## Term Paper

Due date: Thursday, November 30

As an undergraduate you learn the language of physics, the laws of physics, and even some physics trivia. And thanks to the skill of your instructors, the subject hums like a well oiled machine. If there's anything that's daunting, occasionally, it's some of the math that comes with the territory. But that's incidental since you know that, fundamentally, physics is simple and elegant.

But by the time you're a graduate student you realize that the world doesn't always seem to play by the rules of the physics laid out in textbooks. There are subtleties, apparent contradictions, paradoxes. You find out that eventually these things got resolved, but when they first appeared on the radar they were called *effects*. Coming to terms with the *effects* of physics is a good way to think of the next phase of your education.

No doubt some effects, such as *Aharonov-Bohm*, came up in undergraduate physics. The best effects, such as this one, increase your understanding in a deep way, like the vector potential is a more fundamental description of the electromagnetic field. While not all effects are this famous, every one of them provided an important lesson in physics at some point in time. In fact, the name of the effect often becomes a proxy for a general concept, as for example *Hanbury-Brown and Twiss effect* might be used to describe an experiment involving electrons when in fact the original effect arose in stellar interferometry.

For your 6561 term paper you will write about one of the effects of physics. Please select your effect as soon as possible and send your choice by email to the instructor to claim it. There is a strict limit of one student per effect. Here are the guidelines:

- 1. The length of the paper is strictly limited to three pages.
- 2. Try to communicate the effect mostly through words. Keep equations to an absolute minimum!
- 3. Why was the effect surprising counter to dogma or intuition at the time of discovery?
- 4. How did the resolution of the effect advance physics?
- 5. Your effect should involve electromagnetic fields, though possibly in a minor role.
- 6. You may write about an effect that, sadly, never had the word "effect" attached to it, such as the *no-retardation-of-the-Coulomb-force-in-atoms effect*.
- 7. Approach this as a learning experience. Instead of writing about an effect you've known about since high school, consider one of the more obscure effects. Here's a list for browsing:

https://en.wikipedia.org/wiki/List\_of\_effects

8. Have some empathy for the instructor, who is worried about his eyes glazing over when confronted with a pile of effects mostly in the "top hits" category.