Letters to the Editor

A Plea for Civility and Collegiality

I applaud the editorial commitment stated in the March, 2014 "Letters to the Editor" section of *Notices* not to have its articles "aggravate already existing schisms and wounds." For that reason, I was surprised that *Notices* chose to publish Abigail Thompson's article "Does diversity trump ability?" [4], heavily criticizing arguments by Lu Hong and Scott Page in [2] and [3], without insisting that the author omit the article's belittling and uncollegial language characterizing work in an area in which "strongly held beliefs are in play," as she herself states in the article. It is particularly important for highly respected, award-winning mathematicians such as Professor Thompson to help foster a civil discussion in realms in which there are, indeed, strongly held opinions and people just waiting for permission to rip into others with their own.

No mention is made in the article of the reactions of Hong and Page to these claims of fundamental mathematical errors in their work. Given that, it would have also seemed natural during the editorial process to have checked whether the concerns had been discussed with them. According to Page, he knew nothing about the imminent appearance of the *Notices* article until its author sent him a pro forma note that it was about to be published. I am certain that Page, whose bachelor's and master's degrees in mathematics are from Michigan and Wisconsin prior to his PhD in managerial economics and decision sciences from the Kellogg School at Northwestern, and who is director of the Center for Study of Complex Systems at Michigan, would have enjoyed the opportunity to have had a conversation ahead of time regarding Thompson's concerns about the mathematics.

Quote-checking during the review process could also have helped. This one from Page's book [3] is displayed on the first page of the article and sets the stage for what is to follow: "…the veracity of the diversity trumps ability claim is not a matter of dispute. It's true, just as 1+1=2 is true." This appears to invite the reader to believe that Page claims to have in hand a mathematical result that can be fearlessly applied in social science settings to groups of people, and a remark in the same paragraph of the *Notices* article that the quote refers to work "ostensibly proving that a group picked on the basis of 'diversity' criteria outperforms one picked on the basis of 'ability'" seems to confirm that interpretation. Had Page's quote been checked for context, I am certain that there would have been insistence that the sentence following the excerpt also be included in the quote: "However, the claim applies to mathematical objects and not to people directly." Page's claims for the applicability of his "diversity trumps ability" assertion are actually highly qualified throughout his book. For example, right up front in his introduction (p. xxiii) Page states that, "My claims that diversity produces benefits rest on conditions. These conditions require, among other things, that diversity is relevant—we cannot expect that adding a poet to a medical research team would enable them to find a cure for the common cold." This is far from the flat, unqualified endorsement of diversity over ability the reader might infer from the truncated quote.

If someone believes there is an error in a published argument, then of course there is nothing wrong (and everything right) with working with the people originally making the argument to get the word out if corrections need to be made. But the tone and language of the *Notices* article, however much the author's intent might be that it be aimed only at her perception of mathematical content, will likely provide ammunition for doubters who would like to believe that the very value and importance of diversity have somehow been called into question. With or without the mathematical arguments under fire in the *Notices* article, Page's book contains ample arguments and evidence that this is not so. My final thought would be addressed to such a doubter, and was said well in a different context by anthropologist Clifford Geertz in a conversation with colleagues reported in [1], if we just substitute "theorems" for "studies": In a discussion of a topic "of some significance,"

… [one of the colleagues] interjected, "Well, we really don't know whether that's right, because we have no studies on that." To which Geertz retorted, "Well, you live in the society and have eyes, don't you?"

References

[1] M. Dunkelman, *What data can't convey*, Chronicle of Higher Education, August 19, 2014, available online at `chronicle.com/blogs/conversation/2014/08/19/what-data-cant-convey/`.

[2] L. Hong and S. Page, Groups of diverse problem solvers can outperform groups of high-ability problem solvers, *Proc. Nat. Acad of Sciences* 101, no. 46 (2004), 16385–16389.

[3] S. Page, *The Difference*, Princeton University Press, 2007.

[4] A. Thompson, Does diversity trump ability?, *Notices of the AMS* 61, no. 9 (2014), 1024–1030.

—Robert Megginson
University of Michigan
`meggin@umich.edu`

(Received October 16, 2014)

Diversity Trumps Ability and The Proper Use of Mathematics

In my book *Difference*, I present a framework for modeling problem-solving groups. In it, I demonstrate the value of diverse problem representations and heuristics. One of the book's claims, proven jointly with Lu Hong, provides sufficient conditions for a collection of randomly chosen problem solvers to almost always outperform a group of the best problem solvers.

The article "Does diversity trump ability?" (*Notices*, October 2014) characterized that claim as false. That characterization was based on an erroneous counterexample that violates my theorem's **Condition 3**, (specified in my book): *for any nonglobal optimum, some positive proportion of the problem solvers can locate a solution of higher value.*

The counterexample would apply to an alternative set of conditions Lu Hong and I published in *PNAS*, if one

assumes that distinct solutions can take identical values—a possibility that by convention we had ruled out. Note that even with identical values, Condition 3 invalidates the counter-example.

Second, and more troubling, the note accuses me of misusing mathematics, claiming that I imply that the mathematical results are somehow *fact* in the world of people. The accusation is baseless. In my book, I caution readers to apply mathematical models carefully, highlighting the subtleties of moving from the starkness of mathematical logic to the richness of human interactions.

Not everyone understands the role of mathematical claims in the social sciences. Some nonmathematicians have stated that Lu and I "proved mathematically that diverse groups of people always outperform groups of the best." Obviously, such a proof would be impossible. Instead, Lu and I have used mathematics to identify sufficient conditions for a result to hold, a technique widely used by social scientists. Implicit in our derivation is that there also exist conditions under which diversity won't trump ability. The practice of social science often involves carving up the space of possibilities in this way. Doing so helps us to understand when intuitions hold and when they don't.

The *diversity trumps ability result* is just one of many findings described in my book. The contribution of that claim or any other is best understood in the context of the entire ensemble of claims. The purpose of writing the book was to provide formal frameworks within which one can analyze the contributions of cognitive diversity in solving problems and making predictions. By bringing logic to bear on a set of questions that are all too often approached ideologically, my efforts are not a misuse of mathematics, but a valuable and important use.

—*Scott E. Page*
University of Michigan, Ann Arbor
spage@umich.edu

(Received October 16, 2014)

Response to Page and Megginson

I thank Professors Page and Megginson for their responses to my article.

Professor Page contests the validity of my counter-example to the main theorem of his 2004 article with Hong. He says that it "violates my theorem's Condition 3, (specified in my book)". But the book appeared in 2007. The 2004 article in the *Proceedings of the National Academy of Sciences* contained the complete statement of the theorem with the proof. This article and its arguments were the subject of my paper. The counter-example is correct.

I regret that Professor Megginson found some of the language uncollegial. My intention was only to comment on the merits of arguments that were made in a published research article. Professor Megginson argues that it is simply obvious that diversity is a good thing, regardless of the mathematical content of the Hong-Page article ("Well, you live in the society and have eyes, don't you?"). I did not address the question of the value of diversity in my article. The question I considered was simply whether or not a mathematical case for diversity is made in the Hong-Page paper. It is not.

As for their other remarks, I stand by the points in my paper.

—*Abigail Thompson*
University of California, Davis
thompson@math.ucdavis.edu

(Received October 27, 2014)