# Climate change and sustainability in physics class? FREE

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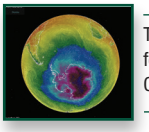
# Climate change and sustainability in physics class?

*by Gary White*



This image signals that this contribution is a featured part of the special collection on "Climate Change and Sustainability in Intro Physics."

I have a confession to make.

After reflecting on more than three decades of teaching physics, I will admit that I have never seriously or intentionally engaged in teaching about climate change or sustainability as part of my physics classes—not in "Physics for Poets," not in calculus-based physics for the engineers and majors, not in algebra-based physics for the pre-meds, not in the astronomy class I taught for middle/high schoolers, not in the upper-level undergraduate courses, even in "special topics" courses—not for a week, not for a day … On the other hand, I have taken time to talk in class about the shape of spandex (a lot of time!); about orbital quirks like the Roche limit, LaGrange points, and Trojan planets; about quantum dots; about the proton-size controversy; about stereotype threat and implicit bias; about ion beam lithography; about Dyson spheres and human space travel; about nuclear dilemmas associated with the atom bomb (watching "Oppenheimer" recently really brought some of those conversations with my students to the fore); and many other topics other than climate change. Oh, I have occasionally given a nod to the subject by computing the efficiency of some system, or discussing the role of albedo for the equilibrium temperature of some abstract planetoid, but addressing climate change full-on even for one class period has not happened.

In retrospect, this avoidance of such an overwhelmingly important science issue in my classroom seems like something that I should begin to address ... and just in time, too! After recently completing my 10th year as Editor of *The Physics Teacher* and roughly equal time teaching the upper-level physics majors at The George Washington University, I am feeling the need to shake up things a bit, and this seems like a good way to get started shaking. This job has been a great ride so far—the best job that I have ever had, I'd say—but I am glad for the new perspectives from the authors responding to our call for papers on climate change. I hope that you get some of the same vibes upon reading this month's issue.

As I look back, I think that the main reason for this omission is that I feel unqualified to teach about climate change and sustainability; and perhaps that was reason enough for the old me. But, as I write this, many of us are enduring the hottest summer we have ever seen, and many are eying the upcoming hurricane season with great trepidation. I cannot help but feel that this issue of human impact on Earth's climate is likely the most important issue that civilization will need to address in the coming years, and it requires detailed understanding of many introductory physics concepts. It feels necessary to the new me to include some introduction to this kind of material as the subject of my physics classroom study; but how to squeeze one more topic into the traditional introductory physics syllabus, and what previously included sacred element to omit? … How to incorporate issues of climate change and sustainability into the physics classroom sequence responsibly?

This month *The Physics Teacher* features our first wave of papers about teaching climate change and sustainability (our sister publication, the *American Journal of Physics,* is also featuring articles with this theme this month), and many tell of ways to incorporate a module or unit into a canonical physics progression. As I read through them, I regret my previous timidity about including more of this material in my physics course; I intend to take some of the exciting new ideas from these brave and forward-thinking authors to be included in my own teaching this semester. For example, this coming semester I am teaching junior-level E&M and we regularly spend a bit of time on the ***E*** and ***B*** fields associated with the Sun's rays hitting Earth, but now I feel it important to expand on this a bit, to include discussion and exploration of how these rays propagate through the various layers of molecules in the atmosphere as a function of frequency, and the ramifications of that—I may have to sacrifice lessons about, say polarization, but the new me is OK with that. I am not advocating that we pretend to be experts in climate change and related topics; rather, much of the foundation of these subjects is rooted in ideas of energy and light and engines and other things with which we already engage our students, and we should be more intentional about learning along with our students how they pertain to climate issues.

We received almost 50 submissions in response to the joint *TPT/AJP* call for papers,[1] on a wide variety of climate-related topics, and we will be sharing the best of these with you over the next few months. Each article that is part of the collection will be accompanied by the image at the top right, a view of Earth from above the Antarctic continent. I hope that you will find useful things for your classroom in these articles.

## Reference

1. Beth Parks and Gary White, "Call for papers on environment, sustainability, and climate change," *Phys. Teach.* **60**, 323 (2022).



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