

hampered by scientists storing cell lines independently. A recent study shows that the numbers of papers linked to 108 cell lines jumped more than 50% within 3 years of such lines being transferred to biological resource centres — such as the American Type Culture Collection in Manassas, Virginia<sup>6</sup> (see ‘The positive effect of access’). Thus, even when biomaterials are unencumbered by intellectual-property rights, making them accessible through a trusted, open-access resource centre increases their effect on research.

The challenge is to provide incentives for today’s researchers to create and characterize novel materials, models and databases, while ensuring that tomorrow’s researchers can access and use these resources to enhance their own productivity. We recommend, first, that scientists and policy-makers establish rules of practice that maximize the productivity of research in the long term — even if those rules cost today’s researchers some inconvenience or loss of competitive edge. The data-sharing strategy used by sequencers of the human genome offers a striking example of the effectiveness of this type of long-range planning.

In 1996, those involved in sequencing the human genome, including the US National Institutes of Health and the UK Medical Research Council, introduced the Bermuda Rules. These essentially require publicly funded researchers to deposit their sequencing data on a daily basis. Where researchers once had a monopoly over their data for several months, they now have sole access for less than 24 hours. In the short term, sequencers are less able to extract private value from their work. The benefits to subsequent research generations, however, in being able to quickly and easily access new sequence data soon after it is generated, have been enormous.

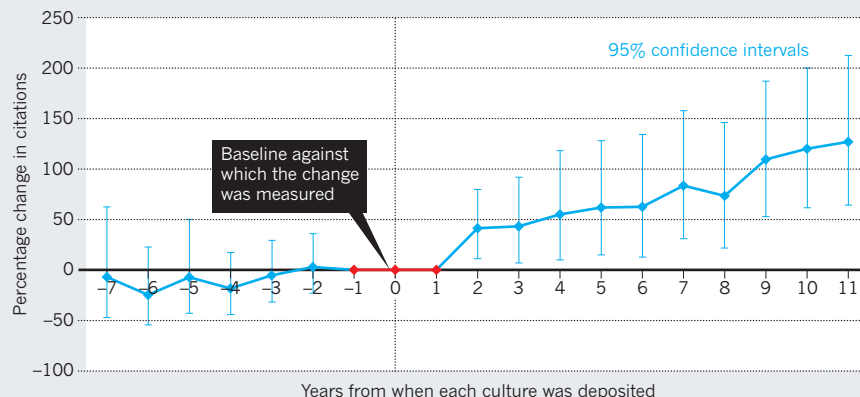
#### GREATER DISCLOSURE

Our second recommendation is that as a default, licensing transactions resulting from publicly funded research be disclosed. The results of research are generally made accessible through publishing, but materials — such as cell lines or tissue samples — and licensing contracts can be extraordinarily hard to obtain. For instance, at least nine patents owned by eight different entities<sup>1</sup> cover the *PSEN2* gene for a membrane protein. Although the information regarding ownership of intellectual-property rights is published by the US Patent and Trademark Office, neither universities nor companies publicize which companies have licensing contracts with the patent owners.

To change this, funding agencies should insist that licensors report each transaction including the identity of licensees and, when feasible, the structure of the transaction<sup>7</sup>. A standardized, accessible database of such transactions (managed perhaps

### THE POSITIVE EFFECT OF ACCESS

The number of papers citing research on 108 cell lines rose rapidly after the cell lines were moved to a centralized, open-access culture collection. Data normalized by cell line, age of research and year of citation.



by the US National Science Foundation) would reduce future transaction costs for innovators trying to build on ideas with many different patented elements.

Third, licences and other access rules should be structured so as to enable further research by as diverse a group of scientists, innovators and entrepreneurs as possible. This does not happen for many resources. For example, roughly 60% of university licences are awarded exclusively to single companies<sup>8</sup>. This means that scientists at other institutions or companies invariably have to pay for, or are prohibited from using, particular ideas<sup>9</sup>. It also means that it is up to licensees whether others can use the university’s intellectual property to develop novel applications, or make resulting products available to the widest set of users, including in developing countries.

The Bayh–Dole Act grants universities flexibility in shaping how intellectual-property rights are used, but most funders are passive in ensuring that such rights don’t inhibit cumulative research. In the Onco-Mouse case, for instance, policy-makers reacted only after a decade of dispute. Some technology-transfer offices have tried to come up with standard language for transparent licensing agreements to ensure, for example, global access to ideas and to the products generated from them. Although not yet widely adopted by universities, such an approach provides a valuable starting point.

Encouraging the broadest possible use of resources must apply to physical access as well. Some well-intentioned foundations, such as the International Myeloma Foundation (IMF) in North Hollywood, California, have taken the lead in establishing crucial disease-specific resources, including patient tissue samples. But, like the IMF, some foundations have granted only a select set of researchers access to the samples in the hope of attracting them to unique research opportunities. A better model is provided by the Coalition Against Major Diseases established by the Critical

Path Institute, in Tuscon, Arizona. In June this year, the members — including patient advocates, pharmaceutical companies, and various institutes and agencies — agreed to pool and share data from failed Alzheimer’s disease clinical trials, thereby broadening access to otherwise proprietary data.

At a time when the public funding of science is under intense scrutiny, tremendous opportunity exists to establish policies that would greatly increase the impact of every dollar of research funding spent. ■

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#### CORRECTION

The Comment article ‘Tar sands need solid science’ (D. Schindler *Nature* **468**, 499–501; 2010) stated that the 650 km<sup>2</sup> footprint of the tar-sands mining is one-hundredth the size of Alberta or Texas. It is one-thousandth the size of those areas.