

Science in Movies Presentation

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Introduction: *Interstellar* Background

- ★ Written by Jonathan Nolan; Co-written and Directed by Christopher Nolan
- ★ Setting: Earth
 - distant future (40-70 years after the movies release year of 2014)



Introduction: *Interstellar* Background

- ★ Earth's crop supply is ravaged by a mysterious plant virus known as, blight, causing global starvation
- ★ Corn and okra: only crops sustaining humanity, however, both could go extinct soon
- ★ Droughts and dry/desert land cause Dust Bowl like disasters



Introduction: *Interstellar* Background

- ★ Main Characters: Cooper & Murph
- ★ Father of Murph & NASA engineer/pilot
- ★ Forced out of occupation like many others to become a farmer in order to sustain humanity.



Plot

- ★ A series of supernatural occurrences in Murph's bedroom leads Cooper to discover a dust trail displaying binary coordinates directing them to a specific location
- ★ Cooper and Murph arrive at an unknown and unmarked facility.



Plot cont.

- ★ Upon arriving to the unknown facility, Cooper is greeted by his former professor, Prof. Brand.
- ★ Brand details Cooper about the presence of a wormhole, which leads to an alternate galaxy, and a possible solution to preventing humanity's extinction



Plot cont.

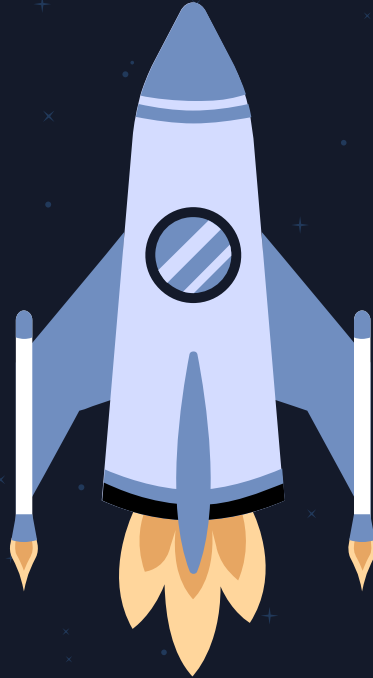
- ★ Prof. Brand explains that the crew of the Lazarus Mission set out over tens years ago, ventured into the wormhole, and documented three promising/habitable planets
- ★ Brand wants to recruit Cooper as the main pilot of the *Endurance* space station with the crew consisting of Brand's daughter, Amelia, Doyle, and Romilly.



Plan A/B

Plan A

- ★ Construct a launchable space station on the ground containing most of the human population and pushing it through the wormhole into a new galactic home
- ★ Provide Professor Brand with enough time to complete his gravity equation, allowing for the launch



Plan B

- ★ Find a habitable planet from one of the three Lazarus' crew members and start a colony with the 5,000 frozen fertilized egg



Plot cont.

- ★ Cooper makes the difficult decision to take on the mission
- ★ Murph barricades her bedroom door, as she is visibly upset with her father's decision and him abandoning her.
- ★ Murph and her father don't leave on good terms



Plot cont.

- ★ Cooper and his crew safely lift off and dock on the *Endurance*
- ★ The crew collectively take a 2-year long hypersleep in order to sleep away the time required to reach Saturn and the wormhole.
- ★ When they awake the crew enters the wormhole and decides to visit Miller's planet. One of the habitable planets found by the Lazarus crew, Miller, Mann, and Edmund



Plot cont.

- ★ The crew realizes that Miller's planet resides extraordinarily close to the black hole Gargantua, exerting a tremendous gravitational pull on it.
- ★ The immense gravity distorts the passage of time relative that on Earth.
- ★ 1 hour on Miller's Planet = 7 years on Earth



Plot cont.

- ★ Cooper devises a plan to quickly retrieve Miller's data without the distortion of time being too severe
- ★ However, upon descending down, the crew is faced with a planet that is completely engulfed in water, with periodic tidal waves over 4,000 feet crashing onto the surface
- ★ Amelia makes it back to the Ranger safely but Doyle is swept away and perishes



Plot cont.

- ★ With the Ranger being water-logged from the tidal wave, Cooper and Amelia are forced to wait on Miller's planet
- ★ Upon arriving back to the *Endurance*, Romilly is visibly aged. He informs the both of them that they have been gone for over 23 years.



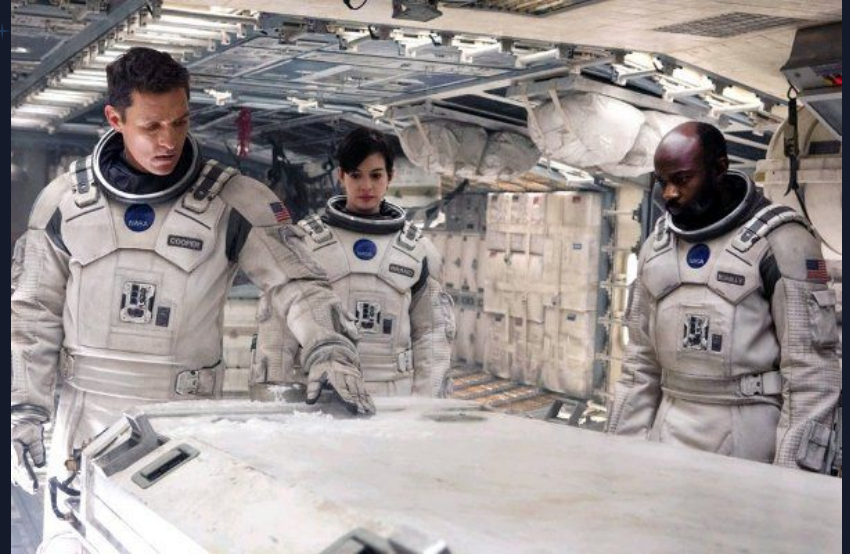
Plot cont.

- ★ In the present day, adult Murph is involved with Prof. Brand's research on the gravity equation
- ★ While on his deathbed Murph promises to Prof. Brand that she would complete his research and find a way to launch the space station.
- ★ However, with his dying breath Brand apologizes for lying to Murph about Plan A's proposal. The equation was solved decades ago and the conclusion was that humanity was doomed from the start.



Plot cont.

- ★ Back on board the *Endurance* the crew take a vote to decide their two choices of action: visit either Dr. Mann's or Edmund's Planet
- ★ Cooper explains that Dr. Mann's Planet is the better course of action because his signal is still pinging, indicating a very likely chance that he is still alive
- ★ Amelia is dissatisfied with being outvoted in favor of visiting Dr. Mann's Planet



Plot cont.

- ★ Upon arriving to Mann's Planet the crew wake up Mann from his hypersleep. He details the environment and it's habitable conditions, to the crew's pleasant surprise
- ★ However, Mann confirms to the crew that Prof. Brand never intended for Plan A to work.
- ★ Additionally, Mann betrays the crew by lying to them about the habitable conditions of the planet. He let his signal continuously ping so that he could be rescued



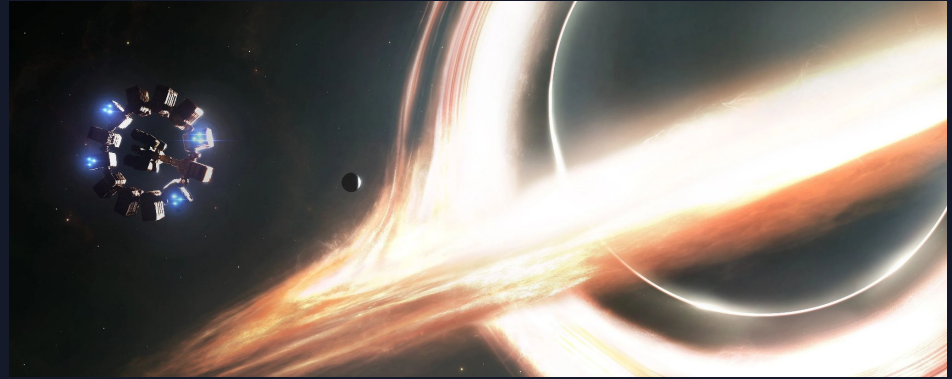
Plot cont.

- ★ Romilly is killed in an explosion that Mann set up to cover his actions
- ★ Mann boards a Ranger but unsuccessfully docks the spacecraft causing a massive explosion on the *Endurance*
- ★ After stabilizing the *Endurance* Cooper and Amelia decide to utilize the Gargantua's gravitational pull to slingshot themselves on course to Edmund's Planet



Plot cont.

- ★ Unbeknownst to Amelia, Cooper planned on venturing inside the Gargantua alongside TARS so that the adequate amount of weight could be shed, allowing Amelia to reach Edmund's Planet.



Plot cont.

- ★ Cooper and TARS enters the Gargantua and arrives at a fifth dimensional plane that is represented in the third dimension, known as the Tesseract
- ★ The Tesseract was constructed by the Bulk Beings, cosmic entities that exist outside the fourth-dimension
- ★ They created the Tesseract for humans to find the solution to humanity's extinction problem



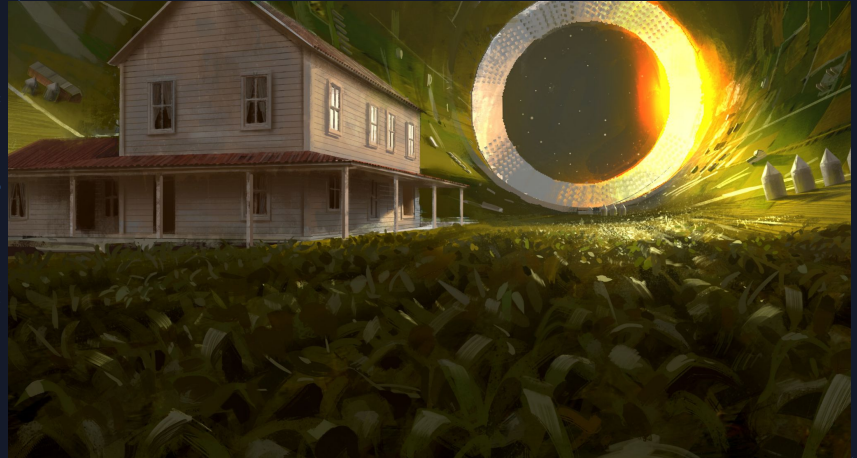
Plot cont.

- ★ TARS was able to encrypt the black hole's data into Morse Code and Cooper translated this information onto the watch that he gave to Murph 23 years ago
- ★ With the black hole data transmitted, the Bulk Beings close the Tesseract and Cooper is transported back through the wormhole.



Plot cont.

- ★ Cooper awakes on Cooper Station, a space station orbiting Saturn named after Murph, commemorating her accomplishments at completing the equation that saved humanity
- ★ Cooper visits Murph to see that her entire lifetime has passed since his departure for the space expedition.
- ★ Murph explains that right now Cooper should be going out in search of Amelia and helping her establish a colony instead of staying with her
- ★ The last scene shows Cooper taking off on a NASA spacecraft in search of Amelia





Methods

Hypersleep Pods

- ★ Hypersleep allows astronauts who travel extensive periods of time in space to preserve vital resources
- ★ Also slows down the aging process and the prevents psychological stress from loneliness and isolation





Methods cont.

Cryonic Technology - REAL WORLD

- ★ The real world application of hypersleep is cryonics.
- ★ Cryonics: process of storing human after death so that future technology could revitalize them.
- ★ The purpose is to lower the temperature of the corpse to prevent degradation.
 - metabolism is slowed
 - Chemical mixtures (cryoprotectants) used to prevent ice formation in cells (Best, 2008).

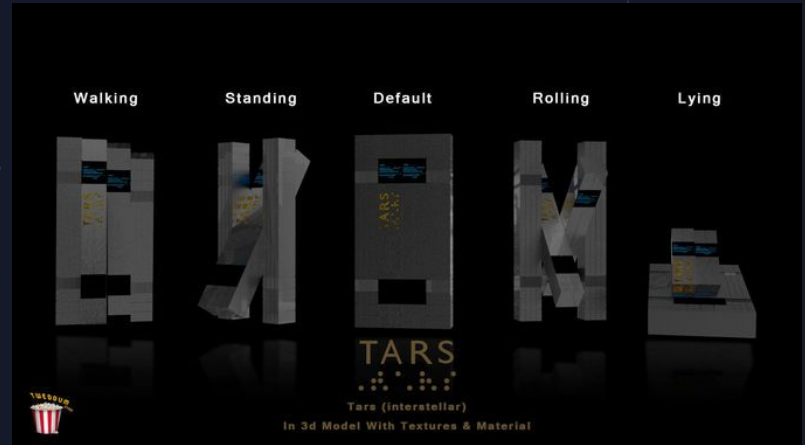




Methods cont.

Artificial Intelligence: TARS, CASE, KIPP

- ★ Robots with human-like voices that aid Cooper and his team on their expedition
- ★ Can perform calculations on command, manually control Ranger spacecrafts, and lift heavy loads
- ★ One of the crew members, Doyle, coded TARS with human personalities such as honesty and humor.





Methods cont.

Artificial Intelligence - REAL WORLD

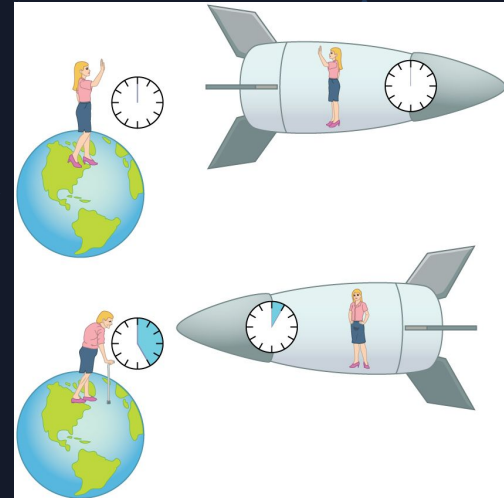
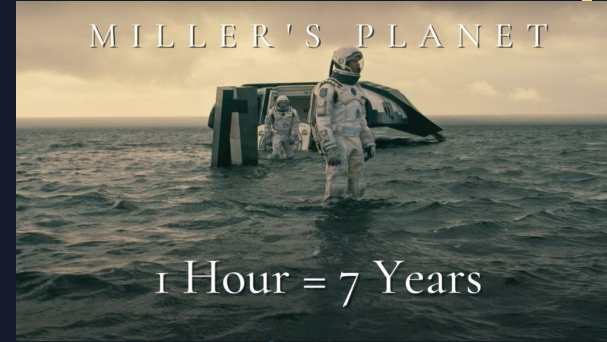
- ★ Artificial intelligence and machine learning has enabled the creation of robots with the capabilities to convey over 60 emotions
- ★ Hong-Kong Hanson Robotics: Sophia
- ★ Human emotions and AI emotions are closely intertwined
 - If AI robots convey positive human-like emotions, humans will likely reciprocate those emotions (Chuah & Yu, 2021)



Methods cont.

Time Dilation

- ★ Time is relative
- ★ Time is experienced and observed differently throughout different areas of the universe.
- ★ The basic premise of time dilation is the gravitational force, the greater the gravitational pull the slower one will experience time.
- ★ This is true in our present life, the further you get from the earth's surface the faster time moves. However, this change is so little that our human senses aren't able to pick up on it.



Results

- ★ The scientific accuracy presented in this film is reasonably high. All concepts such as time dilation and wormholes are supported by theoretical physics, however, have just not been observed in practice and are 100 percent proven.
- ★ The movie presents the fact that Miller's planet's gravitational force is around 130% of Earth's, this simply isn't even close to what is needed to create this extreme time dilation.
- ★ The film was created hand in hand with an actual renowned physicist, Kip Thorne to create different theoretical equations based on science to help develop an accurate and scientific depiction of space.



Discussion

- ★ Interstellar was created to symbolize the connection between our human connection coupled with the ever growing technological advancements we see around us. The way humanity bands together in efforts to survive.
- ★ The use of science fictions adds a element of seriousness to the overall tone of the film. It creates a world that is very similar to ours and showcases concepts that are foreign to us but are theoretically possible. This bridges a gap between something that is completely fictional and makes it into something that feels very real, which allows the viewer to empathize with it more.





Discussion

- ★ Proves the worth of our planet and the possible outcomes of the current climate crisis on Earth.
- ★ The concept of time and how it changes
 - results in a dramatic end to the movie where the main character is portrayed as younger than his daughter.





References

- ★ Best, B. P. (2008). Scientific justification of cryonics practice. *Rejuvenation Research*, 11(2), 493–503. <https://doi.org/10.1089/rej.2008.0661>
- ★ Chuah, S. H.-W., & Yu, J. (2021). The future of service: The power of emotion in human-robot interaction. *Journal of Retailing and Consumer Services*, 61, 102551. <https://doi.org/10.1016/j.jretconser.2021.102551>

Thank You!

