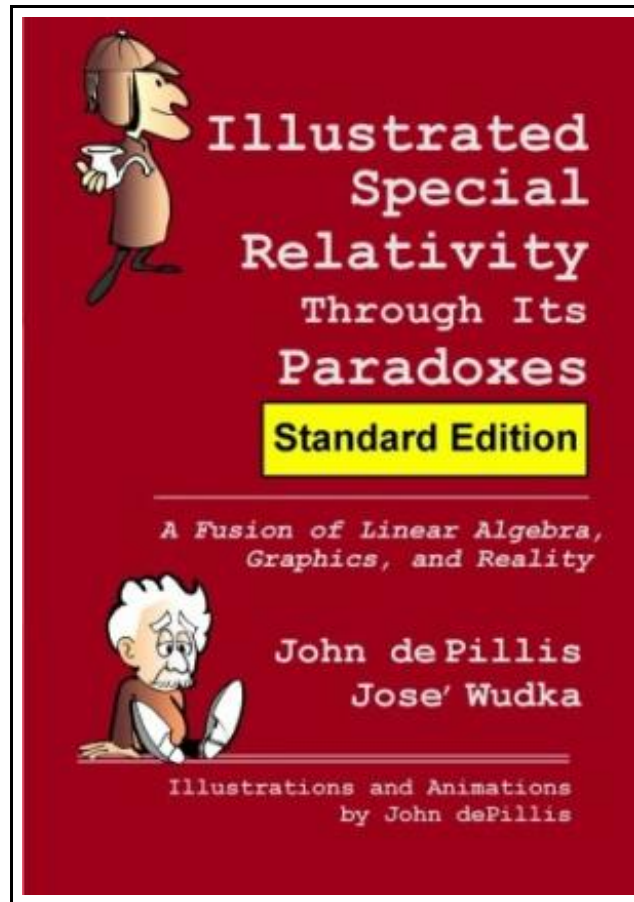# Illustrated Special Relativity Through Its Paradoxes: A Fusion of Linear Algebra, Graphics, and Reality

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ILLUSTRATED SPECIAL RELATIVITY THROUGH ITS PARADOXES: A FUSION OF LINEAR ALGEBRA, GRAPHICS, AND REALITY

J Depillis Illustrations. Paperback. Book Condition: New. Paperback. 384 pages. Dimensions: 10.0in. x 7.0in. x 0.9in.This accessible work, with its plethora of full-color illustrations by the author, shows that linear algebra --- actually, 2x2 matrices --- provide a natural language for special relativity. The book includes an overview of linear algebra with all basic definitions and necessary theorems. Since Einstein acknowledged his debt to Clerk Maxwell in his seminal 1905 paper introducing the theory of special relativity, we fully develop Maxwells four equations that unify the theories of electricity, optics, and magnetism. Using just two laboratory measurements, these equations lead to a simple calculation for the frame-independent speed of electromagnetic waves in a vacuum. (Maxwell himself was unaware that light was a special electromagnetic wave.) Before analyzing the paradoxes, we establish their linear algebraic context. Inertial frames become (2-dimensional vector spaces) whose ordered spacetime pairs (x , t) are linked by line-of-sight linear transformations. These are the Galilean transformations in classical physics, and the Lorentz transformations in the more general relativistic physics. The Lorentz transformation is easily derived once we show how a novel swiveled line theorem, (a geometric concept) is equivalent to the speed of light being invariant for all observers a (a physical concept). Six paradoxes are all analyzed using Minkowski spacetime diagrams. These are (1) The Accommodating Universe paradox, (2) Time and distance asymmetry between frames, (3) The Twin paradox, (4) The Train-Tunnel paradox, (5) The Pea-Shooter paradox, and the lesser known (6) Bug-Rivet paradox. The Bug-Rivet paradox, animated by the author at Special-Relativity-Illustrated. com, presents another proof that rigidity is incompatible with special relativity. E mc2 finds a simple derivation using only the relativistic addition of speeds (the Pea-Shooter paradox), conservation of momentum, and a...

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