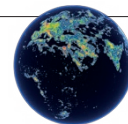


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Turning point

The result of next week's crucial UK referendum on whether or not to remain in the European Union will have worldwide repercussions.

The people of the United Kingdom will next week vote to either leave or remain in the European Union. At stake is not only the future of the United Kingdom and its place in the world, but also the future of Europe itself.

For science and research, the benefits that flow from being part of the EU are obvious. Free movement of people makes it easier for researchers in one EU state to live and work in others, which in turn promotes access to a plethora of multi-country collaborations. Belonging to the EU gives member states ready access to a huge pool of diverse scientific expertise and shared research facilities (see page 307).

The EU itself will spend more than €120 billion (US\$135 billion) between 2014 and 2020 on research, collaboration and innovation, including around €40 billion in beefing up scientific infrastructure in its poorer regions. Some €13 billion will go to one of the EU's greatest research successes, the highly competitive European Research Council, created in 2007 to award research grants to scientists of any nationality. Not surprisingly perhaps, a *Nature* survey in March showed that an overwhelming majority of UK researchers are in favour of remaining. Leading scientists from many disciplines have taken to the pages of newspapers and to the airwaves to plead the case for staying in the EU, making science a theme of the political campaign.

COOPERATION

The benefits of EU regulations to research and innovation in the life sciences were highlighted in a report published on 11 June by the UK House of Commons Science and Technology Committee. But it also noted shortcomings, for example in the translating of EU legislation into national laws. Some countries — Britain included — often implement national laws that go over and above that required by the EU (a practice known as gold-plating), resulting in variation between countries. The report also argued that the EU's application of the 'precautionary principle' in regulations needs to be more closely based on robust scientific evidence.

Scientists in Britain and elsewhere will have their own complaints about the way the EU works. But the UK referendum should not be a vote on whether or not the EU is perfect — how could it be? The question must be whether the unique system of cooperation that it represents does what it sets out to do.

It is *Nature's* view that when it comes to science and science-based regulation, the EU is much greater than the sum of its parts. Over time, it has replaced a maze of regulations and technical standards in its 28 member states — on everything from the life sciences to car parts — with common EU-wide regulations. Its environmental-protection laws are also widely recognized as world-leading.

Such cooperation has helped Europe to become the research and economic powerhouse that it is today. And the strength of UK science

has allowed Britain to have an outsized say in shaping EU research and regulations. Outside the EU, its influence would be greatly diminished.

Many of those who have been pushing for Britain to leave complain of diminished sovereignty. But in the modern globalized world, a willingness to pool aspects of sovereignty is the only way for a country such as the United Kingdom to have any strong say in shaping international rules, from financial regulation to air pollution. Climate change, the environment, use of natural resources, energy security and sustainable agriculture: all are examples of science-based issues on which Europe can be much more effective as a bloc than any mem-

***"It is time to
build a better,
stronger EU, not
tear it down."***

ber state alone — not to mention countering terrorism, or managing the potential threat of Russia on Europe's eastern flank. At a time when so many of Europe's most important challenges are increasingly regional and global, it is time to build a better, stronger EU,

not tear it down. The 'Brexit' camp insists that a split from the EU will allow Britain to make more of its own decisions. It might, but many of those decisions would carry much less weight.

It is difficult to get multiple nation states to agree to sacrifice some autonomy for what is in their collective interest. It requires hard work and, of course, often plodding negotiation and compromise. Britain undervalues that effort at its peril.

Built from the ruins of a Europe devastated by the Second World War, the EU has, despite its defects, woven together often-fractious, if not belligerent, nations into a bloc that has secured peace and democracy and has helped to build a Europe that has common values and rights. It has also managed to peacefully assimilate many former Soviet states under the democratic and societal obligations of the EU umbrella.

Continued engagement of the United Kingdom in the EU is vital, and its citizens bear a heavy responsibility on 23 June. So do the representatives on both sides of the debate, who have tended to stray into hyperbole and exaggeration. For example, a central claim of the 'Leave' campaign has been that a Brexit would free up £350 million (US\$500 million) a week that could be spent on the National Health Service and other public services. This is simply false. That figure is Britain's gross contribution to the EU; when the money Britain receives back is taken into account, it is less than £250 million a week. The reality is that the United Kingdom is in full control of the vast majority of its public spending; its net contribution to the EU budget was around £8.8 billion, or slightly more than 1% of its total public spending of £735 billion, in 2014–15. As the Confederation of British Industry concludes: "The UK's net budgetary contribution is a small net cost relative to the benefits."

We urge UK readers to critically examine the issues and to get out and vote — because every vote in this crucial election will matter. ■

Under the sea

If life in the oceans is to be preserved, people must get to know the wonders of the deep.

It was World Oceans Day last week, and the annual event highlighted once again just how poorly studied two-thirds of our planet's surface is. But this year's tag line, "Healthy Oceans, Healthy Planet", should remind us that we do know some things about the sea — notably, how much people depend on it.

Millions of people rely directly on food taken from ocean waters, and millions more depend on money from fishing, tourism and other marine activities. But across the world, these relationships are often undermined.

Nowhere is this more apparent right now than at the world's coral reefs. Bathed in warming waters, reefs everywhere are bleaching as the corals on them sicken and turn white. Many will die, and so will animals that live on them.

The outlook for corals is bleak, but it is not yet hopeless. Online this week, we publish one approach that could point to ways to rescue them from the brink (J. E. Cinner *et al.* *Nature* <http://dx.doi.org/10.1038/nature18607>; 2016). A huge analysis of data on fish found at more than 2,500 reefs identifies 15 'bright spots' — reefs in a better state than models suggest they should be — and then digs into the factors that might be responsible. Bright spots include unpopulated, unfished regions such as the Chagos islands, and areas that are close to towns and are fished, such as Kiribati and the Solomon Islands. The study also pinpoints 35 'dark spots' where conditions were surprisingly poor, such as Montego Bay in Jamaica and Lord Howe Island in the Tasman Sea between Australia and New Zealand.

The researchers used information on a reef's habitat, depth, nearby human population and amount of fishing to model how many fish could live at each site.

Such insights can help to steer conservation efforts. And conservation of coral reefs is a popular cause. More difficult is the protection and preservation of what lies deeper.

Although there is a huge public appetite for documentaries that detail the wonders found under the surface of our seas, to many people the oceans are a mysterious, even threatening, place. This feeling is reflected in — and doubtless enhanced by — the approach of storytellers. From storms and sharks to mystery and other-worldliness, the oceans are made to seem an unknown and unknowable place: it is never safe to go back in the water.

What we do know about life beneath the waves does sometimes make its way into the public consciousness. The 2003 animated film *Finding Nemo*, for example, delighted not just the public but also marine biologists, many of whom were impressed that the ocean they knew had been represented with such fidelity in how the animals moved and interacted (talking fish notwithstanding).

"To many people the oceans are a mysterious, even threatening place."

On page 325, we interview one of the people responsible for that accuracy: Adam Summers of the University of Washington in Friday Harbor. (He also worked on the sequel, *Finding Dory*, which lands this week.) Summers rightly points out that although filmmakers often need to bend or even break the truth to tell stories, facts can add something, too.

As a biomechanist, his contribution was both to supply general fish facts, such as insights about the whale-shark character, and to give precise feedback on how the animals could move realistically even when they were doing things that no marine animal could actually do. If you watch and are amazed by the octopus sequences in the film, you will see the result of imbuing teams of highly talented animators with the knowledge of professional scientists.

There are many marine researchers who reach out to the public and inspire a love of the sea by discussing their work. This should be applauded. But there are also many who only really talk to other ocean scientists about their work (a problem far from unique to the field).

If more landlubbers are to engage with the oceans, and understand and appreciate them as researchers do, then all involved must do more to emphasize more widely the wonders of the depths and the threats that face them.

Finding Nemo and *Finding Dory* may please scientists with their accuracy, but it would be a tragedy and a disaster if future generations had to watch them to find out what a coral reef looked like. ■

Nature distilled

We need your views on an experiment to convey the latest research in digestible form.

Since 1869, *Nature* has set itself two goals, which can be boiled down to presenting science and its implications to the public, and presenting them to professional researchers. Public outreach is important for science — it is the public that pays for most of it — and with much of our magazine content and the brief summaries of research papers made accessible to journalists in advance, much good science is available to them. But what of the professional researchers — how can *Nature* best present science to you?

Any journal that tries to publish the most important results that it is sent, in all fields of science, will run into the same problem. Every bit of our output, we hope, is useful and interesting to somebody somewhere. But even the most optimistic of our editors would concede that the pool of readership for each of these specific advances is only a small subsection of our audience, professional researchers included. To the outside world, science is science. To those who read *Nature*, science is a multiplicity of

specialisms — and specialists.

We know that most of you are specialists, and that you don't read most of what we present to you. You're busy people. It is hard enough to follow the literature that you need to read. Even the titles of research papers in an unfamiliar field can look incomprehensible. But if you're anything like us, one reason you got into science in the first place was curiosity about the world — and not just the tiny piece of it that you now focus on. Wouldn't it be useful and interesting to keep better track of the rest? Or at least, the rest that is published in *Nature*, and therefore already judged to be important?

We think so, and this week we begin an experiment to see how many of you agree. We have revisited 15 recently published *Nature* papers and asked the authors to produce two-page summaries of each. The summaries remain technical — these are not articles suitable for the popular press — but they try to communicate both the research advance and why it matters. The authors of these papers have been enthusiastic — they want the broadest possible readership — and we thank them for their cooperation. Now we want to know what you think. The first three summaries are published online this week (see go.nature.com/1uhcy3x). The rest will be released in the coming weeks. Please take a look. Be brave — pick a topic that you expect to struggle with — and then fill in the online survey to let us know what you think. ■