Laura Wood

1/19/18

Project idea

This problem is to help you get started on your individual research project. First, define your phenomenon: what is it and why is it interesting to you? Find a few papers (at least 4) that you can use to start your background research. Please give the full references to these papers. Write 2 to 3 paragraphs that describe your phenomenon and your interest in it.

The topic I find interesting for the research paper is the historical formulation of Maxwell’s equations. This includes who the different people are who contributed to the final form of Maxwell’s equations, what different forms the equations have taken throughout history, the conceptual meanings of those different forms, and how the final recognized set of today emerged.

I think this will be interesting and helpful, for a couple different reasons. It will improve my own understanding and internalization of Maxwell’s equations and their conceptual meanings through examining the different proofs, arguments, and thought processes that contributed and changed throughout history. I also look at many physics classes now through the lens of thinking of how I would teach the subject, which might be useful to potential future careers and research, as well as helping me learn the subject better in another way. I think it will be interesting to consider if there’s any usefulness in teaching Maxwell’s equations in more depth from a historical perspective.

This idea was slightly sparked by looking at a footnote of Griffith’s that references the following. I haven’t been able to find a free copy of this article, but will keep looking and may use this.

Bork, A. M. (1963). Maxwell, Displacement Current, and Symmetry. American Journal of

Physics, 31(11), 854-859. doi:10.1119/1.1969140

Possible references:

Tarasov, V. E. (2008). Fractional vector calculus and fractional Maxwell’s equations. Annals of

Physics, 323(11), 2756-2778. doi:10.1016/j.aop.2008.04.005

Dyson, F. J. (1990). Feynman’s proof of the Maxwell equations. American Journal of Physics,

58(3), 209-211. doi:10.1119/1.16188

Heras, J. A., & Báez, G. (2008). The covariant formulation of Maxwells equations expressed in a

form independent of specific units. European Journal of Physics, 30(1), 23-33.

doi:10.1088/0143-0807/30/1/003

Sciamanda, R. J. (2000). On Maxwell’s displacement current-I. The Physics Teacher, 38(6), 329-

329. doi:10.1119/1.1321803

Selvan, K. (2009). A Revisiting of Scientific and Philosophical Perspectives on Maxwells

Displacement Current. IEEE Antennas and Propagation Magazine, 51(3), 36-46.

doi:10.1109/map.2009.5251190

Wolsky, A. M. (2015). On a charge conserving alternative to Maxwell’s displacement current.

European Journal of Physics, 36(3), 035019. doi:10.1088/0143-0807/36/3/035019

More possible references:

I started my search for references on the Wikipedia page on the history of Maxwell’s equations, so I may also use some of the following books referenced there if I can find copies of them, especially since I’m unsure of the usefulness of the articles I found so far.

Crease, R. P. (2010). The great equations: breakthroughs in science from Pythagoras to

Heisenberg. New York (NY),:

W.W. Norton.Flood, R., McCartney, M., & Whitaker, A. (2014). James Clerk Maxwell:

perspectives on his life and work. Oxford: Oxford University Press.

Keithley, J. F. (1999). The story of electrical and magnetic measurements: from 500 BC to the

1940s. New York: IEEE Press.

Nahin, P. J. (2002). Oliver Heaviside: the life, work, and times of an electrical genius of the

Victorian age. Baltimore: The Johns Hopkins University Press.