PLOS BIOLOGY

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In the **March 31** release:

- Harnessing nature to promote planetary sustainability *(images; Australia, Mexico, Spain, and others)*

Other Papers in the Collection: (for further information, contact Claire Turner, biologypress@plos.org):

- **Dancing to a different tune, can we switch from chemical to biological nitrogen fixation for sustainable food security?**
  Giles Oldroyd and Min-Yao Jhu ask whether it is possible to engineer plants to biologically fix their own nitrogen and create self-fertilizing crops, thereby increasing sustainable farming practices in the face of a changing climate by reducing our dependency on chemical fertilizers.
  Link to the live article:
  https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3001982
- **Is it realistic to use photosynthesis to produce electricity directly?**
  Christopher Howe and Paolo Bombelli describe how electricity can be generated directly from photosynthetic microorganisms and look at what hurdles need to be overcome before this biophotovoltaic power can be used outside the lab.
  Link to the live article:
  https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3001970
- **Microbe-mediated removal of carbon dioxide for sustainable mining**
  Jenine McCutcheon and Ian Power outline how microbes can be used to help the mining industry transition to a more sustainable future by making better use of mine tailings as a carbon dioxide sink.
  Link to the live article:
  https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002026

- **Make it easier to be green: solutions for a more sustainable planet**
  Andrew Tanentzap highlights the urgent need for solutions to make our use of the planet's resources more sustainable and protect nature in this Editorial accompanying the new collection.
  Link to the live article:
  https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002064

Peer-reviewed *Opinion pieces/Editorials* *N/A*

Harnessing nature to promote planetary sustainability

Special issue of PLOS Biology *explores biology-based technologies to keep Earth green*

As Earth's population grows, the demands of modern lifestyles place mounting strain on the global environment. Proposed solutions to preserve and promote planetary sustainability can sometimes prove more harmful than helpful. However, technologies that harness natural processes could be more successful.

Such technologies are the focus of the latest issue of the open access journal *PLOS Biology*, which features a special collection publishing March 31st of papers highlighting biology-based solutions that could be applied to reduce carbon dioxide emissions, eliminate non-degradable plastics, produce food or energy more sustainably, and more.

In one of the papers, Federica Bertocchini and Clemente Arias of the Spanish Natural Research Council outline recent research supporting the possibility of using insects to degrade plastic waste, specifically polyethylene. This insect enzyme could serve as a more sustainable alternative to current methods of incineration and mechanical recycling.

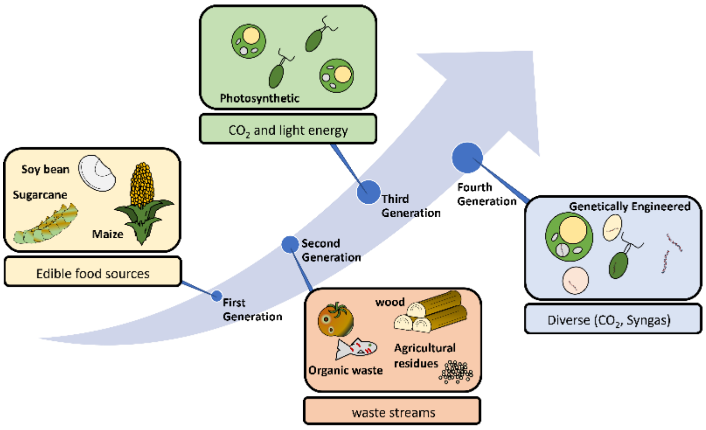
Bertocchini adds, “Plastic biodegradation: the technology is not quite there yet, but insect enzymes may represent the tipping point in the field.”

In another plastics-focused article, Sandra Pascoe Ortiz of Universidad del Valle de Atemajac, Mexico, examines ongoing initiatives to develop fully recyclable bioplastics—a broad category of materials that are either made from renewable sources and may or may not be biodegradable, or are made from fossil sources but are biodegradable. Pascoe Ortiz reveals that these initiatives, while promising, are still far from completely solving the problem of plastic pollution.

Pascoe Ortiz adds, “Plastic pollution is a serious problem that needs to be addressed, there are some materials that can help to solve it, but the most important thing is to be aware of the use and disposal we give to different products regardless of the material.”

Turning to the challenge of carbon dioxide pollution, Peter Ralph and Mathieu Pernice of the University of Technology Sydney, Australia describe the potential of using photosynthetic algae to capture carbon dioxide produced as a byproduct of a wide variety of industrial applications, keeping the greenhouse gas out of the atmosphere. The researchers have already put this approach into practice by collaborating with a brewery.

Ralph adds, “Algae-based carbon capture and manufacture (CCM) has great potential to help mitigate climate change by capturing atmospheric carbon and using it to create long-lasting bioproducts to store carbon. Additionally, CCM offers numerous industrial benefits, such as reducing the cost of chemical processes and enabling the use of advanced manufacturing, potentially transforming many industries into climate-positive biomanufacturing.”



[Thomas Brück's research group (Werner Siemens Chair of Synthetic Biotechnology) at the Technical University of Munich, Germany] summarizes the current state of available biofuel technologies. Advanced biofuels are sustainable "drop-in" alternatives to fossil equivalents and complement other renewable energy resources, thereby eliminating CO_2 emissions. The researchers outline a definitive set of policy recommendations for rapid global deployment of these technologies.

Brück adds, "Advanced biofuels do not compete with agriculture and can be realized via greenhouse gas neutral or even negative processes today. These can contribute to energy security and sustainable mobility but require a stable legislative framework together with financial incentives for broad industrial roll out and applicability."

Along with the other articles in the collection, these perspectives could help inform and guide policies and further initiatives to keep Earth green.

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The full Collection is available in *PLOS Biology* here:
https://collections.plos.org/collection/going-for-green-biology-for-planetary-sustainability/

In your coverage, please use this URL to provide access to the freely available papers in *PLOS Biology*:
https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3001979
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Image 1 Caption: A wax worm producing holes in a polyethylene sheet from a plastic bag (blue). A cocoon produced by wax worms is visible on top of a sheet of beehive wax. Small fragments of plastics are attached in the the outer part of the cocoon (blue debris).

Image 1 Credit: Simoan Gaddi (CC-BY 4.0, https://creativecommons.org/licenses/by/4.0/)

Image 1 URL: https://plos.io/3J3tUPz

Image 2 Caption: Plastic bottle floating on water. Symbol of environmental pollution

Image 2 Credit: Ivan Radic, Flickr (CC-BY 2.0, https://creativecommons.org/licenses/by/2.0/)

Image 2 URL: https://plos.io/407rZjX

Image 3 Caption: Technology transition from first to fourth generation biofuels.

Image 3 Credit: Dania Awad/TUM (CC-BY 4.0, https://creativecommons.org/licenses/by/4.0/)

Image 3 URL: https://plos.io/3yGyazE

Image 4 Caption: Pilot plant photobioreactor for oleaginous algae biomass production at the TUM AlgaeTech Center. Extracted lipids from biomass are used for third generation aviation biofuels.

Image 4 Credit: Thomas Brück/TUM (CC-BY 4.0, https://creativecommons.org/licenses/by/4.0/)

Image 4 URL: https://plos.io/3JDPVWD

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