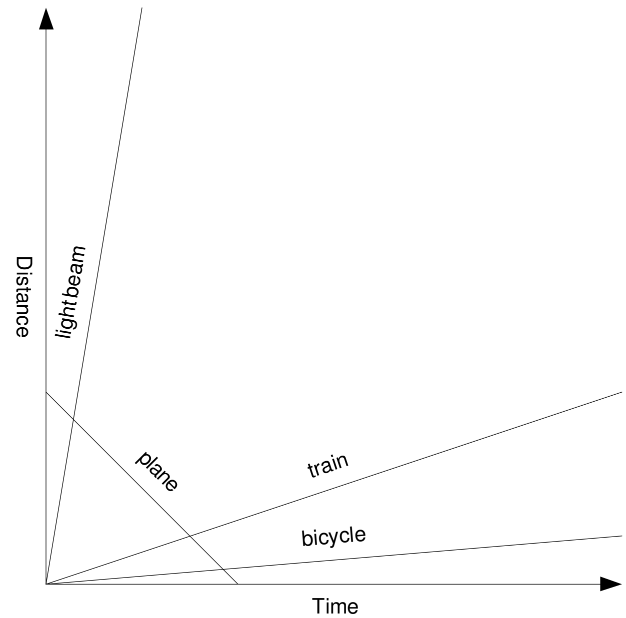
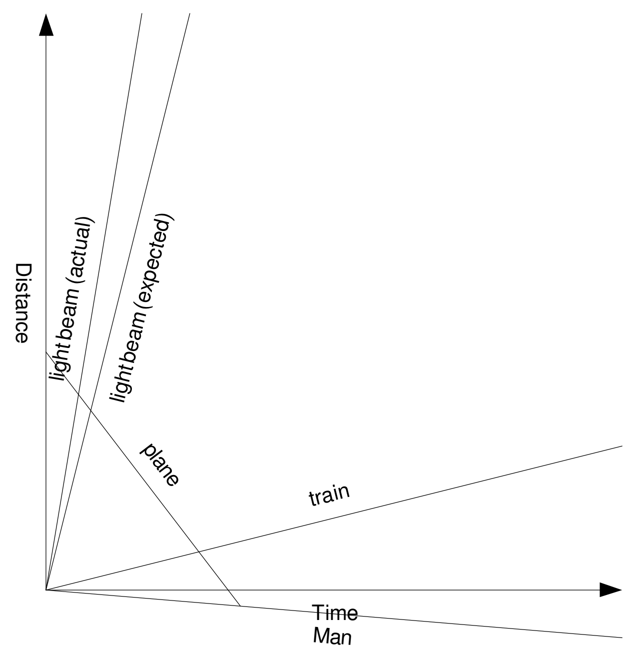
# Special Relativity in One Page

Let the origin represent the location of a man holding a stopwatch and a flashlight. Let the x axis denote the time that has passed since the stopwatch was started. Let the y axis denote the distance from the man. The slope of a line represents the speed of an object. Objects moving away from the man (bicycle, train, light beam) are represented by the lines with positive slope. An object moving toward the man (plane) is represented by a line with negative slope.




The woman riding the bicycle has a frame of reference that is rotated with respect to the man's frame. The speeds of objects relative to her are obviously different from their speeds measured by the man. Therefore, you would expect the speed of light measured by her to be different from (slower than) its speed measured by the man.

In actuality, the speed of light measured by her is *exactly the same* as its speed relative to the man. Ironically, the theory of relativity is a theory of "absolutivity"—the speed of light is constant with respect to any observer. This has been verified through multiple speed measurements by moving and stationary observers.




Because the woman is in motion, she has shrunk, and time has slowed down for her. Only then would her measurement of the speed of light be faster than expected. Einstein's amazing insight was that the *scales* on a moving frame of reference are different than the scales on a stationary one. This has also been verified through multiple measurements. For example, two clocks were synchronized. One was kept stationary and the other was sent on a fast plane trip, during which it slowed down. When it returned, it was found to be slow with respect to the stationary one.