Correspondence

Climate policy must integrate blue energy with food security

To rescue the marine environment and ensure sustainability of its resources, more effective mitigation of conflicts is urgently needed across all sectors of the oceans. This includes those related to food production, local people's livelihoods and blue energy — the renewable energy harvested from seas and oceans.

Integrated offshore wind farms and fisheries, for example, can use monopile structures to support the turbines that also act as artificial reef systems to encourage biodiversity (C. Li *et al. Environ. Sci. Technol.* **57**, 6455–6464; 2023), and fisheries can be powered by on-site solar or tidal energy (X. Xiao and Y. Yang *Nature* **607**, 239; 2022). However, challenges such as finding suitable locations, paying financial compensation, ensuring aesthetic acceptance by the public and supplying long-term observational data still hinder the scalability of such symbiotic projects. Stakeholders should develop systemic solutions based on scientific evidence, policy guidance and project monitoring. They also need to test the viability of projects, and help to implement and promote policies for adopting them.

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AI could transform metal recycling globally

Metal recycling needs to become more cost-efficient because it is a crucial contributor to the global circular economy and the transition to renewable energy. Typically, only 1% of the most important metals — notably rare metals — are recycled (see, for example, Y. Geng *et al. Nature* **619**, 248–251; 2023). Better and more effective systems are needed to identify, sort, trade and transport these end-of-life materials. Artificial intelligence (AI) could help.

AI combined with metal-waste-exchange platforms has the potential to make metal recycling easier and more profitable (see, for example, www.doctorscrap.com). For instance, using AI alongside robots could help in sorting and separating used metals (R. Sarc *et al. Waste Mgmt* **95**, 476–492; 2019). We must also find ways to combine AI, recycling and innovative research results from a range of disciplines (including materials science, information technology and computer science) to achieve an inexpensive, equitable and effective transition to a circular and sustainable world. Such innovations might then be extended to recycling industries for other materials, including plastics, paper and even food.

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Apply publication-charge waivers across hybrid journals, too

To make open access (OA) publishing models more equitable, researchers should have equal opportunities to publish their work as OA in the journal that best meets their needs. Extending discounts and waivers to cover the article-publishing charges of a wider range of journals could be instrumental in achieving this.

IOP Publishing data show that OA articles are downloaded 80% more than those behind a paywall, on average, and that OA articles have 30% more citations than paywalled ones. Article-publishing charges are the most common way to cover the costs of OA publishing, with most fully OA journals offering discounts and waivers to support researchers from low- and middle-income countries (LMICs).

However, most research is still published in 'hybrid' journals that have a mix of OA and paywalled content. IOP Publishing offers waivers and discounts on article-processing charges across all 62 of the journals that it manages editorially — both fully OA and hybrid. This opens up many more journals for researchers from LMICs to consider.

Although waivers and discounts alone can't deliver long-term equity in OA publishing, they can improve it today.

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Can AI make genuine theoretical discoveries?

When *Nature* included ChatGPT alongside its list of ten people who helped to shape science in 2023 (*Nature* **624**, 509; 2023), it seemed deliberately provocative. The natural tendency to exaggerate the achievements of artificial intelligence (AI) is found not only in regard to large language models, but also in the abstract world of theoretical physics and pure mathematics.

Indeed, it's now a common joke that mathematicians could soon be out of a job. In response to this, several people, including Bryan Birch — best-known for the Birch and Swinnerton–Dyer conjecture, a Millennium Prize problem and one of the most important conjectures in mathematics — proposed a test to determine whether an AI had truly made a theoretical discovery. This is a mathematical analogue of the Turing Test, which ChatGPT has passed (see *Nature* **619**, 686–689; 2023).

The test hinges on three criteria. First, the discovery should be made automatically by the AI, without human intervention; second, it should uncover a concrete mathematical structure; and third, it should be of sufficient importance to spark new research.

According to these terms of 'the Birch test', no AI has yet made such a discovery. For the time being, our jobs are safe.

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