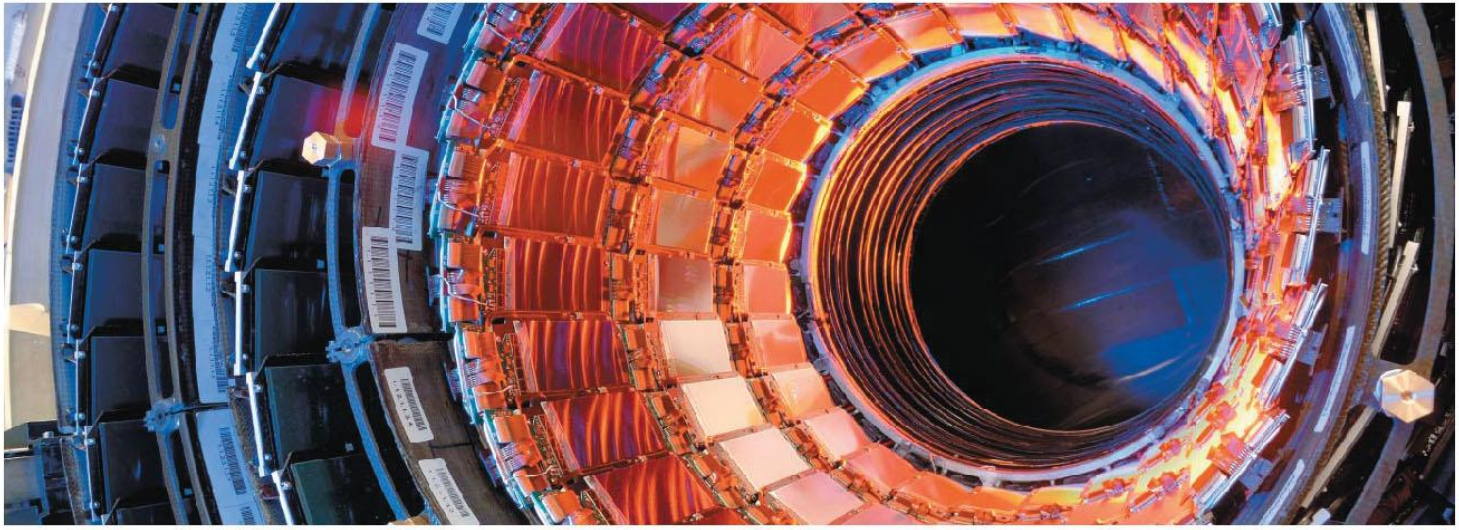
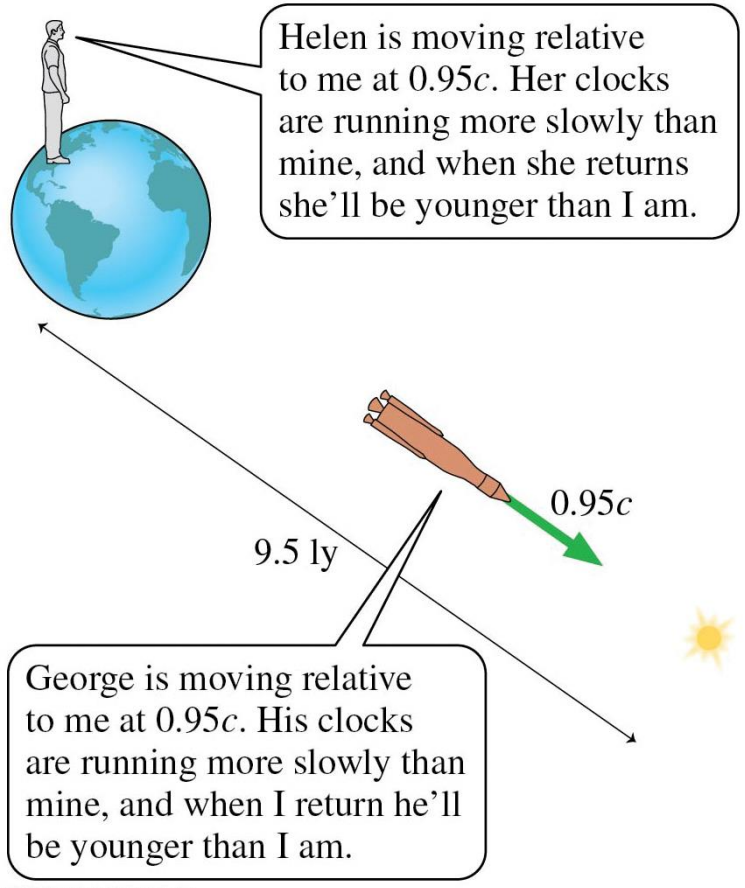
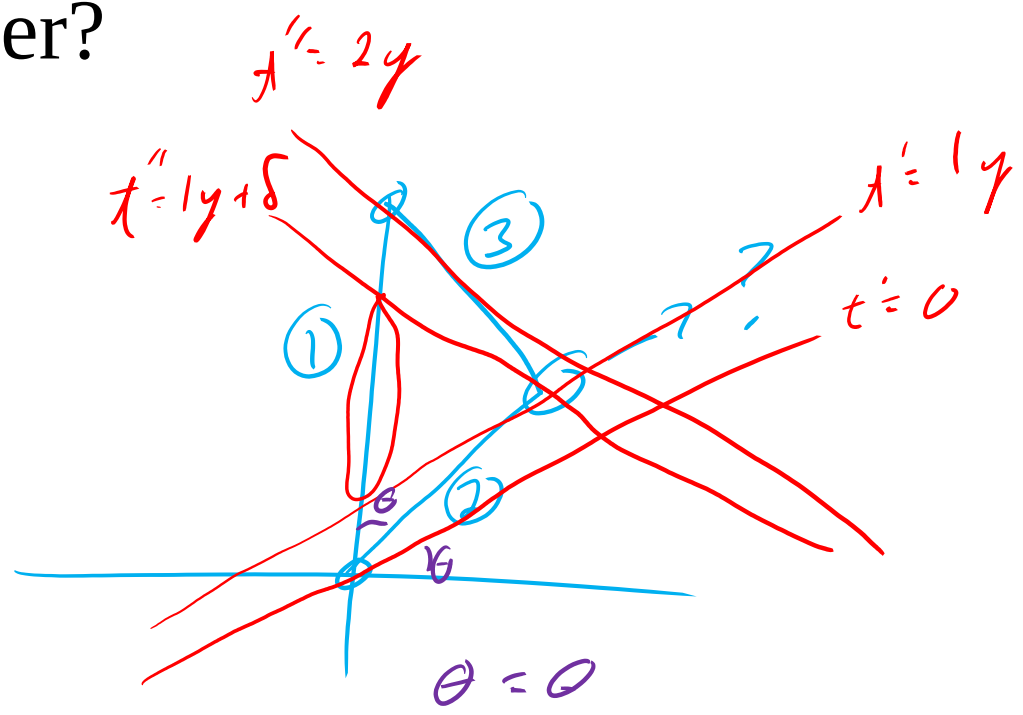
Chapter 36 – Relativity

- Reference frames, events, measurements, space-time diagrams
- Postulates of special relativity, impact on simultaneity
- Time dilation, space contraction, and Lorentz transformations
- Relativistic momentum and energy

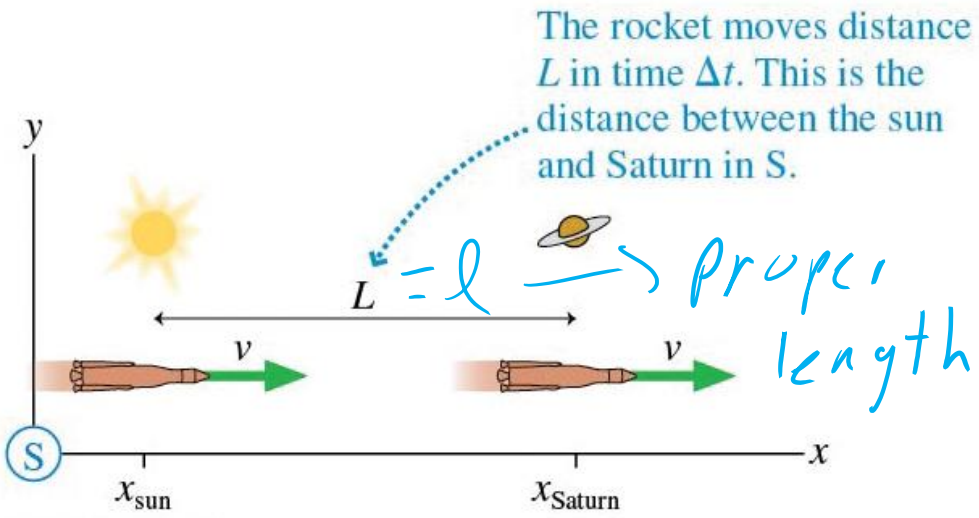


Twin Paradox: One twin gets on a rocket, flies away really fast, then comes back. When the twin returns which one is older?

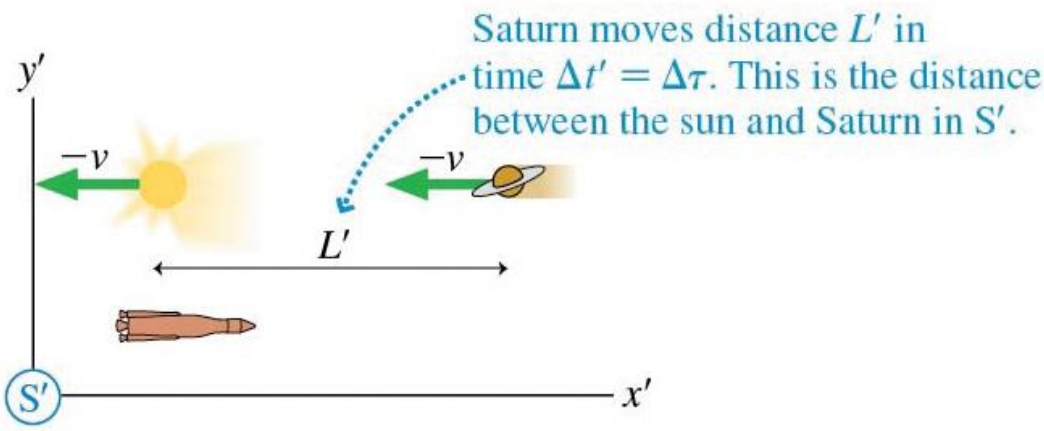




(a) Reference frame S: The solar system is stationary.



(b) Reference frame S′: The rocket is stationary.



$$\frac{L}{\Delta t} = v = \frac{L'}{\Delta t'} = \frac{L'}{\Delta\tau} = \frac{L'}{\Delta t/\gamma}$$

τ (tau (Greek)) → proper time

$v = \frac{1}{2}c$

$\beta = \frac{1}{2}$

Team Up questions

$$\gamma = \frac{1}{\sqrt{1-\beta^2}} = \frac{1}{\sqrt{1-\left(\frac{1}{2}\right)^2}} = \frac{1}{\sqrt{3/4}} = \frac{2}{\sqrt{3}}$$