Correspondence

Rise in retractions is a signal of integrity

A stigma should not be attached to the retraction of a scientific paper, as you explain (*Nature* **507,** 389–391; 2014). It should also be emphasized that the rise in retractions over the past few years does not signify a surge in misconduct: on the contrary, it reflects a growing scientific integrity.

Too many academics and journalists conflate retractions with the falsification of results. However, retractions account for less than 0.02% of publications annually — a fraction of the 2% of scientists who admit in anonymous surveys to having manipulated data at least once (see D. Fanelli *PLoS ONE* **4,** e5738; 2009).

The majority of formal retractions have been issued in recent years, with none before the 1970s. A growing number of journals are now prepared to publish retractions, and the apparent increase in retraction rate disappears after correcting for this factor (see D. Fanelli *PLoS Med.* **10,** e1001563; 2013).

Retractions are therefore more logically and usefully interpreted as evidence for the commitment of editors and scientists to remove invalid results from the literature.

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Practical costs of data sharing

Aside from the ethics and etiquette of fully open data-sharing (*Nature* **507,** 140; 2014), there are practical issues that journals still need to address.

One is the cost of sharing data. Both the Public Library of Science and the UK Royal Society recommend the storage repository Dryad, which currently charges US$15 for the first gigabyte of data over its 10-gigabyte limit, and $10 per gigabyte thereafter. However, studies in areas such as neuroscience can generate terabytes of raw data (1 terabyte is 1,000 gigabytes) — a quantity that few labs could afford to upload.

And, given that searching Dryad for 'neuroscience' yields just three papers but 2,286 for 'ecology', a 'one-size-fits-all' data-sharing policy may not work across all disciplines.

Another concern is the availability of new computer code. Researchers often write their own data-analysis code for each new study, but do not always document it fully. Making code usable by others may therefore require considerable extra work — particularly given the diversity of computing platforms and software versions (see also N. Barnes *Nature* **467,** 753; 2010).

These challenges also vary by discipline: analysis may comprise a few lines of code in some fields but thousands in others, as dictated by the requirements of individual papers.

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Scottish separation could harm science

On 18 September, there will be a referendum in Scotland to decide whether it should become an independent country. As scientists and members of the campaign group Academics Better Together, we feel that Colin Macilwain gives an incomplete picture of Scottish science (*Nature* **493,** 579; 2013): we strongly believe that its brightest future is as part of the United Kingdom.

Scientists in Scotland benefit from being part of the large, efficient UK research community, in which competition and collaboration drive high-ranking research. As a small independent nation, Scotland would be forced to drop out of many research areas because it could no longer afford large-scale infrastructure. Collaborative research is likely to be more difficult across a national border. Also, Scotland would lose its disproportionately high block grant from the UK government, allocated in part to fund research and education in its universities.

The Scottish National Party's White Paper recognizes all this. The party wants Scotland to remain in the UK research-council system, but there are political indications that this may not be an option. The Wellcome Trust and the Association of Medical Research Charities have declared that it would be hard to fund research in another country. Scottish medical research would also be affected by restricted access to large UK clinical trials.

In our view, separating from the United Kingdom would leave scientists in Scotland with much to lose, for imperceptible gain.

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Former Iron Curtain safeguards wildlife

Aaron Ellison calls for conservation efforts across countries to offset the adverse effects of political borders on wildlife (*Nature* **508,** 9; 2014). The European Green Belt (www.europeangreenbelt.org), which is converting former cold-war territory in central and eastern Europe into a network of protected conservation areas, is one such initiative that should serve as a model for other regions with a history of strife.

The European Green Belt was instigated in 2003 and stretches 12,500 kilometres along the former Iron Curtain, the political barrier that existed from 1945 until 1989. The belt consists of protected core areas, sustainable-use areas, ecological corridors and buffer zones, which provide linked habitats and migration routes for such animals as wolves, bears and lynxes, as well as for amphibians and birds.

Not least, it offers a symbol of reconciliation, enjoying the patronage of Mikhail Gorbachev, former Soviet Union president.

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Two brains and a forgotten theory

Two *Nature* papers published 100 years apart on the role of tension in brain cortex folding are connected by a historical footnote.

I discovered this as a result of a coincidence: the brain of the poet Walt Whitman and that of anatomist Andrew Parker ended up in a lab waste bin after dying within a week of one another in 1892. Both had been collected by the secretive American Anthropometric Society, which sought to uncover neuroanatomical features in the brains of eminent people. Unfortunately, Whitman's brain shattered after being dropped on the floor; Parker's crumbled after soaking in fixative for too long.

Beyond this shared fate of neural machinery, there is little information about Parker himself. My investigations revealed that he had proposed a mathematical theory of cortical folding based on the laws of liquid films and surface tension (see W. B. Benham *Nature* **55,** 619–620; 1897) — ironic, considering that the laws of liquid physics and chemical reactions crumbled his brain. I also found that his conclusions nicely complement a theory put forward a century later (D. C. Van Essen *Nature* **385,** 313–318; 1997).

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CORRECTION

The data for the graphic in P. Ginsparg's Correspondence (*Nature* **508,** 44; 2014) were incorrectly credited to C. Labbé, who provided just a subset of the raw data used by the author.

SUPPLEMENTAL INFORMATION

These correspondence pieces are rather short and the original submission was much longer. Consequently, it is worth supplementing the ideas in the published piece with further information. I am also happy to add further information if questions arise (email: kweiner@stanford.edu). First, I attach the original submission and then, I include supplemental references that are helpful to the reader, as well as address some concerns that may be unclear in the final Correspondence piece that was shortened from its original version for publication.

How Walt Whitman's discarded brain uncovered a forgotten theory of cortical folding

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Walt Whitman was a suspected member of the American Anthropometric Society (AAS). The AAS collected brains of eminent men with the goal of uncovering neuroanatomical features underlying the achievements of these men. AAS membership required brain donation upon death. Whitman died in 1892, and due to a clumsy AAS assistant, his brain shattered on the floor and was discarded. Unbeknownst to most present day Whitman enthusiasts and most neuroscientists, Andrew Parker's brain landed in the hands of the AAS during the same time period and was also mishandled. Parker, who was a Comparative Anatomy and Zoology Professor at the University of Pennsylvania, died a week prior to Whitman. Parker's brain soaked in Müller's fluid for too long, crumbled into pieces, and was also discarded. Few documents reveal specifics about the Whitman-Parker connection beyond the discarded fate of their neural machinery, largely because there is little information on Parker altogether. However, digging into the *Nature* archives[1] reveals that Parker proposed a mathematical theory of cortical folding based on the laws of liquid films – ironic considering it would be the laws of liquid physics and chemical reactions that would crumble his brain to pieces. Parker proposed[2] that cortical partitions developed around separate centers of growth. Fissures then formed when parts of cortex joined – like soap bubbles colliding. Upon publication, Parker's work was fondly covered in the News section of *Nature*[1]. Parker's theory complements cortical folding theories proposed 100 years later[3] and deserves a place in scientific history. While we may never know the full story behind the Whitman-Parker connection, two things are certain: *Nature* has played a role in preserving Parker's contribution to theories of cortical folding and the full story detailing the Whitman-Parker connection was once trapped within a trashcan containing the discarded brains of these two eminent men.

REFERENCES

1. Benham, W. B. The primate brain. Nature 55(1435), 619-620. (1897). (http://www.nature.com/nature/journal/v55/n1435/pdf/055619a0.pdf)
2. Parker, A. J. Morphology of the cerebral convolutions with special reference to the order of primates. Journ. Acad. Nat. Sci. Philadelphia X, 247-362. (1896).
3. Van Essen, D. C. A tension-based theory of morphogenesis and compact wiring in the central nervous system. Nature 385(6614), 313-8 (1997). (http://www.nature.com/nature/journal/v385/n6614/abs/385313a0.html)

Additional references:

1. Parker's original paper:

Parker, A. J. Morphology of the cerebral convolutions with special reference to the order of primates. Journ. Acad. Nat. Sci. Philadelphia X, 247-362. (1896).

Link: http://books.google.com/books?id=tYtWAAAAYAAJ&pg=PA247&lpg=PA247&dq=morphology+of+the+cerebral+convolutions+with+special+reference+to+the+order+of+primates&source=bl&ots=z7I3D-SBgB&sig=OsJPBj-iWKaSkGZuws9eSuDZgok&hl=en&sa=X&ei=rgRkU4b8B4L0oAT2_YLICA&ved=0CDcQ6AEwBg#v=onepage&q=morphology%20of%20the%20cerebral%20convolutions%20with%20special%20reference%20to%20the%20order%20of%20primates&f=false

2. Edward Spitzka wrote an important paper about the brains of six eminent men that includes details of the Parker/Whitman fiasco:

Spitzake, E. A. (1907). A Study of the Brains of Six Eminent Scientists and Scholars Belonging to the American Anthropometric Society, together with a Description of the Skull of Professor E. D. Cope. Transactions of the American Philosophical Society, New Series, Vol. 21, No. 4 (1907), pp. 175-308.

Link: http://www.jstor.org/stable/1005434

3. There are many Whitman theorists that do not think Whitman's brain was actually discarded. A great piece by a Whitman enthusiast including many historical details (including Whitman's response to reading Parker's obituary, as well as a theory that Whitman's brain was not destroyed):

Burrell, B. (2003). The Strange Fate of Whitman's Brain. Walt Whitman Quarterly Review. 20(3): pgs. 107-133.

Link: http://ir.uiowa.edu/cgi/viewcontent.cgi?article=1708&context=wwqr

4. For those interested in the history of cortical folding and proposed hypotheses, about 20 years prior to Parker's work, Wilhelm His proposed that proliferative pressure plays a crucial role in how the cortex gets its folds (thanks to Troy Shinbrot (http://coewww.rutgers.edu/~shinbrot/Web2009/index.html) for contacting me and pointing me to this work):

His, W. "Unsere korperform und das physiologische problem ihrer entstehung". (C. W. Vogel, Leipzig, 1874). 152 cited in LA Davidson, MAR Koehl, R. Keller & GF Oster, "How do sea urchins invaginate? Using biomechanics to distinguish between the mechanisms of primary invagination," Development 121 (1995) 2005-18.

Some concerns:

1. *Why was Parker's work important?* The late 1890s was a time of macroanatomical discovery. There was a huge debate about nomenclature and the labeling of anatomical structures. There was a German contingent lead by Wilhelm His and a small American contingent led by Burt Wilder to determine one list of anatomical names, including those of the gyri and sulci of the brain. Evolution was also a hot topic with many atlases discussing the importance of the 'affenspalte,' or ape sulcus, in an attempt to determine if the lunate was present in all primates. Like prior neuroanatomical atlases, Parker's work addressed many of these topics. However, Parker's atlas stood out because he actually proposed a mechanism and a series of equations for how the brain actually forms its folds. Other mechanistic hypotheses had been proposed prior, such as the role of proliferative pressure in the development of cortical folds (His, 1874). However, to have a series of equations theoretically explaining how the folds actually form was not very fashionable for this time period and it was even predicted in Benham's review that this section would be ignored. Benham writes, 'This part of the paper is illustrated by numerous formulae and diagrams; but I imagine most anatomists will pass these by.' And they did. Parker's theory was also likely forgotten because he died young and his paper was published posthumously, so he never had a chance to build on the work he proposed. It should be noted that his ideas were different, but complement, more recent tension hypotheses and therefore, I believe that Parker's work was before it's time and was the first to propose a mathematical theory involving tension to explain cortical folding.

2. *The brains of Whitman and Parker were not in the same trashcan, or 'waste bin.'* The key point of the article is that Parker's work was before its time and it nicely complements later tension theories of cortical folding. For this short article, the connection to Whitman serves as the missing link to uncovering who Parker was and nothing more. As the AAS itself was very secretive (not many members even admitted to being members), the historical records are spotty. However, many have written about Parker, Whitman, and the AAS in poetry journals and in science articles. Edward Spitzka writes about the facts of Parker and Whitman's brain in a 1907 paper discussing the brains of six eminent men (reference included above). The 'lab waste bin' is a phrase that I argued with the editors about because I originally just had 'trashcan' (as seen in the original submission above), and then they changed this to 'the same lab waste bin.' So I argued with them that readers would take this literally and think the brains were on top of one another in a trashcan when in actuality, they were just both mishandled by the lab assistant (theorists question about the discarding, not the mishandling). However, though Whitman and Parker died a week apart and their brains were both mishandled by the AAS, Whitman's brain was dropped way before Parker's was found and likely discarded earlier (the exact date is unknown). There are also plenty of theorists who believe that Whitman's brain still exists somewhere. But, it is highly unlikely that even if that were true, that we would find it because when Spitzka wanted to do his original examinations in 1901 that went into the 1907 paper, Dercum and Spitzka's father (both founding members of the AAS in 1889) didn't even know where the brains were.

3. *I did not write in the first person.* As you can see in the original submission, I did not write in the first person. Even when reading the original and the end product, you can see the difference in voice. All the Correspondence pieces need to fit on 1 page, so the end result was drastically cut from the original submission in order to accommodate the other Correspondence pieces.

Hopefully this clarifies why not more could be included in the end result and I’m happy to clarify further should any questions/issues arise from readers of the condensed version used for publication.