AUTHORS:
Nomakwezi Mzilikazi[1]
Aliza le Roux[2]
Bettine Jansen van Vuuren[3]

AFFILIATIONS:
[1]Research Support and Management Division, Nelson Mandela University, Port Elizabeth, South Africa
[2]Department of Zoology and Entomology, University of the Free State, Qwaqwa campus, Phuthaditjhaba, South Africa
[3]Centre for Ecological Genomics and Wildlife Conservation, Department of Zoology, University of Johannesburg, Johannesburg, South Africa

CORRESPONDENCE TO:
Nomakwezi Mzilikazi

EMAIL:
Kwezi.Mzilikazi@mandela.ac.za

HOW TO CITE:
Mzilikazi N, Le Roux A, Jansen van Vuuren B. Bad science cannot be used as a basis of constructive dialogue: Response to Prof. Nicoli Nattrass commentary. S Afr J Sci. 2020;116(special issue), Art. #8583, 4 pages. https://doi.org/10.17159/sajs.2020/8583

ARTICLE INCLUDES:
☐ Peer review
☐ Supplementary material

KEYWORDS:
biological sciences, academic freedom, scientific debate

PUBLISHED:
10 July 2020

Bad science cannot be used as a basis of constructive dialogue: Response to Prof Nicoli Nattrass commentary

The media has been flooded with responses to the commentary authored by Prof Nicoli Nattrass from the University of Cape Town (UCT) and published by the *South African Journal of Science* on the 20th of May 2020. We regard this commentary as racist, offensive, damaging, and unscientific. Even more shocking has been the response attributed to Prof Nattrass by the media, wherein she reportedly claims that the statement issued by the UCT Executive condemning her commentary is '*bending to political pressure and prevents debate on transformation*' (News 24 06 June 2020). Prof Nattrass appears to operate from an assumption that her speculative opinion piece is contributing to a constructive scientific debate because she framed her correlations in scientific language and statistics. She appears not to acknowledge that personal bias may have fuelled the foundational assumptions of her study, and thereby does damage to the name of science – and biological sciences in particular – in an era where there is already a tenuous relationship between science and the broader public. This lack of self-reflection is unfortunately an indictment of how most of us are trained to believe that we, as scientists, are fully objective, and that our research carries no moral or emotional valence. Our response to Prof Nattrass's opinion piece highlights how damaging this lack of scientific introspection is in the hands of an esteemed researcher, and how an actual scientific investigation of the question '*Why are black South African students less likely to consider studying biological sciences?*' should look like.

The emotional valence of research: Why the commentary is racist, offensive, and damaging

At its core, the commentary is racist and offensive because it depicts and frames a whole racial grouping as largely governed by materialism, linked to a poor relationship with nature and pets. It fits neatly into the decades of narrative that seeks to position black people as incapable of thinking beyond their immediate circumstances. By asserting as a valid hypothesis that black students think national parks should be scrapped in favour of giving land to the poor, it belittles the negative impact that centuries of dispossession of land has had on black people. Finally, it is offensive because it positions the necessary debates around the protection of the environment and disastrous consequences of not doing so, as an exclusively white concern.

Although generalising about biological sciences, the focus of the commentary appears to be in the specific field of biodiversity/wildlife conservation. The piece effortlessly minimises the work of many prominent black scientists, researchers, and managers in the sphere of wildlife conservation. To cite a few

individuals, the Chief Executive Officer of the South African National Parks (SANParks), which is tasked with preserving South Africa's biodiversity and cultural heritage, is Mr Fundisile Mketeni, a black man. The Head of Conservation Services at SANParks is Dr Luthando Dziba, another black man. The many thousands of rangers and guides that work within the network of national and provincial protected areas are predominantly black; these people put their lives in danger on a daily basis to protect our wildlife, natural and cultural heritage for current and future generations, often in remote areas, with rustic accommodation at best.

The commentary is further problematic in that it portrays UCT as the microscope through which the participation of black students in biological sciences must be examined. In her speculative title, Nattrass manages to delegitimise the work of scientists and academics as well as undermine the aspirations of students at the other public universities, nationally. To cite a few, UCT's neighbour, the University of the Western Cape, has a vibrant Department of Biodiversity and Conservation Biology that teaches undergraduate courses and conducts world-class research. The University of Mpumalanga has a budding programme in Nature Conservation. The University of Venda hosts a prestigious Research Chair under the auspices of the South African Research Chairs Initiative, training students and conducting research in Biodiversity Value and Change. The best student presentation at the biennial Zoological Society of Southern Africa conference (2019) was by a black student from the University of the Free State's Qwaqwa campus. At all the institutions cited above, the participation of black students exceeds 90%. Although there is a clear lack of transformation in biological sciences (in fact, in all STEM fields) at many of our top universities, this is not universal; the University of Johannesburg being a case in hand. The assertion that black students do not consider careers in biological sciences largely reflects the nature of institutions: there are black students pursuing their studies in biological sciences, they are just not registered at UCT.

It is also unclear what reference the participation of black students is being measured against. There are many factors that may determine whether a student eventually considers and pursues a career in the biological sciences. For example, studies carried out by Centre for Research on Evaluation, Science and Technology (CREST) at the University of Stellenbosch have repeatedly shown that financial considerations (affordability) emerge as the single, most important determinant of whether a student will pursue a postgraduate degree or not. In the natural and physical sciences, where field work is typically the norm, sexual harassment is a contributing factor impacting women's career choices [1,2]. Mentorship, employable skills training, and role models in inclusive research communities are all factors that known to affect postgraduate student choices and success. Randomly highlighting factors such as materialism (using a scale not clearly validated for the South African population) and pet ownership, Prof Nattrass does not reveal actual interest in the broader research on barriers to participation.

Deconstructing claims of scientific validity: The fatal flaw in the science

At its core, quantitative research examines testable hypotheses, which are falsifiable ideas based on prior observations or extensive research. This opinion piece is based on no prior research or observations that we could find: there appears to be little evidence in the literature that pet ownership, positive exposure towards nature, positive attitudes towards conservation, or a lack of materialism leads to students considering a career in the biological sciences. Of course, with over 800 million cats and dogs kept as pets[3], globally, it is hard to see how pet ownership would predict choice of career path. As has been pointed out elsewhere[4], we all tend to work for financial security, and it is therefore very difficult to link such materialism to a specific career choice. Thus, the hypotheses posed are extremely hard to falsify, and there is no clear

a priori reason why we might expect links between the variables in question.

This brings us to the fatal flaw in the science. Prof Nattrass is guilty of conflating correlation and causation. She is getting responses that are valid in, and of, themselves (although it needs to be determined if the materialism scale has been validated for South Africans), but the answers are not linked. She may just as well have examined whether or not number of pets were correlated with any other direction of study. Why not Psychology or Geriatrics? After all, there is an established relationship between emotional well-being and spending time in green spaces[5], or pet ownership and health in older people[6]. Correlation is not causation unless you have established the link between the variables. As an experienced scientist, she should be aware of this very basic fallacy.

To answer her central question in an unbiased way, several options were open to Prof Nattrass. Convenience sampling, as was her approach, is valid for many situations, but is not broadly generalisable, especially with a sample size of just over 200 participants. Random sampling (drawing names or numbers from a database) would have yielded more generalisable results, with stratified random sampling (choosing a subset from the biological sciences and a subset of students from other fields) probably yielding more representative and potentially generalisable answers. Further, if Prof Nattrass strongly wanted to stay with quantitative research, she could have established some answers by posing the question, '*Why are you studying in this particular field?*' with a large number of potential answers to choose from.

The real conversation we ought to have

Notwithstanding the flaws in the Nattrass commentary, this conversation is indeed an important one. It is important not only for the sake of transformation, but because all scientific fields need to address the historical socio-economic class imbalances that exist within the entire South African National System of Innovation. At any time that a portion of the population does not participate fully, a significant pool of talent is excluded, and that can only be to the detriment of biological sciences. Talent is equally distributed amongst all people, be those black or white; linked to this is the aptitude of people for specific fields of study. What is required to inspire talented people with an aptitude for conservation and biological sciences to follow their hearts and study biology is not whether they owned a pet or grew up visiting the Kruger National Park; rather, it is ensuring that they have role models that they can identify with, ensuring that biological laboratories at school level are well equipped, investing in biological sciences at university level through adequate financial support to undergraduate and postgraduate students. If we cannot present *wow* moments of biological discovery to talented younger people, we cannot expect them to study biological sciences. The COVID-19 pandemic highlighted the dire need for a significantly higher investment in biological sciences[7]; the future of humanity may depend on talented students and scholars to realise this.

The *South African Journal of Science* is a flagship journal of the Academy of Science of South Africa (ASSAf). In turn, ASSAf aims to mobilise the best intellect, expertise, and experience in service of the nation. The commentary published Prof Nattrass does not live up to these ideals. Many scientists have criticised Prof Nattrass's piece, and just as many have stood up for her, in the name of academic freedom. Yes, as scientists we have freedom of thought and speech, but this freedom does not shield us from the consequences of our speech. Publishing a piece that is inherently flawed undermines one's own scientific credibility. Furthermore, science and scientists are not neutral or 100% objective, otherwise there would be no need for peer review and ethics committees. Assumptions and conclusions need to be evaluated by a community committed to responsible science. There are, or should be, checks and balances against our personal biases. Debate must be encouraged, and based on facts, logic and the ability to admit fault or

accept correction. That is what should distinguish scientific advice, scientific debate, and thought from unexamined philosophies.

Acknowledgement

We acknowledge Andre Ganswindt, Michael Cherry, and others for valuable discussions.

Nomakwezi Mzilikazi *is the current Honorary President of the Zoological Society of Southern Africa and the Director of Research Support and Management at the Nelson Mandela University. She writes in her personal capacity.*

Aliza le Roux *is the Assistant Dean of the Faculty of Natural and Agricultural Sciences, and an Associate Professor in the Department of Zoology and Entomology, University of the Free State, Qwaqwa campus. She is a Council Member of the Zoological Society of Southern Africa. She writes in her personal capacity.*

Bettine van Vuuren *is the Head of Department of Zoology, and Director of the Centre for Ecological Genomics and Wildlife Conservation, University of Johannesburg. She is the Immediate Past President of the Zoological Society of Southern Africa. She writes in her personal capacity.*

References

1. Aguilar SJ, Baek C. Sexual harassment in academe is underreported, especially by students in the life and physical sciences. PLoS ONE. 2020;15, e0230312. https:// doi.org/10.1371/journal.pone.0230312
2. Clancy KBH, Nelson RG, Rutherford JN, Hinde K. Survey of Academic Field Experiences (SAFE): Trainees Report Harassment and Assault. PLoS ONE. 2014;9, e102172. https://doi.org/10.1371 /journal. pone.0102172
3. Bedford E. Global dog and cat pet population 2018. Statista. Accessed 8 June 2020. https://www.statista.com/statistics/ 1044386/dog-and-cat-pet-population-worldwide/
4. Dziwa S. Academics have a duty to exercise responsible scholarship. Accessed 8 June 2020. https://newblackrepublic.org/academicsnicolinatrass/
5. Huynh Q, Craig W, Janssen I, Pickett W. Exposure to public natural space as a protective factor for emotional well-being among young people in Canada. BMC Public Health. 2013;13:407. https://doi.org/10. 1186/1471-2458-13-407
6. Enders-Slegers M-J, Hediger K. Pet ownership and human–animal interaction in an aging population: Rewards and challenges. Anthrozoös. 2019;32:255–265. https://doi.org/10.1080/08927936.2019.1569907
7. Le Roux A, Jansen van Vuuren B. What zoologists should learn from a zoonotic pandemic. The Conversation. 2020 June 4. https://theconversation.com/what-zoologists-should-learn-from-a-zoonotic-pandemic-137951