Editorial: Introducing the Collection on Photovoltaic Energy Conversion

It is our pleasure to announce *Physical Review Applied*'s Collection on Photovoltaic Energy Conversion. This will comprise approximately two dozen invited papers from experts in this extremely important and rapidly growing field. The Collection formally opened in March 2021 and will close in about 18 months.

The Collection recognizes the imminent and growing threat that climate change poses to life on Earth. We see changes that might occur over geological time periods instead occurring in only a few decades—the result of humankind's use of fossil fuels to provide the energy that keeps civilization moving forward [1]. We have come to the point where the burning of fossil fuel must cease if we are to preserve that very civilization.

In spite of this seemingly dire situation, the solution is right overhead, and it is free, abundant, and economically harvested. Of course we refer to the Sun, which is in fact the source of all energy on Earth, though we have only just begun to exploit the many sources of solar energy. This is where the applied physics community has an essential role to play—in discovering, improving, and developing all of the means of harvesting sunlight, to supply humanity's ever-growing need for energy.

Our Collection is dedicated to presenting some of the most advanced and revolutionary approaches to harvesting solar energy, using a variety of processes for photovoltaic energy conversion.

We have invited contributions that describe how sunlight can be used to generate clean hydrogen fuels through the splitting of water, and how novel and environmentally benign materials can be employed in thin-film solar cells that directly generate electricity, perhaps beating the nearly ubiquitous silicon solar panel at its own game. Another type of device, the thermophotovoltaic cell, produces electricity from heat, whether that be waste from industrial processes or a medium for intentional interim storage. Harvesting heat (both in the far field and very close to the source) at temperatures much lower than that of the Sun poses exciting technological challenges, while introducing new physics. Emerging areas of nonreciprocal heat transfer and utilization of sub-band-gap emission for device cooling are also among the many topics that we plan to cover.

This Collection will include original research and reviews of the broader field of photovoltaic energy conversion. We hope that it will capture your attention, and importantly your interest in participating in this new and rapidly expanding area of applied physics.

[1] IPCC Sixth Assessment Report (2021), <https://www.ipcc.ch/report/ar6/wg1/>.

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