

Special and General Relativity

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Special relativity, Einstein, 1905. Galilean invariance (movement is imperceptible from a closed, non-accelerating ('inertial') frame of reference) implies speed of light in a vacuum, c , is a constant. Implications. Mass-energy equivalence, c is limit on velocity, time dilation (moving clocks run more slowly), length contraction (moving objects shorten) (both as c is approached; the Lorentz factor gives values). Space and time are unified (Lorentz invariance).

General relativity, Einstein, 1915. Acceleration and gravitic fields are the same: gravity is a geometric property of spacetime, the curvature of which is related to the energy and momentum of whatever matter and radiation are present. Astrophysical implications; time dilation and light deflection by gravity; black holes, gravitational waves.