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Using the Cycloid to Motivate the E and B Transformations MARC FRODYMA, Retired, MY PHUONG LE, San Jose City College — Einstein's route to special relativity was via electrodynamics, as evidenced by the title of his 1905 paper: "The Electrodynamics of Moving Bodies". Relativity emerges naturally from viewing simple electromagnetic systems in different frames of reference. Before obtaining the correct field transformation equations, Einstein applied the Galilean transformation to such electromagnetic systems, producing equations correct to first order in v/c. Here, we describe an alternate method of obtaining the approximate field transformations, beginning with circular motion in a uniform B field. The basis of our technique is that a Galilean transformation applied to a circular trajectory produces a cycloid. We also show how this method can be visualized using well-known simulation software. Students in lower division general physics can carry out the resulting lab exercise. Although relativity is taught in upper division electrodynamics, in the lower division, it is usually placed with "modern physics" in the third semester of a three-semester sequence of general physics. This class is generally taken after students have completed electrodynamics. We advocate bringing relativity back into lower division electrodynamics, since Einstein showed this to be the natural route to relativity.

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