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Physics should acknowledge its environmental impact and act on it

Physics has an undeniable environmental cost, which sits uncomfortably with the climate and sustainability concerns of many physicists. How can you respond?

As a physicist, it is likely you are aware of environmental sustainability issues: over 90% of surveyed physicists in the US believe the planet is warming because of human activity[1], for example. However, for many physicists, the connection between research and the environment can feel tenuous. You may be tempted to shrug, declare it to be a problem for governments and oil companies, and continue with business as usual. What difference can you make as a physicist anyway, short of abandoning your current research programme and working on green technologies or climate modelling instead?

It's true that physics can be useful for sustainability goals, sometimes in surprising ways. For example, the physics of measurement science underlies efforts to build widespread networks of air-quality monitors, as discussed in a Comment in this issue. But even if you never find a direct environmental application for your research, there is another way forward. As a physics community we can all acknowledge that research comes with an environmental cost. Weighing up such costs and benefits can guide you to make changes to how you do physics in practice.

One substantial environmental cost of physics research is in the flights taken by researchers; for some physicists, flights are the single largest contribution to the carbon footprint of their work[2]. Our February 2020 Editorial looked at how conferences can reduce their environmental impact by using online and hybrid formats[3]. In October last year, we shared our practical advice for work travel within Europe by train, aiming to empower physicists in the UK and Europe to replace at least some flights with trains[4].

Air travel emissions are not the only environmental cost of doing physics. Physics is becoming increasingly computation-heavy, and operating and cooling computers takes a lot of electricity. The environmental cost of this electricity depends on how it is generated, which is a factor usually out of the direct control of researchers. But physicists can think about how to limit or even reduce their power consumption. In a Worldview in this issue, computational physicist Peter Skands describes how he balanced science and climate goals as he chose what methods to use in a project, and calls on funders to reward researchers for taking environmental costs into account.

All fields of physics have their own environmental issues. For example, particle accelerators use a huge amount of electricity and low-temperature experiments use coolants such as helium-3, a finite and dwindling natural resource. Even pen and paper theorists work in buildings that have energy requirements and embedded carbon footprints. Depending on your career stage, you may have greater or lesser control over these impacts. But we should all do what we can, whether it's through making changes directly or by advocating for them. There is no one-size-fits-all approach to making physics more environmentally friendly.

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To explore these topics further and to help the whole physics community take action, together with *Nature Reviews Methods Primers*, *Nature Reviews Materials*, *Nature Reviews Earth & Environment* and *Nature Reviews Chemistry* we are launching a Collection of articles on physics and sustainability, which we will be adding to throughout this year. We are using the collection to bring together articles about how physicists can contribute to environmental sustainability — by working on questions that have direct relevance to sustainability and the Earth's climate, but also by changing the ways physicists work. The collection has only just started, and we want to grow it into a valuable resource for all physicists. We therefore welcome suggestions from you on topics to cover, whether as shorter Comment-style articles or longer Reviews. (We have previously given some advice on how to pitch ideas for articles to the journal[5].) Together, we can turn our concerns into action.

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