time trav·el

noun

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

\[ t' = \frac{t}{\sqrt{1 - \frac{v^2}{c^2}}} \]
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 for an article about new theories which could allow us to create stable wormholes.