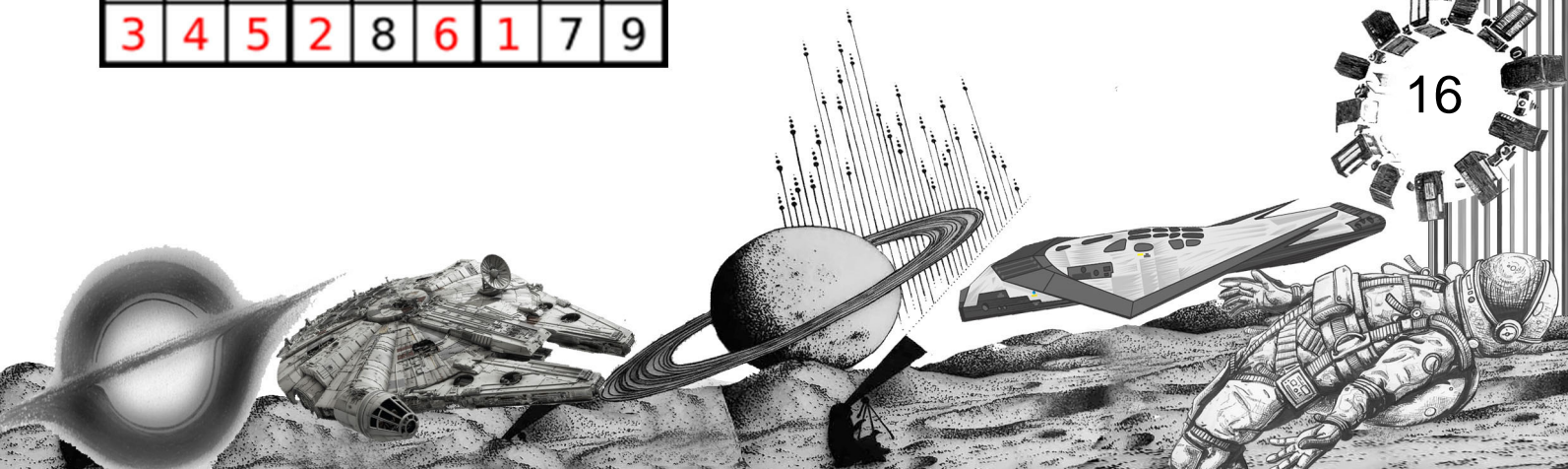
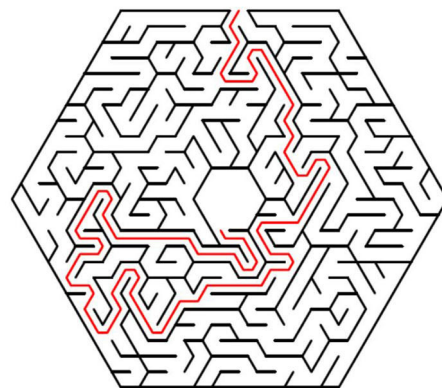
Alien/

Extraterrestrial life, life which does not originate from Earth

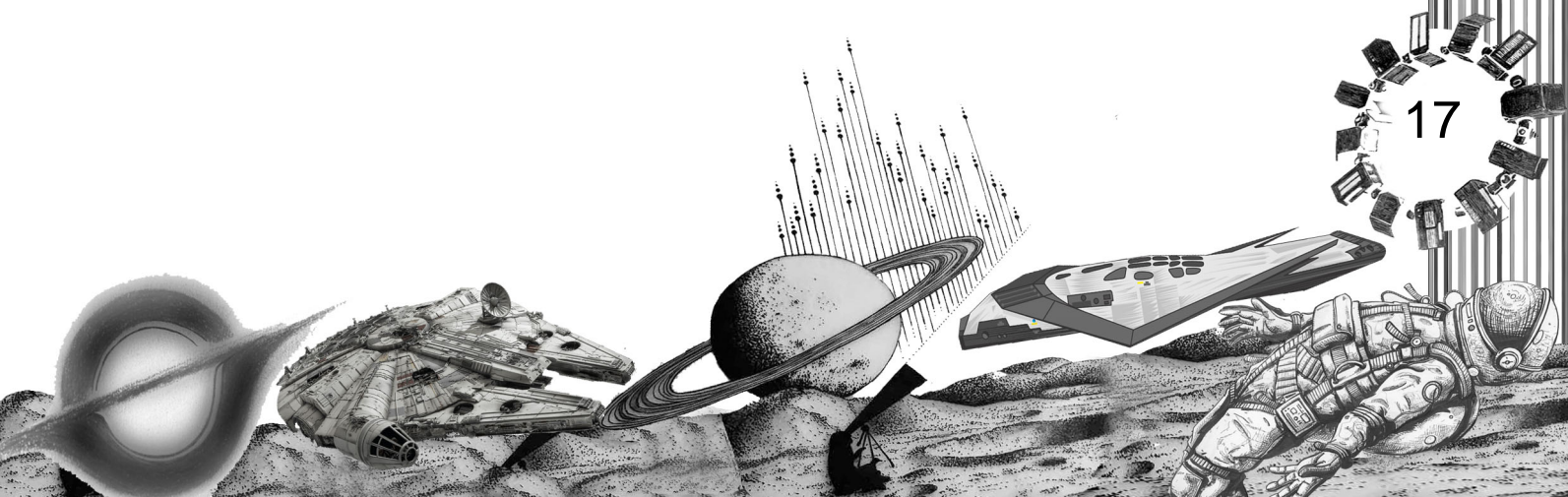
Hockenberry/Concept developed by US chrononaut Andrew D. Basiago to describe the type of Mandela effect that seems to arise from the percipient of the effect detecting information that has permeated his timeline from an adjacent timeline

Timezone/is a region of the globe that observes a uniform standard time for legal, commercial, and social purposes.

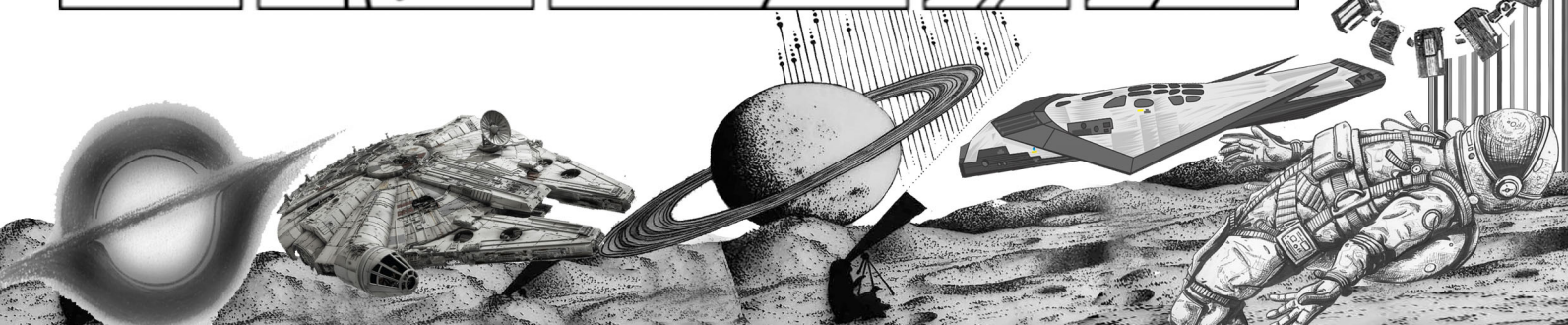
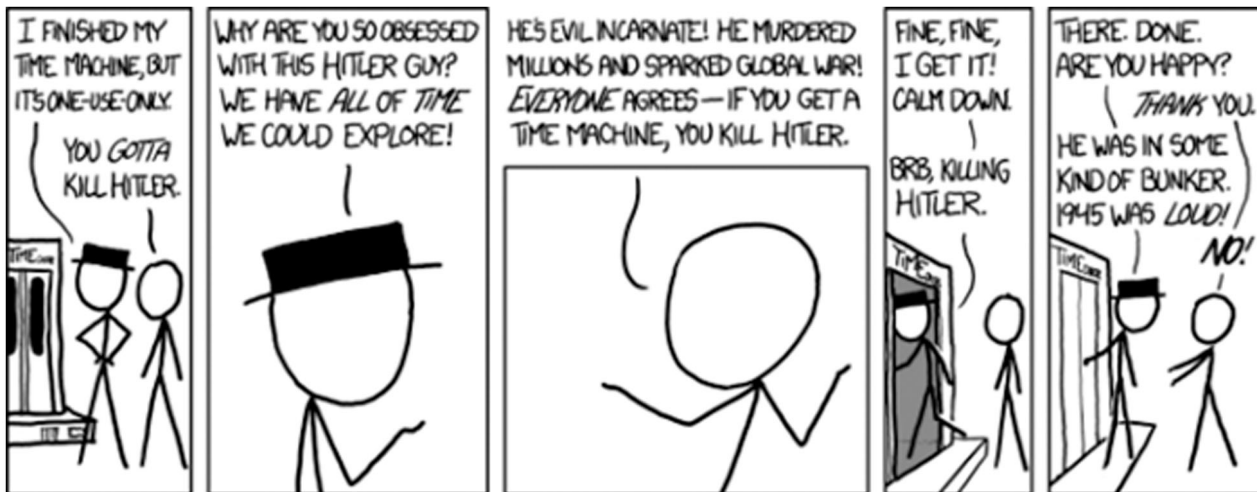
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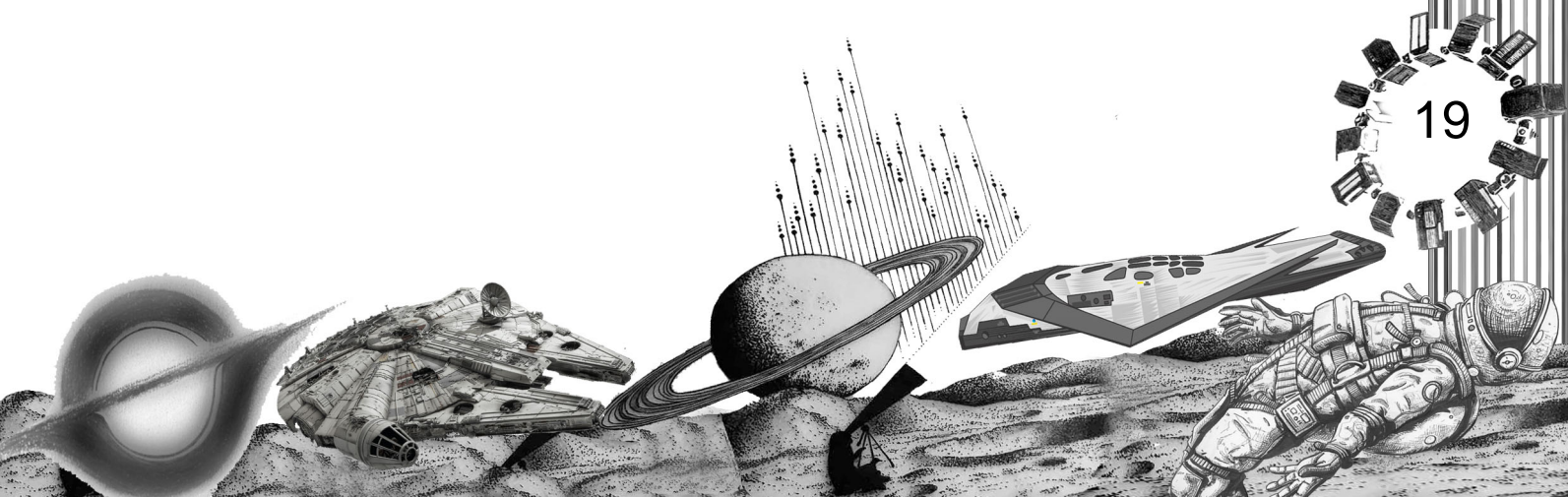
fortune in the name of your uncle's son, you decide to go back into the past and assassinate your grandfather. But then, if your grandfather dies, your father won't be born, you won't be born. If you aren't born, how did you go back in time? A way out of this paradox is to believe that physics won't allow the affecting event to occur. For instance, even if you pull the trigger while shooting your grandfather, the gun will simply malfunction. Alfred Bester's *The Men Who Murdered Mohammed* gives an intriguing outlook on the Grandfather paradox. Although it's entirely sci-fi, believing that everyone has an independent timeline, with their own past and future, exclusive of the others, is pretty cool. He describes each of us as being the strands of spaghetti in the same pot. No time traveller can ever meet another time traveller in the past or future; each of us must travel up and down our own strand alone. The moment you attempt to alter the past, by say, murdering someone, you become the spaghetti sauce; you can visit any strand you like, because you've destroyed yourself, ceased to exist. You've committed "chronicide". From all the knowledge, we've gained from sci-fi movies and books, we've learned that things can fall into a black hole, but never come out. Another crazy physicist, Leonard Susskind showed that the information of what goes into the black hole is not "lost"; it's rather "smeared" onto the surface of what is called as the Event Horizon. If you're a hard-core gamer, the first thing that'll hit your mind here is, can we compare the black hole to a "Quantum DVD"?



”? By that logic, if we were to construct a massive DVD player that can scan Quantum DVDs, we could hit replay and see the past of absolutely everything that ever entered the black hole. The question, however, is whether it’s really possible to construct such a Quantum DVD player. There’s a plethora of scientific possibilities of time travel, apart from travelling at the speed of light and scanning black holes. One such possibility is a worm hole; it connects two points in the space through a higher dimension. This means, that if an object enters one end of a worm hole, it is transferred to the other end opening at another portion of the universe, almost instantaneously. The two ends of the worm hole might be separated by trillions and trillions of miles. This is what Cooper explains with the help of a piece of paper and pencil in the movie *Interstellar*. Another possibility is a cosmic string; a hypothetical one dimensional defect left over from the formation of the universe. When two such cosmic strings cross paths at very high speeds, a spaceship can take a very precise path and be directed to another string, thereby permitting time travel. Out of the many theories on time travel, one of my favorite is the Multiverse Theory. It states that our universe is not the only one, there are many such parallel universes. Every single outcome of an event occurs at each parallel universe.



This also provides a possible explanation for the Grandfather paradox mentioned above. For instance, when you go back into the past to kill your grandfather, you might simply be transported to a parallel universe, leaving the grandfather of the current universe untouched. If we were to believe the above possibilities, and if Time Travel were actually made possible, the question is, whether it is ethical. Jumping into the future and foreseeing a tsunami or an epidemic will help us save millions of lives; crawling back into the past and killing Hitler will save the lives of all the innocent Jews killed by him. While all this seems alluring, are we ready for the Evil sneaking through the hole in the wall with millions of malicious plans cooking up in his head! It would, on the other hand, be too naïve of us, to disregard the possibility of “the century of time travel”. In an era of exponential scientific development, we might not be too many decades away from the media drooling over the first Time Machine in mankind’s history, a Quantum knife to slice the Time Melon. Are we predestined for chaos?

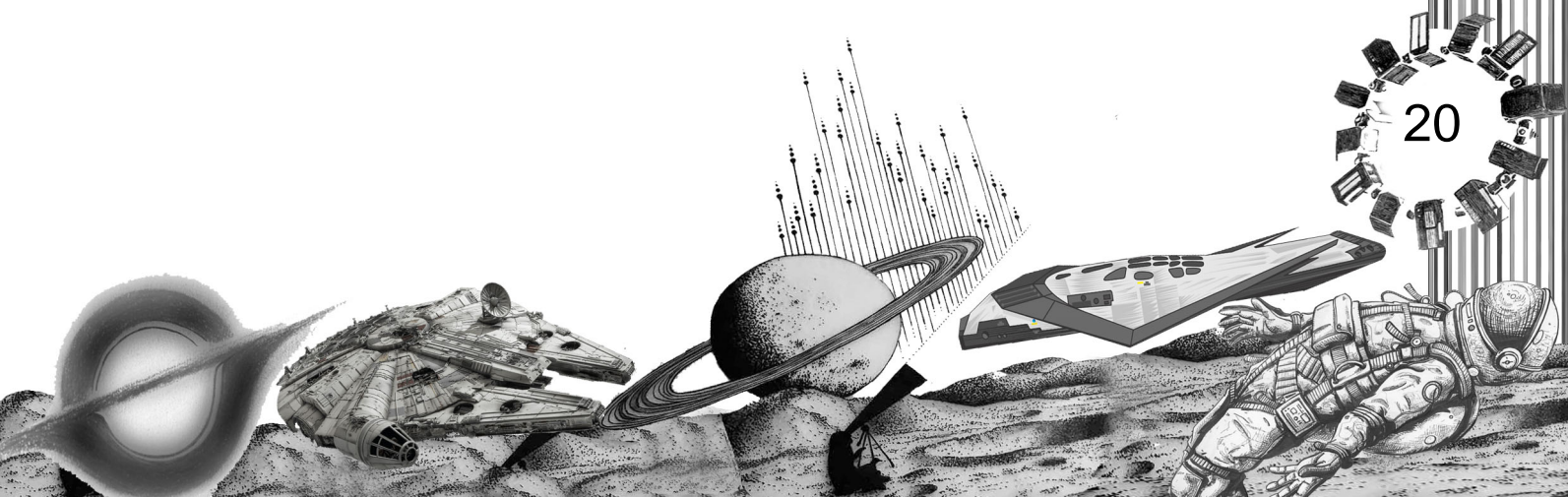


Intricacies of Travel into the Future

Sagar Brijwani (D19A)
BE Second Prize Winner

When people talk about “The next Big Thing,” they’re never thinking big enough. It’s not a lack of imagination; it’s a lack of observation. I’ve believed that the future is always within sight, and you don’t need to imagine what’s already there. Travelling forwards in time is surprisingly easy. Einstein’s special theory of relativity, developed in 1905, shows that time passes at different rates for people who are moving relative to one another - although the effect only becomes large when you get close to the speed of light.

If one were to leave Earth in a spacecraft travelling at an appreciable fraction of light speed, turn around and come back, only a few years might have passed on board but many years could have gone by on Earth. This is known as the Twin’s Paradox since a traveler undertaking such a journey would return to find herself much younger than her twin. There’s only



Intricacies of Travel into the Future

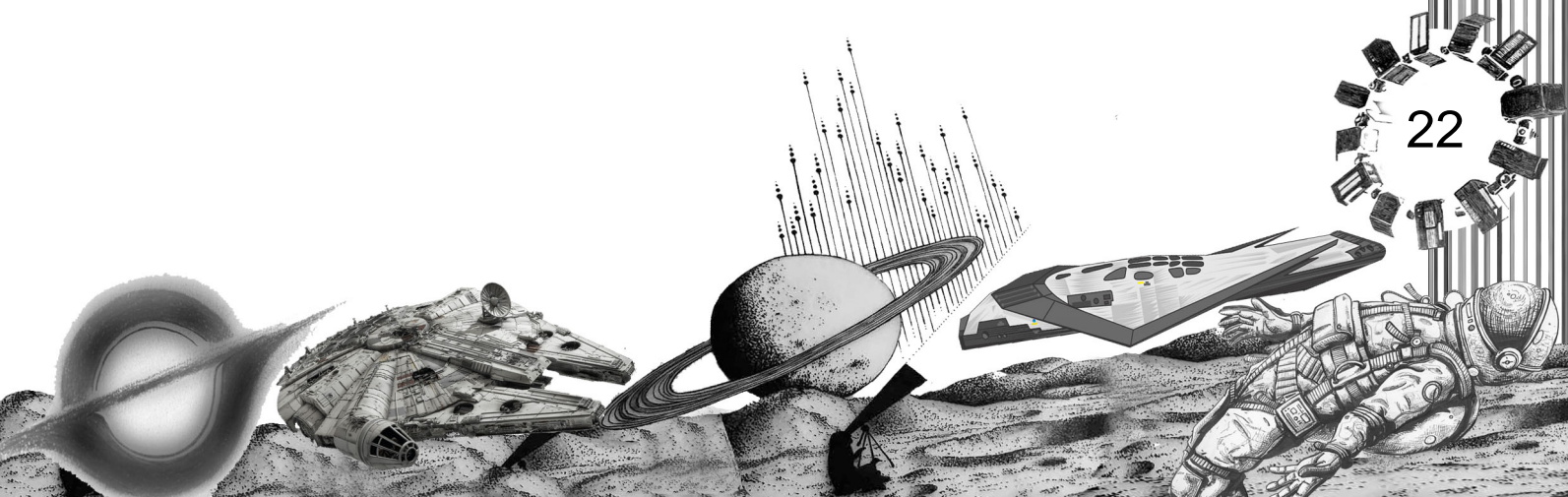
Sagar Brijwani (D19A)
BE Second Prize Winner

one problem from anyone wishing to get a glimpse of the future — getting back. It would mean travelling faster than light — and that's not possible.

There are various ways in which a person could "travel into the future" in a limited sense: the person could set things up so that in a small amount of their own subjective time, a large amount of subjective time has passed for other people on Earth. For example, an observer might take a trip away from the Earth and back at relativistic velocities, with the trip only lasting a few years according to the observer's own clocks, and return to find that thousands of years had passed on Earth. According to relativity, there would be no objective answer to the question of how much time "really" passed during the trip; it would be equally valid to say that the trip had lasted only a few years or that the trip had lasted thousands of years, depending on the choice of reference frame. This form of "travel into the future" has been demonstrated at very small time scales, and applies to any time scale. It can be applied using velocity-based time dilation under the theory of special relativity, for instance by traveling at almost the speed of light to a distant star, then slowing down, turning around, and traveling at almost the speed of light back to Earth as discussed in the twin paradox. It can also be applied using gravitational time dilation under the theory of general relativity, for instance by residing inside of a hollow massive and dense object, or residing just outside the event horizon of a black hole, or residing sufficiently near an object whose mass and density causes sufficient gravitational time dilation near it. It is believed that if this thing happens it would be a great revolutionary change in the life of a dreamer.



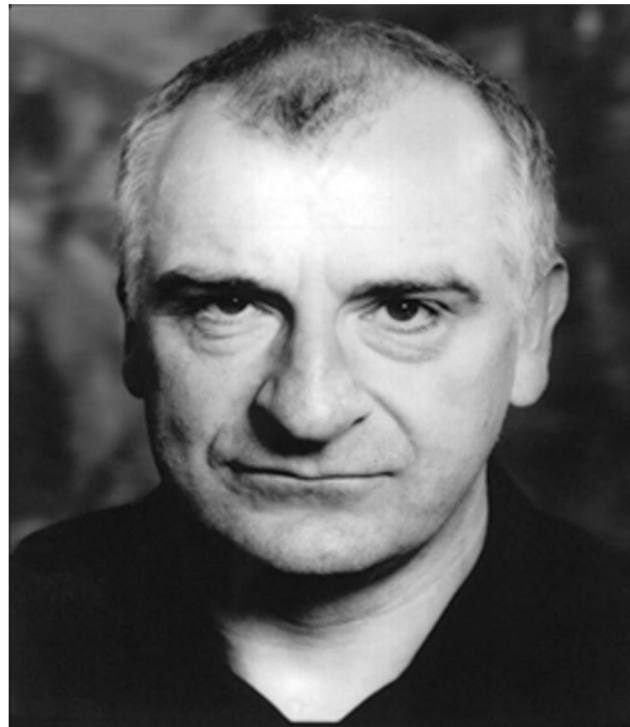
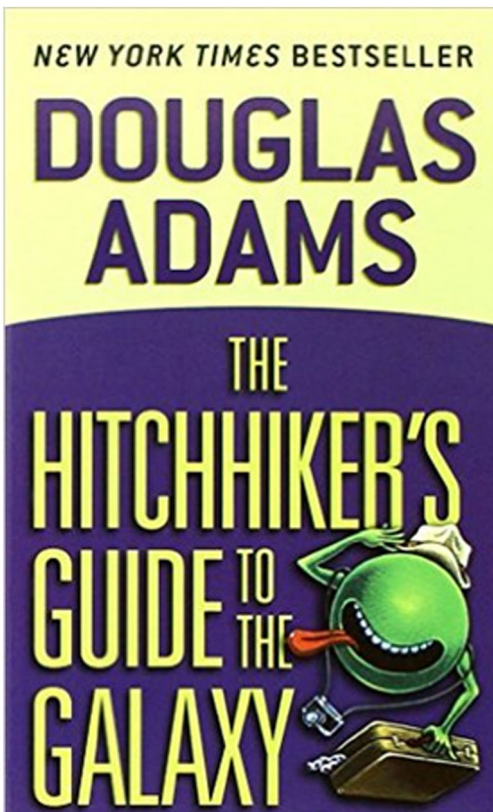
The dream of hurling through the space time-continuum is probably as old as the human imagination. H.G. Wells published his masterpiece, 'The Time Machine' in 1895, which led to many so-called mad-scientists trying to build time machines in their basements. H.G. Wells himself didn't believe in the possibility of time travel, calling it a "scientific romance". Little did he know that in just 10 years, Albert Einstein would put forth his theory of special relativity and prove once and for all that time travel is possible, at least theoretically. Time travel, as envisioned by Einstein, is best illustrated by the story of the twins. One twin stays home while the other makes a round-trip voyage into outer space, traveling at nearly the speed of light for 10 years, as measured by the stay at home twin. When the travelling twin returns, she finds her sister has aged 10 years, while she has hardly aged at all. In all intents and purposes, the twin has travelled 10 years into the future. This is the "time-dilation" effect of special relativity, and although it is most noticeable when velocities approaching that of light are involved, it is happening around us all the time. As we move relative to each other we are—all of us—traveling into the future at different rates. The differences in these rates are very small, sure, but they are real. We are all time travellers. Although travelling to the future is relatively simpler to comprehend, traveling to the past, or returning back from a trip to the future, is a somewhat more challenging proposition. Stephen Hawking, for one, suspected that by some as-yet-undiscovered mechanism, nature prohibited traveling back in time. One sticking point was the "Grandfather Paradox": If I travelled back in time and killed my grandfather, I could



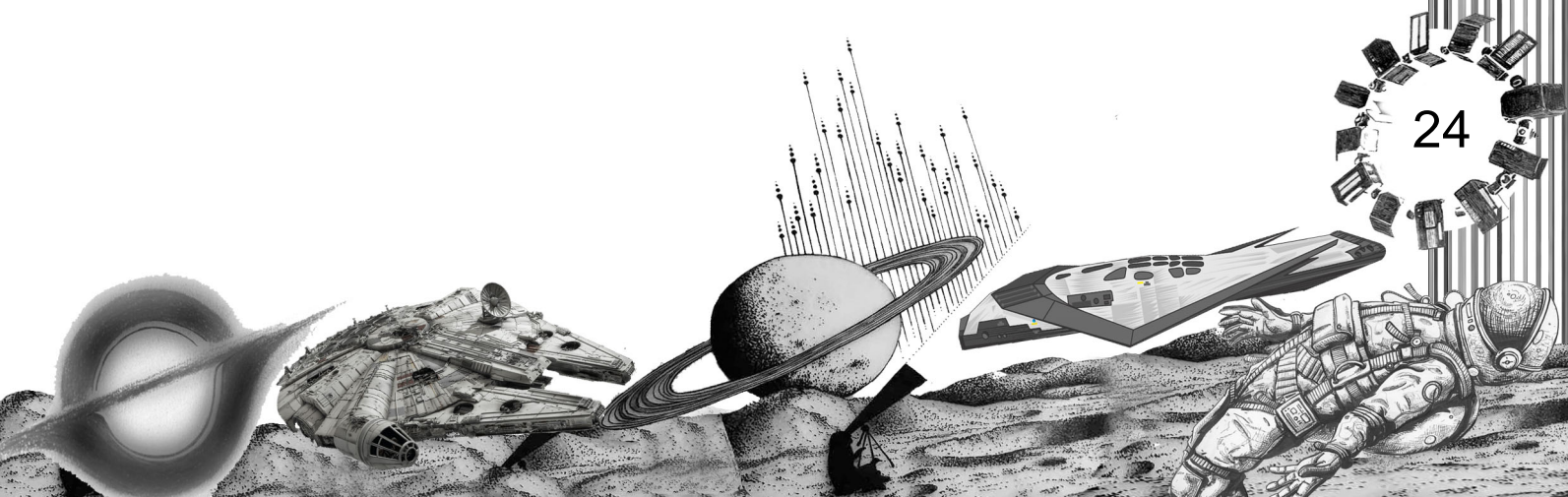
Time, the Universe and Everything

Ajit Krishnamoorthy (D14A)
TE First Prize Winner

not have been born. But if I have not been born, I cannot live to travel back and kill my grandfather. The Russian-born physicist Igor Novikov, an avid investigator into the subject of time travel, has suggested that the paradox doesn't apply because space-time is probably self-consistent. That is, I may be able to travel back in time and somehow become interwoven into a past of which I was already a part, but I will not be able to kill my grandfather, quite simply because I have not killed him already. According to the incredibly gifted writer and comic-philosopher Douglas Adams, encountering such paradoxical situations in time travel is only part of the problem, as is evident from this passage from his book 'The Hitchhiker's Guide to the Galaxy' — "One of the major problems encountered in time travel is not that of



becoming your own father or mother. There is no problem in becoming your own father or mother that a broad-minded and well-adjusted family can't cope with. There is no problem with changing the course of history—the course of history does not change because it all fits together like a jigsaw. All the important changes have happened before the things they were supposed to change and it all sorts itself out in the end. The major problem is simply one of grammar, and the main work to consult in this matter is Dr. Dan Streetmentioner's *Time Traveller's Handbook of 1001 Tense Formations*. It will tell you, for instance, how to describe something that was about to happen to you in the past before you avoided it by time-jumping forward two days in order to avoid it. The event will be described differently according to whether you are talking about it from the standpoint of your own natural time, from a time in the further future, or a time in the further past and is further complicated by the possibility of conducting conversations while you are actually traveling from one time to another with the intention of becoming your own mother or father. Most readers get as far as the Future Semiconditionally Modified Subinverted Plagal Past Subjunctive Intentional before giving up; and in fact, in later editions of the book all pages beyond this point have been left blank to save on printing costs. *The Hitchhiker's Guide to the Galaxy* skips lightly over this tangle of academic abstraction, pausing only to note that the term "Future Perfect" has been abandoned since it was discovered not to be." Metaphysical and philosophical questions aside, exactly how realistic is the physics of backward time travel?



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We only have a vague idea of the inner workings of the physics that control these concepts and we will not have a real understanding until we have developed a full theory of quantum gravity. The so-called “Theory of Everything”, the holy grail of contemporary theoretical physics, aims to bridge the gap between relativity (which explains nature on very large scales, where gravity becomes important) and quantum mechanics (which explains nature on very small scales, where quantum effects become important).

In the recent years, interest in time travel is dwindling. Sadly, no mad scientists are building time machines in their basements. A lot of physicists argue that work in less flashy areas might yield a greater intellectual profit. New Zealand physicist Matt Visser, himself the architect of a number of theoretical time machines, calls this attitude “overly cautious and boring”. He is right, as even the mere idea of time travel is anything but boring. Even if scientists and physicists all around the world work on solving the puzzles posed by time, we have no way to say for sure if practical time travel will ever come to fruition. The least we can do is console ourselves that, at the very least, we know that the answer to the ultimate question of life, the universe and everything is 42.



The Race against Time

Yogita Balani (D7B)
SE First Prize Winner

A trip to the past that can change the future?! The past cannot be changed and the future cannot be decided, we have been believing this for years. But what if you can travel in time; actually run through the space time continuum and land into the past or the future and revisit the scenes from your past or have a glance at your future? Time travel is a 'RAT' race, Race Against Time! But, can anyone actually do that? Nevertheless, this subject has been studied frequently in the recent times and is still being focused on. Researchers and scientists believe that there exists a parallel universe where travelling in time is possible. According to Einstein's theory, if one can manage to move faster than the speed of light, he can travel in time. He had stated a theory of special relativity which says that time slows down or speeds up depending on how fast you move relative to something else. For instance, a person inside a spaceship approaching the speed of light would age much slower than if the same person was at some other place on earth. Now, if a parallel universe does exist, is it not possible that for that universe there might be another parallel universe and for that second one, another one? Thus



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emanates the existence of multiverse, i.e. existence of multiple universes at the same time. And if this is true, then time travel must also be latent because then how else could have been the multiverse discovered if not by traveling into another dimension! Time travel has two aspects associated with it: the past and the future. Regarding the past, the biggest question will be, whether the events that have already taken place, the incidents that have already happened can be changed or not. It is believed that, if any previous occurrence is subjected to changes, an alternate timeline is created wherein the happenings are altogether different. This is because, one action leads to the next and everything that happens in our regular lives is a chain of actions dependent on one another. Thus, time travelling will lead to the current timeline being ruptured and the creation of a timeline where everything will happen according to the one different decision made after visiting the past. On the other hand, if there are no changes made but only one witnesses the past, the timeline remains intact. Now the question that arises is, was a particular decision made because someone travelled in time and saw something happen which led to him taking that decision in the future? This is a paradox, a question which remains unanswered. Another ambiguity arises when the argument of traveling to the past is raised. Suppose you meet a new person and that person is from the future, i.e. he has travelled to his past and now this person claims that he is your offspring and he reveals who you are going to marry but for the sake of an experiment, if you completely block any possibility of meeting that girl then how could your son who is standing in front of you, exist? There have been many quests regarding this controversy, too.

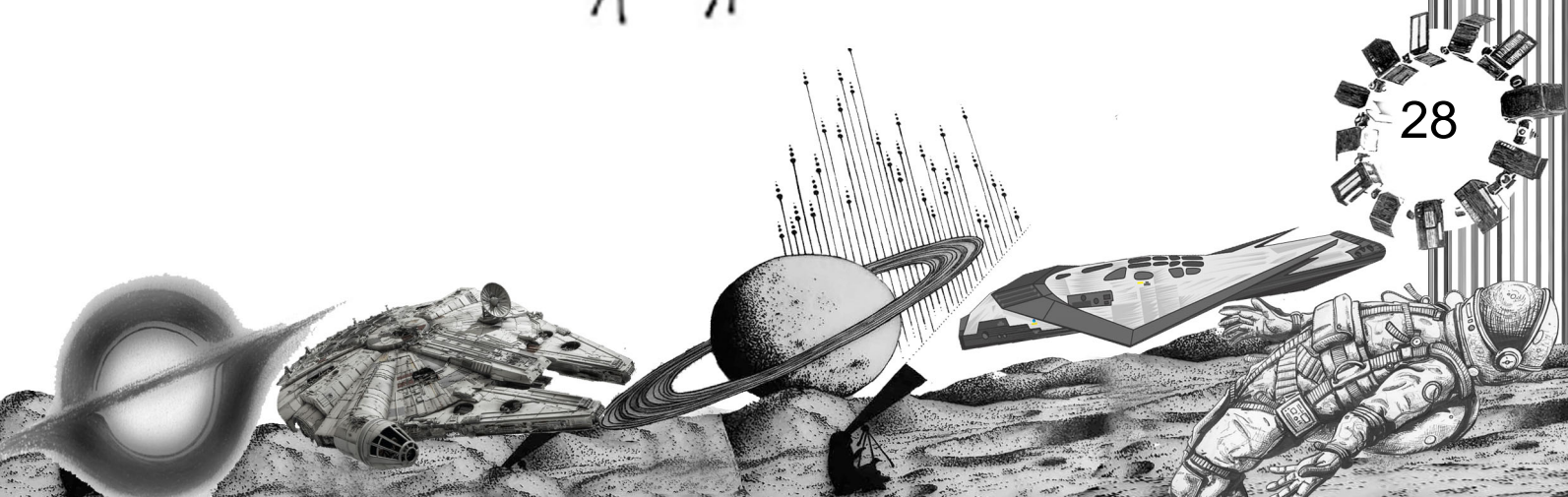


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Travelling to the future is an intriguing subject that has gained the attention of many experimenters because if that can be done, who wouldn't want to know what future stores for them? But the future has infinite possibilities because everything that is going to happen relies on whatever happens now, in this very moment, in the present. Just like with the past, every tick of the clock, every breeze of the wind/every rustle of the leaves, every wave of the ocean, every movement of the surroundings is a series of interconnected actions and consequences. And even if one action is changed, the future still remains unpredictable even if one has seen it because it still has n number of probabilities. Thus, even though there is no solid proof of the phenomenon of time travel being executed, it remains an intricate topic that has incessantly grabbed the interest of many. And how incredible would it be if we could travel to the future and find out whether time travel and the experiments associated with it are to become successful!

I AM A PARADOX.
/ NO YOU'RE NOT!
EXACTLY.
OHH...





IEEE-VE SIT