Correspondence

Counter the risk of Alzheimer's transfer

You urgently call for sterilization procedures that can destroy possible protein 'seeds' of Alzheimer's disease on medical instruments (*Nature* **531,** 294–297; 2016). In fact, a proof of principle for such technology is in place and promises to allay fears of surgical transmission.

The process entails adapting an assay for the transmission risk of pathological prion proteins that are deposited on instruments after surgery. A team at the Robert Koch Institute — a governmental body that safeguards public health — used this approach to develop precautionary sterilization procedures (see M. Beekes *et al. Acta Neuropathol.* **128,** 463–476; 2014) against protein aggregates known to be associated with Alzheimer's and Parkinson's pathologies (A. Thomzig *et al. Acta Neuropathol. Commun.* **2,** 151; 2014).

The researchers tested different experimental or commercial instrument cleaners that are effective against prions, followed by steam sterilization. They found that in crude human-brain suspensions that were attached to steel-wire grids acting as instrument surrogates, this treatment combination removed amyloid-β, tau and α-synuclein protein aggregates, as indicated by western blotting.

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Fanning the flames of Australian wildfires

Climate change will increase the frequency, intensity and scale of Australian bushfires, at huge cost to its population and unique biota. Yet the government-funded science agency, CSIRO, plans to cut at least 100 jobs in climate research. Australia urgently needs political leadership on climate action and investment in climate science (see also D. Lindenmayer *Nature* **531,** 305; 2016).

For example, fires last year burned an estimated 90% of the habitat occupied by the critically endangered marsupial Gilbert's potoroo (*Potorous gilbertii*) and the western ground parrot (*Pezoporus flaviventris*; go.nature.com/ogriue). The affected areas also contain six other endemic threatened plant and animal species. Their already small and isolated remnant populations are now even more vulnerable.

In Victoria alone, 4.3 million hectares of eucalypt forest burned in 2003–14, comparable to the entire area destroyed over the previous 50 years (T. A. Fairman *et al. Int. J. Wildland Fire* http://doi.org/bdkt; 2015). Moreover, modelling for southeastern Australia predicts 5–25% increases in fire risk by 2050 compared with 1974–2003 (see go.nature.com/xmpj8z).

Australia's ill-advised reduction of its climate-science capacity will severely compromise its ability to respond to this growing threat.

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EU cash goes to the sticky and attractive

Winning European research money does not depend only on a well-funded research base (G. Parisi *Nature* **530,** 33; 2016). We find that it is also contingent on national governments' ability to retain their own scientists ('stickiness') and to attract others from abroad ('attractiveness').

We analysed statistical indicators of EU scientists' mobility for 2007–14 (http://erc.europa.eu and go.nature.com/bpeylu) to determine the stickiness and attractiveness of different countries. We quantified attractiveness and stickiness as the relative difference between the numbers of incoming or remaining researchers, respectively, and of outgoing ones.

For both measures, we found that the higher the value, the better were that country's chances of securing European research funding. The United Kingdom and Sweden are examples of high scorers in both; Italy is among the lowest (see go.nature.com/wyvtls).

We conclude that there is a 'rich-get-richer' effect for countries that have high attractiveness and stickiness scores. Those nations also boast a high gross domestic product per capita and tend to invest more in research and development. This means that they can lure and retain the best researchers by providing competitive salaries and a guaranteed future in research.

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One of animal-study criteria backfires

Applications for animal studies in the European Union have become weightier and more informative since the EU's animal protection act was adopted in 2010. Because applications are now more challenging to review, researchers in some German states are charged a processing fee. This seems to run counter to the act's unifying approach, because no fee is levied from animal researchers in other EU countries.

Fees vary according to the burden of reviewing. For example, the charge for a 30-page application, which currently takes 3–4 months to review, might be €1,000 (US$1,130) or more — irrespective of whether or not it is successful. German scientists are in effect being penalized for complying with the act by submitting more-detailed applications as part of the 'refinement' of animal research — one of the '3Rs' criteria (see www.nc3rs.org.uk/the-3rs).

Such fees could push scientists to conduct their work abroad or deter them from doing animal experiments at all. This would be a disaster: the freedom of scientific research in Germany is as highly regarded as animal protection (Articles 5 and 20 of the Fundamental Law).

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Too many mining disasters in Brazil

Another mining dam collapsed in Brazil last month, bringing the country's total of these human and environmental disasters to more than 80. With at least 600 mining dams still operating, the government urgently needs to evaluate the associated risks, tighten its mining code and enforce its safety law for dams.

The environmental effects reach beyond the pollution of fresh water, soils and coastal systems. Such accidents eradicate rare endemic species and disrupt ecological interactions, ecosystem functions and evolutionary processes (M. Lambertz and J. A. Dergam *Nature* **528,** 39; 2015; J. Massante *Nature* **528,** 39; 2015).

Those responsible for these dam accidents still go unpunished (R. Meira *et al. Biodivers. Conserv.* **25,** 407–409; 2016). In our view, the most pervasive and systematic threats to Brazil's biodiversity are rooted in weak official policies and poor monitoring, management and legislation.

Three mining companies in Brazil have set up a US$1.1-billion foundation to mitigate social, environmental and economic effects on the Rio Doce basin. But without policy reform, the ecological and social issues could dash Brazil's hopes of meeting the 2020 Aichi biodiversity targets (M. Di Marco *et al. Conserv. Biol.* **30,** 189–195; 2016).

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Rich-get-richer effect in the EU research funding success

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Supporting Material for M. De Domenico and A. Arenas, Nature 531, 580 (2016)

Prof. Giorgio Parisi [1] and 69 signatories requested EU to push national governments to improve research funding, specially for countries like Italy that might not compete for the H2020 funding programme, at variance with other countries like the United Kingdom, Germany and Scandinavia.

We gathered official data [2][3] concerning statistical indicators, aggregated between 2007 and 2014, and our analysis shows that the national funding is not the quintessential secret for obtaining successful returns in terms of EC financial contribution.

First, we built a simple mobility network between countries (the nodes) and a fictitious destination called "Other Country", because of the lack of public information about origin/destination pairs. We show the resulting network in Fig. 1. If there are researchers winning a grant in a certain country who move abroad (to "Other Country"), a red link is established. Similarly, If there are researchers winning a grant in "Other Country" who move towards a certain country, a blue link is established. The width of a link is proportional to the number of researchers moving, to get an idea of the intensity of each flow incoming from and outgoing to each country.

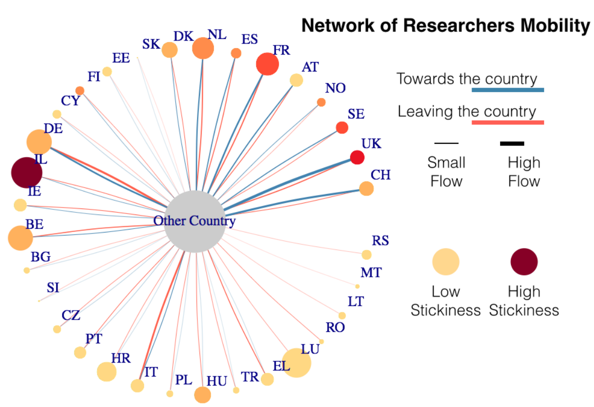

FIG. 1. Mobility network of researchers granted by ERC between 2007 and 2014. Node's color encodes country's stickiness, whereas links encode incoming (blue) and outgoing (red) flows of researchers (see the text for further details).

Quantifying country's success factors. Clearly, there are some countries acting as sources of the flow and other acting as sinks of the flow. We argue that country's attractiveness – i.e. its ability to attract researchers from abroad – and stickiness – i.e. its ability to prevent "brain drain" – play a dramatic role in achieving success in research funding.

We quantified attractiveness as the relative difference between incoming and outgoing flows of researchers. Similarly, we quantified stickiness as the relative difference between the flow of nationals remaining in the country and the outgoing flow of researchers. In both cases, the higher the value, the better. More technically, if we indicate with $s_i^{(in)}$ and $s_i^{(out)}$ the in-going and out-going strength, respectively, of the $i-$th country, we define the attractiveness score as

$$\mathcal{A} = \frac{s_i^{(in)} - s_i^{(out)}}{s_i^{(out)}} \tag{1}$$

and the stickiness index as

$$\mathcal{S} = \frac{s_i^{(self)} - s_i^{(out)}}{s_i^{(out)}} \tag{2}$$

where $s_i^{(self)}$ indicates the amount of national researchers that do not leave the country. The two scores are appropriately normalized between $\epsilon > 0$ and 1 and we show in Fig. 2 the countries participating to FP7 calls, ranked by their attractiveness (left) and stickiness (right).

The most attractive countries are Switzerland and UK, with Israel and UK having the highest stickiness. It is interesting the case of Italy, that in 7 years of funding lost many researchers and was not able to attract foreign researchers, at variance with Switzerland, UK, Sweden, Norway, Austria, France and Spain, to cite just the top ones. Another very interesting case is Israel, middle-ranked with respect to attractiveness and ranked first by stickiness, meaning that it is not very attractive for foreign researchers but it is the best one in taking care of national researchers, keeping its precious "brains" within its own borders. UK, Sweden and France performs very well also in this case.

Quantifying research funding success. We show in Fig. 3 the correlation between the product of our two success scores $\mathcal{A}$ and $\mathcal{S}$ and the Gross Domestic Product (GDP) per capita. This correlation suggests the possibility to use the two success indices, together with a socio-economic indicator of country's wellbeing, to gain further insights about the EC financial contribution success rate. We show in Fig. 4 the correlation between the

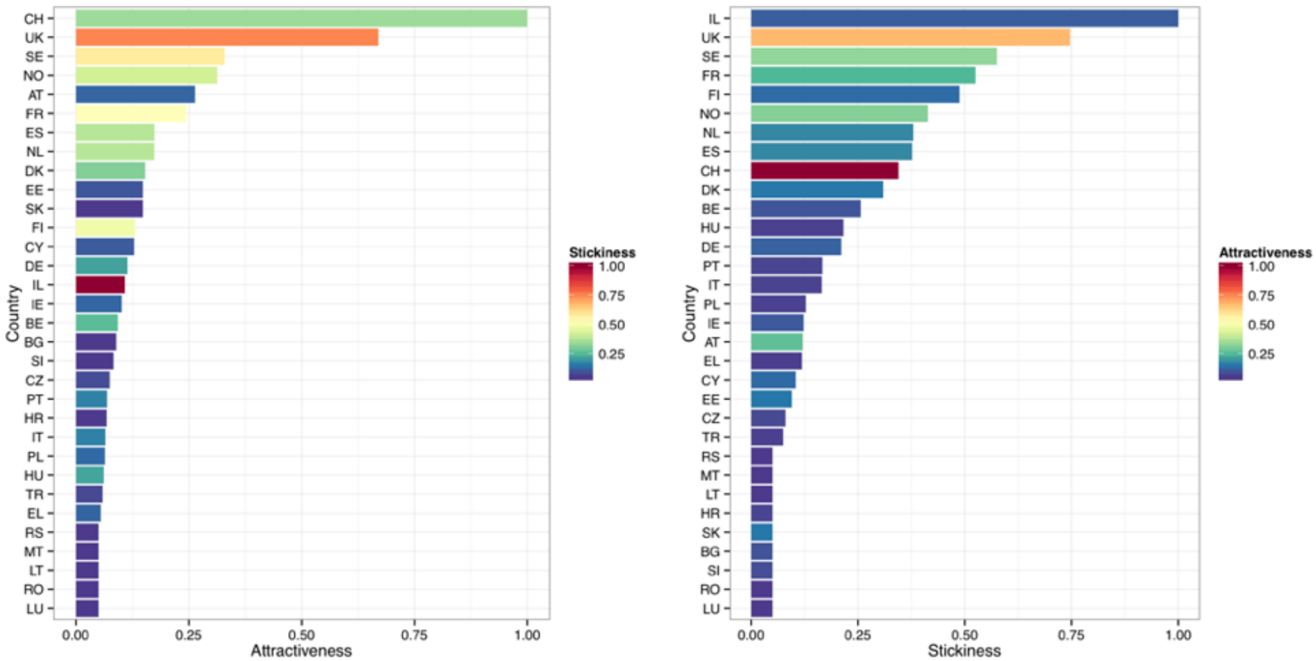

FIG. 2. Country attractiveness (left) – defined as the relative difference between the incoming flow and the outgoing flow of grantees – and stickiness (right) – defined as the relative difference between the self flow and the outgoing flow of grantees.

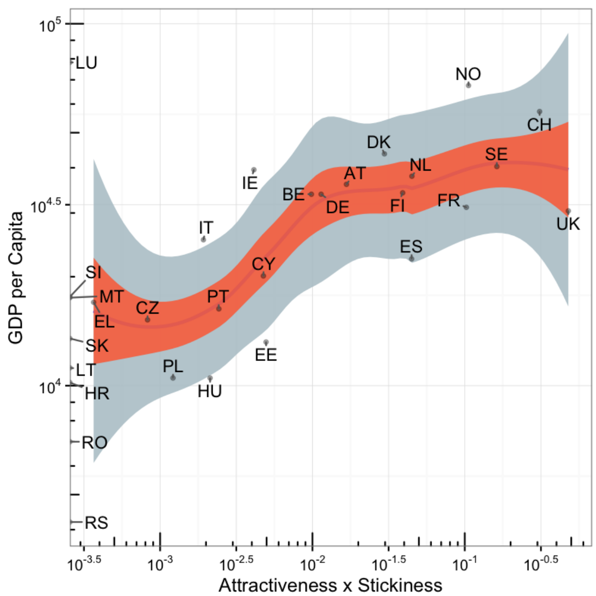

FIG. 3. The product of our attractiveness and stickiness scores is significantly (although nonlinearly) correlated with the GDP per capita. This might indicate that attractive countries that also take action to prevent "brain drain" are the ones with relatively higher standard of living.

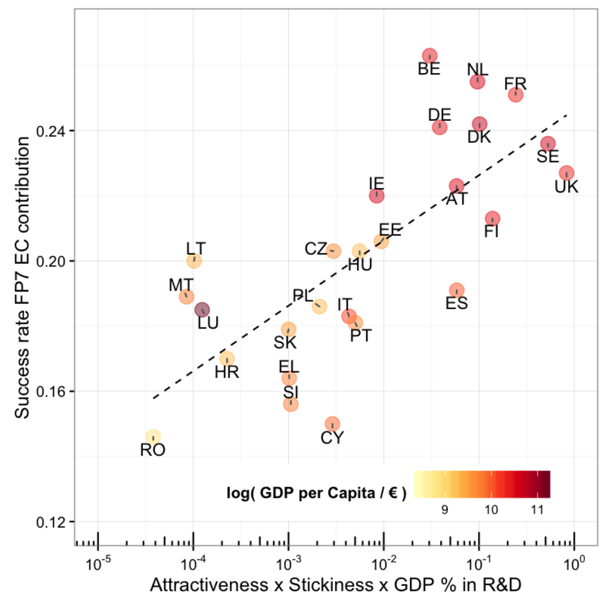

FIG. 4. The product of attractiveness, stickiness and 2014's percentage of GDP expenditure on Research and Development (R&D) significantly correlates with the EC financial contribution success rate.

product of attractiveness, stickiness and 2014's percentage of GDP expenditure on Research and Development (R&D) versus the EC financial contribution success rate.

Making the plausible hypothesis that such a correlation is the observational effect of some causation mechanism, we observe a kind of special Matthew effect, where countries that invest more in R&D, that attract foreign researchers (enhancing "brain gain") and that maintain the national ones (preventing "brain drain"), get richer in terms of financial contribution success rate and top research. Notably, the GDP per capita is higher in the most successful countries.

Summarizing, our analysis quantitatively supports the request by Parisi et al. and reveals that the national investment in R&D is as crucial as the ability of national governments to attract scientists from abroad, e.g. providing competitive salaries, and to keep the best national minds, e.g. providing mechanisms to guarantee their future in research.

[1] G. Parisi, *Governments: Balance research funds across Europe*, Nature 530, 33 (2016).
[2] ERC Calls 2007 – 2014 (FP7 & H2020). URL: `http://erc.europa.eu`.
[3] *FP7 funding programme: Country profiles and funded projects*, September 2014. URL: `http://go.nature.com/bpeylu`.