

# Time Travel



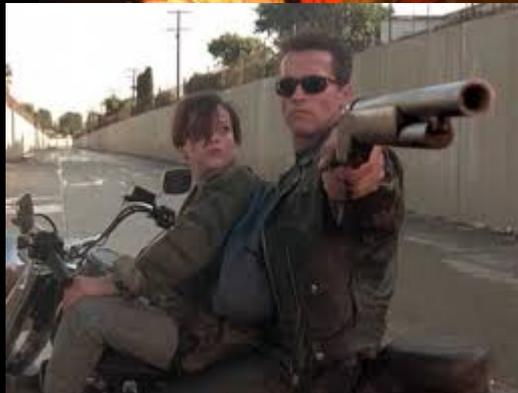
*UDLS - Jul 10 2015*

# time trav·el

*noun*

1. (in science fiction) the action of traveling through time into the past or the future.

# In Pop Culture



# In Pop Culture



**Can it be done??**

**Yes!**

We are all currently traveling forward in time!!

# Forward Time Travel

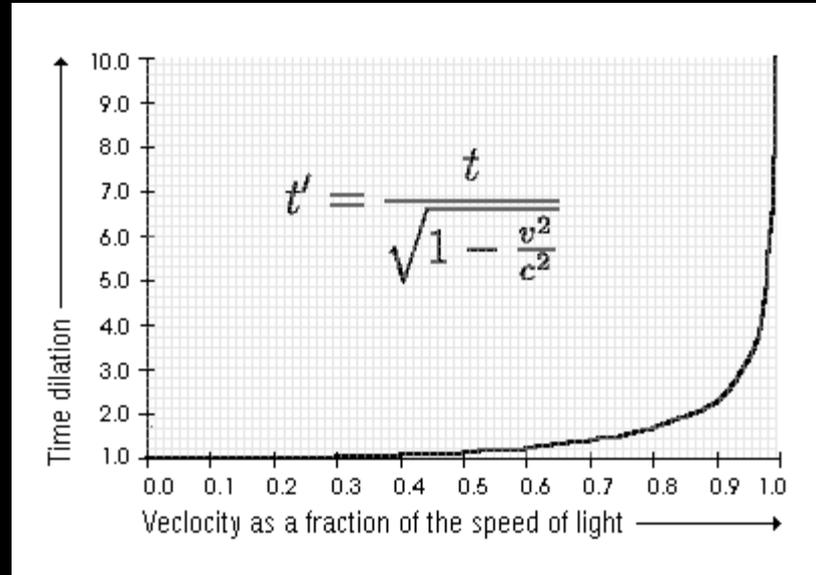
Stories from early history (Hindu, Japanese, Buddhist mythology)

- involve protagonist visiting supernatural entity; return home after 100+ years

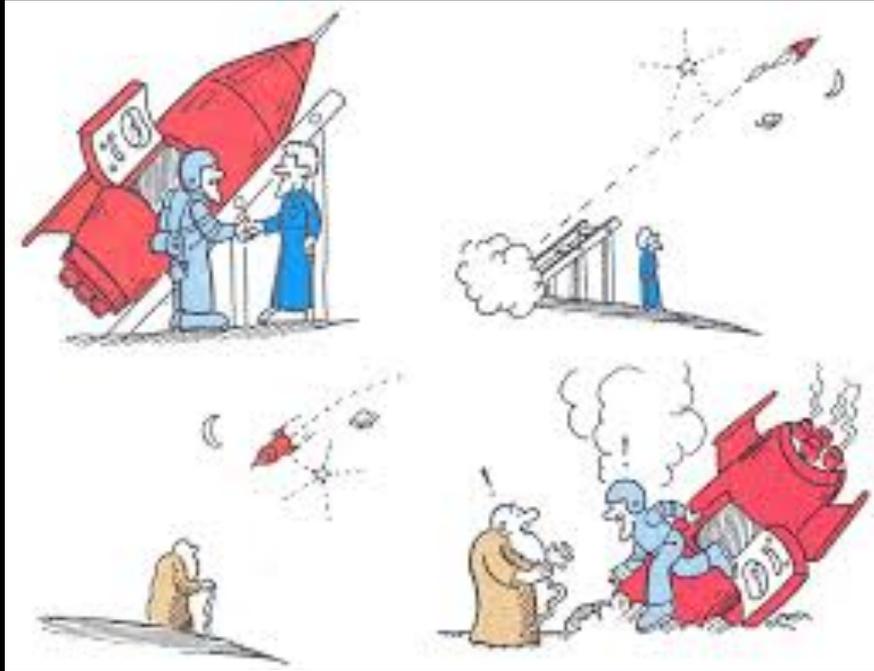
# Time Dilation

## Special Relativity

- Einstein (1905)



# Twin Paradox



Sergei Krikalev spent 803 days in space orbiting Earth; result, traveled 0.02 seconds into future

# Backward Time Travel

- modern idea
- first appears in early 18-19th C. English Lit
  - Christmas Carol?
- H.G. Wells *The Time Machine* (1895)

also time zones.

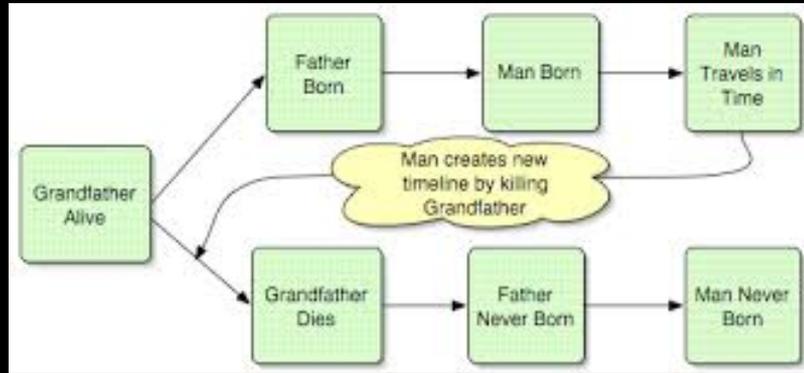
# Backward Time Travel

Impossible in the standard model; would require information propagation FTL speed

Theoretical particle: **Tachyon**

- travels faster than  $c$
- uses more energy as it slows down

# The Grandfather Paradox



# The Butterfly Effect

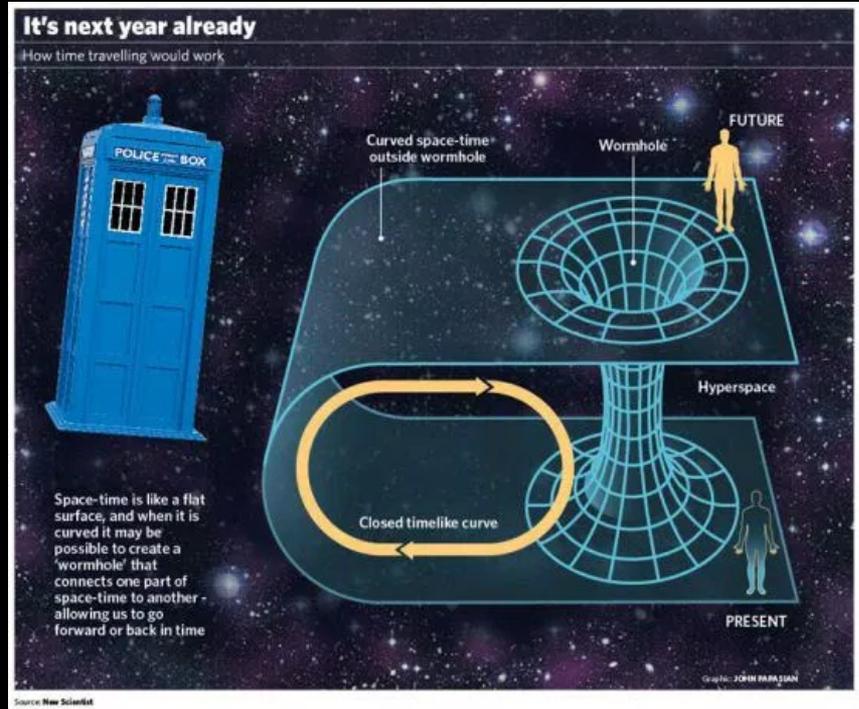
Chaos Theory

smallest change to the  
past could drastically  
alter future

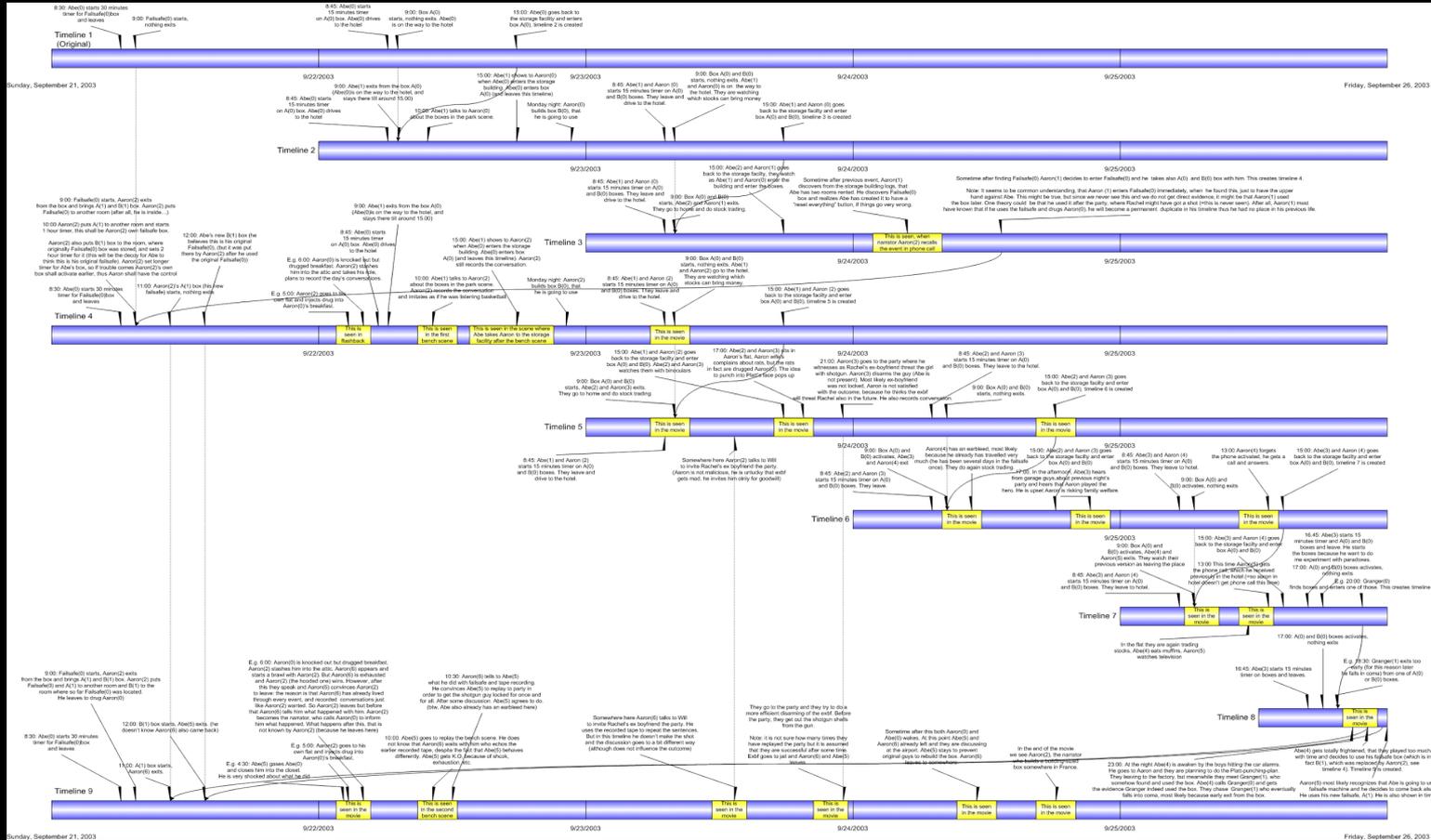


# The Einstein-Rosen Bridge

Blackholes;  
wormholes



# Timelines



Go to [is.gd/wormholes](http://is.gd/wormholes) for an article about new theories which could allow us to create stable wormholes

