Tennessee Technological University Physics Department Seminar

Not All Uniform B-Fields Are The Same!

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Abstract: Set up a uniform **B**-field and place a rectangular-plate capacitor such that the **B**-field lines are parallel to the planes in which its plates lie. Quasi-statically turn off the **B**-field – what happens? This seemingly simple and innocuous question (which appears in a famous undergraduate electrodynamics textbook) hides behind it several insights about the nature of electrodynamics which must overturn the popular attitude regarding the magnetic vector potential. These insights are normally obscured by the standard formulation of electrodynamics in terms of the **E**- and **B**-fields, and this standard formulation hinders students and professional physicists alike from a fully physical understanding of electromagnetic induction. This problem is resolved by introducing the vector potential and showing the physical nature that it captures and that the **B**-field leaves out. In particular, it is discovered that different **A**-fields, while giving rise to the same **B**-field, also give rise to *completely different empirical results*. This new insight will demonstrate by a purely classical argument that the vector potential is a real specification of the **B**-field, and that not all uniform **B**-fields are the same!

Bio: Benjamin Luna earned a BS in Physics and in Mathematics at TTU in 2020 and an MS in Physics at the University of Tennessee, Knoxville in 2022. He is pursuing his PhD in Physics at Clemson University under Dr. Murray Daw.

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