Strategies for making geoscience PhD recruitment more equitable

Ben Fernando*, Sam Giles, Christopher Jackson, Anya Lawrence, Munira Raji, Rebecca Williams, Jenni Barclay, Louisa Brotherson, Ethny Childs, Jacqueline Houghton, Anjana Khatwa, Alicia Newton, Keely Mills, Francisca Rockey, Steven Rogers, Catherine Souch, Natasha Dowey

*Department of Physics, University of Oxford: benjamin.fernando@physics.ox.ac.uk | @space_quakes

Introduction
Geoscience is one of the least diverse science disciplines in the Global North in terms of ethnic minority representation[1–3]. Over recent years, efforts to improve access and participation in the geosciences have increased, with funding bodies recognizing the need to invest in this work[4].

A disproportionate number of researchers from ethnic minority backgrounds are lost at the transition from undergraduate study to postgraduate research[5,6], representing a major barrier to equality of representation across senior levels of geoscience in both academia and industry. This stems from a complex interplay of structural, individual, and cultural factors[2,5,7,8]. Efforts to address this have been hampered by a severe lack of funding and resources for postgraduate widening participation programs.

While ongoing, long-term, and properly funded structural change is needed across the academic life cycle, one immediately easily leveraged area is the reform of graduate admissions processes. Admission to doctoral programs is often highly competitive, and the admissions procedures used can introduce bias and structural inequity. Critically, many of these problems remain hidden, because the students most impacted by this inequity are so poorly represented in postgraduate research cohorts.

As part of the Natural Environment Research Council-funded Equator project, we set out to raise awareness of these issues, better understand the current state of play in doctoral recruitment practices, and to work with UK doctoral programs to develop best practice recommendations to improve ethnic minority representation in postgraduate geoscience research[9]. Our recommendations for reform are transferable to doctoral programs and funding bodies across the international geoscience community, and are summarised and justified below.

Recommendations
Advertising
Most doctoral programs use multiple advertising routes such as online PhD databases and mailing lists. Demographic data collection at application stage is variable, with low reporting, but anecdotal evidence collected during our study identified that the main barrier to diversification of doctoral student cohorts was a lack of applications. This suggests that visibility of geoscience PhD opportunities is lacking among ethnic minority students. This could be alleviated by making greater use of demographic networks (e.g. Black in Geoscience), developing resources to engage ethnic minority students earlier in their undergraduate degrees, and working with student groups who are involved with students from minoritized.

Care should be taken to develop targeted materials that anticipate the concerns often raised by potential applicants - for example highlighting application fee waivers, financial support (especially if dedicated for minoritised groups), and post-graduation career paths with stable financial incomes.

Support for applicants
Evidence from the Equator project suggests that candidates from ethnic minority backgrounds are not submitting applications for doctoral study even if interested and may benefit from tailored support at the pre-application stage. Workshops or online Q&A sessions, co-hosted by relevant student networks, may help answer questions that currently act as a barrier to application. Similarly, developing a standardised webform or email template through which applicants can submit expressions of interest may aid those who are uncomfortable contacting potential supervisors. Peer-to-peer pre-interview mentoring of applicants may be used to increase familiarity with the process and doctoral research environments as a whole. Greater use of paid research placements may also help to increase knowledge of doctoral research amongst minoritised applicants, whilst also helping to develop transferable skills.

The 'known' factor

Unconscious (and indeed conscious) biases are likely to have the most impact on which candidates are successful at the evaluation and interview stages. Controlling supervisor input is crucial to ensure that 'known' candidates are not unfairly advantaged. This may include reducing the emphasis on supervisor recommendations when initially sorting applications, requiring declarations of conflict of interest for known candidates, or allowing supervisors to nominate additional candidates from minoritised backgrounds. Candidates should also be encouraged – or required - to use a standardised CV that makes clear what information is being sought.

Equitable metrics
Many programs assess candidates based on rigid criteria which are designed to identify 'excellence' but do not account for structural inequalities. As an example, students' degree classification is often a key metric, but this does not account for undergraduate awarding gaps between white and ethnic minority students[10]. Such metrics serve to discriminate against students from already under-represented or under-served groups. A greater use of holistic evaluations to assess applicants is vital. These should judge potential success beyond just applying limited metrics based on past academic performance and opportunity alone. Such an approach could include revisiting minimum degree levels or grade point averages as well as scoring schemes that upweight academic prizes. Similar issues arise when candidates from more competitive undergraduate institutions are favoured (without accounting for lower attendance of ethnic minority students at so-called "higher tariff" universities[11]), or when a Master's degree is a prerequisite for admission (without recognising the lower participation of marginalised groups in Master's study, often for financial reasons[12]). Templates for reference letters that highlight the candidate's experience and potential, rather than simply academic performance, should also be provided.

Application and interview questions should take a narrative approach and judge transferable skills in both academic and non-academic contexts. Standardised scoring sheets for assessing applications and interview performance will also help alleviate biases in evaluation. In the longer term, doctoral training programS may wish to consider using 'conditional offers', where candidates with lower academic scores but high potential are offered places dependent on the completion of paid pre-sessional training.

Coordinated change
Amending admissions procedures are particularly challenging, especially when recruitment takes place across multiple institutions, but coordinating changes between universities and departments could be to the advantage of everyone. We recognize that changes here will likely take place over a longer term, requiring coordination between different departments and institutions, as well as pressure on funders. Shorter-term, paying current students to undertake an 'accessibility check' on websites and application materials would ensure that documents and webpages are clear and do not assume pre-existing knowledge about applying to doctoral programs.

Data collection and positive action
A standardized approach to data collection would facilitate a framework for positive actions to be developed (e.g. dedicated interviews slots and funded places specifically for students from ethnic minority backgrounds) as well as long term evaluation of interventions. However, the level of demographic data collected varies significantly, and is constrained by legal frameworks. We suggest that, where permissible, a standardised set of protected characteristics[13] and other demographic data should be collected, mandated by funding bodies if required. The development of an equitable framework for the use of contextual data in assessment of applications - which will likely require local legal expertise - will be crucial to sustaining these activities over the long term.

Conclusions
These recommendations are designed as a potential framework within which efforts to improve the diversity of postgraduate researchers in geosciences can be formulated. They are not exhaustive, and cohort-based multi-year investigations of the effectiveness of different interventions and considerations of intersectionality, coupled with tailored support throughout the PhD itself, are essential. In the long-term, the development of more graduate access programs that target

undergraduate students well in advance of the PhD application process (such as Oxford's UNIQ+[14]) will be critical if we are to reach candidates who would not otherwise consider a geoscience PhD.

Key references
1.   Bernard, R. E. & Cooperdock, E. H. G. No progress on diversity in 40 years. *Nat Geosci* **11**, 292–295 (2018).
2.   Dowey, N. *et al.* A UK perspective on tackling the geoscience racial diversity crisis in the Global North. *Nat Geosci* **14**, 256–259 (2021).
3.   Dutt, K. Race and racism in the geosciences. *Nat Geosci* **13**, 2–3 (2020).
4.   UK Research and Innovation. NERC DEI research in environmental science: project summaries – UKRI. https://www.ukri.org/publications/nerc-dei-research-in-environmental-science-project-summaries/ (2022).
5.   Leading Routes. *The Broken Pipeline.* https://leadingroutes.org/mdocs-posts/the-broken-pipeline-barriers-to-black-students-accessing-research-council-funding (2019).
6.   UK Research and Innovation. *Diversity Results for UKRI funding data 2014/15 to 2018-19.* https://www.ukri.org/files/about/ukri-diversity-report/ (2020).
7.   Giles, S. *et al.* Open letter concerning CDT and DTP student recruitment across the UK. https://docs.google.com/document/d/1EInAKFl7px2DxYv-sAZxVOyTjkm-AE29CzFFnjxw6hg/edit (2020).
8.   Fernando, B. & Antell, G. *Recommendations for improving racial equality, diversity, and inclusion in the Department of Earth Sciences, University of Oxford.* (2020).
9.   Dowey, N. J. *et al.* The Equator Project. *Pre-Print* (2022) doi:10.31223/X5793T.
10.   National Union of Students & Universities UK. *Black, Asian and Minority Ethnic Student Attainment at Universities.* https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2019/bame-student-attainment-uk-universities-closing-the-gap.pdf (2019).
11.   GOV.UK. People starting at higher education providers with high, medium and low entry tariffs. https://www.ethnicity-facts-figures.service.gov.uk/education-skills-and-training/higher-education/entrants-at-higher-education-providers-with-high-medium-and-low-entry-tariffs/latest (2022).
12.   GOV.UK. First year entrants onto postgraduate study. https://www.ethnicity-facts-figures.service.gov.uk/education-skills-and-training/higher-education/first-year-entrants-onto-postgraduate-degrees/latest (2022).
13.   UK Government. *Equality Act 2010.* (2010).
14.   University of Oxford. UNIQ+. https://www.ox.ac.uk/admissions/graduate/access/uniq-plus (2022).