demanding role needs a thorough selection process. But we must weigh its costs and benefits. In tenure's case, the benefits can include a high quality of research and teaching. The costs include the stress applicants face and the significant faculty resources that go into the tenure review. Not to mention, the outcome of that review can be largely arbitrary, as noted in Feder's article by Meg Urry, director of the Yale Center for Astronomy and Astrophysics, who has observed the tenure system for 40 years.

The UK stopped using the tenure system in the late 1980s. Newly hired lecturers typically have a probationary period with some strings attached, such as requirements to graduate from a teaching course or to submit a certain number of large grant applications (but not necessarily win them, since that is beyond applicants' control). The requirements are much less stringent than those of the US tenure system. The lecturer-selection panels I have sat on have all agreed that the current level of competition and the quality of short-listed candidates are so high that appointed lecturers are almost guaranteed to be successful. Of course, sometimes things go wrong in ways we cannot foresee, but that risk is too small to worry about.

Without a tenure system, the UK is still successful in terms of research output. According to a 2019 UK government report comparing the research output of many countries, the UK had the highest field-weighted citation impact. It was also the country from which publications are most likely to be highly cited.[1]

It would be interesting to see whether different outputs related to physics in particular are correlated with the tenure system. Armed with this evidence, physicists could lead the way in improving faculty-hiring processes.

Feder reports that current academic practices have resulted in assistant professors receiving the advice to keep their research "mainstream." We should consider such a system problematic, as it stalls progress and is at odds with what research is about.

Feder also notes that "an unwritten requirement" for tenure "is that a candidate be a 'good fit.'" It is unclear what "fit" means exactly, but we can assume that it means to be like others both professionally and socially. Fitting has not been discussed at the panels I have been a part of, but I can imagine that the issue exists outside the US tenure system. I can think of many ways in which being different, and not fitting, is positive and contributes to versatility. That also goes well with the recent "bin the boffin" initiative led by the Institute of Physics in the UK.[2] There clearly will be cases when not fitting is a problem. We need to have tools to deal with such cases, and we often do. And in my and my colleagues' experience, dealing with those cases has often been easier than dealing with issues created by those who "fit."

References

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Tidal power's limits

In the August 2023 issue of Physics Today (page 22), Rachel Berkowitz nicely examines how turbines installed in strong tidal currents could provide power for small communities that currently rely on diesel generators. The article emphasizes the reliability and predictability of tidal energy compared with solar and wind power. Unfortunately, tidal power is limited at the global scale and cannot contribute significantly to humanity's overall needs.

To illustrate this point, compare current human power consumption of about 20 terawatts (TW) with the availability of various renewable energy sources. Insolation at Earth's surface is approximately 100 000 TW, showing the potential of solar power. Wind power, with dissipation of close to 1000 TW, also has potential. Tidal dissipation is a mere 3.7 TW. Simple models indicate that this is a reasonable upper bound to what could be extracted in principle, though extracting more than a small amount is not technically feasible and would cause significant changes in global tides as well as major changes locally.

Places such as Cook Inlet in Alaska, the Bay of Fundy in Canada, Pentland Firth north of Scotland, and Cook Strait in New Zealand offer a potential of hundreds of megawatts or even more than a gigawatt (GW), but a strong current of, say, 3 m/s corresponds to a head of only 0.5 m. Providing significant amounts of power in such a situation requires huge fluxes of water through turbines—several tens of thousands of cubic meters per second per GW, depending on the details of the installation. A large turbine array would also slow the flow, which would limit the available power and potentially have a significant environmental impact. In places where the strong current is associated with a tidal range of several meters, exploitation using a barrage or lagoon seems preferable, although this would have other disadvantages.

Instead, the best energy-related use of strong, cold tidal currents might be to provide cooling water for nuclear reactors. For example, in the Bay of Fundy, which has the world's highest tides and where the use of tidal turbines is proposed, a CANDU-6 pressurized heavy-water reactor at Point Lepreau uses 26 cubic meters per second of cooling water for a power output of up to an average 600 MW of electricity. That's just 43 cubic meters per second per GW, less than the tens of thousands of cubic meters per second required for the same output using in-stream turbines. Many factors need to be taken into account in comparing potential sources of power but, even where a large-scale in-stream tidal-power project is feasible, it seems appropriate to quote the late David MacKay's freely available book *Sustainable Energy—Without the Hot Air*: "Please don't get me wrong: I'm not trying to be pro-nuclear. I'm just pro-arithmetic."

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