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**This is an accepted manuscript before typesetting. The final version of this manuscript is now published in Nature Geoscience available at <https://doi.org/10.1038/s41561-021-00737-w>. Please feel free to contact any of the authors; we welcome feedback.**

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1 **A UK perspective on tackling the geoscience racial diversity crisis in**  
2 **the Global North.**

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13 **Geoscientists will play key roles in the grand challenges of the twenty-first century, but**  
14 **this requires our field to address its past when it comes to diversity and inclusion.**  
15 **Considering the bleak picture of racial diversity in the UK, we put forward steps**  
16 **institutions can take to break down barriers and make the geosciences equitable.**

17

18 The roots of modern geoscience lie in early colonial principles that land could belong to those  
19 willing to use its products, regardless of indigenous territories and practices. The production of  
20 geoscience knowledge has therefore been historically tied to a desire to explain the distribution  
21 and extractability of resources, largely for the benefit of the colonising force<sup>1</sup>. This knowledge  
22 now has an essential role to play in equitable and sustainable development, but it cannot be  
23 successfully applied without diverse representation amongst geoscientists. Addressing global  
24 problems that impact people from all walks of life means we must work within and across a wide  
25 array of communities.

26

27 A robust approach to diversity and inclusion needs to begin at home, especially in the very  
28 countries that have benefited from the structures and wealth of a colonial past. Geoscience in  
29 the Global North is disproportionately white, a result of both historic systemic racism that  
30 impacts academia as a whole<sup>2</sup> and subject-specific issues that make our discipline less  
31 inclusive to many underrepresented groups<sup>3</sup>. In the USA, for example, just 6% of Geoscience  
32 doctorate degrees are awarded to students from underrepresented minorities (defined as  
33 American Indian or Alaska Native, Black or African American, Hispanic or Latino) despite 31%  
34 of the population belonging to these groups<sup>4,5</sup>. Moving forwards, we must remove the bias and

35 hostile environments that have led to inequality in our discipline, attract researchers from a  
36 variety of backgrounds and retain them throughout their careers.

37

38 The lack of diversity in geoscience has been documented in North America<sup>4,5</sup>, but there has  
39 been little focus on diversity trends in postgraduate geoscience research ('PGR'; PhD and  
40 MRes courses) in other regions of the Global North. This work aims to highlight issues facing  
41 UK Geoscience in a similar way to Bernard & Cooperdock<sup>4</sup> in the US, to give international  
42 perspective to these discussions. The data we present from the UK Higher Education Statistics  
43 Authority (HESA)<sup>6</sup> paint a similarly dismal picture (see Box 1). It is difficult to expand this  
44 approach to other Global North countries because demographic data are not collected in much  
45 of Europe<sup>7</sup>.

46

47 To provide context for our discussion, we must reflect on our own experiences. Of the twelve  
48 authors of this paper, four identify as BAME (we use the term 'BAME' for Black, Asian and  
49 minority ethnic throughout this piece for consistency with HESA terminology, but recognise this  
50 homogenises different identities and obscures experiences felt by one race or ethnicity). The  
51 majority of us have not been the victim of direct racism. We approach this from the perspective  
52 of concerned Geoscience academics, rather than scholars in equity, diversity and inclusion  
53 (EDI), although a number of us have EDI responsibilities in institutions or charities. Our aim is to  
54 highlight the situation and promote the need for action. Geoscientists in both industry and  
55 academia should work together to listen to diverse voices, challenge biases and transform  
56 geoscience culture to be more inclusive and accountable.

57

## 58 **Factors involved in racial inequity in UK Geoscience**

### 59 ***Pre-university***

60 Fundamental lack of acknowledgement that geoscience is deeply rooted in, and built on,  
61 colonialism, white power, violence, exploitation and slavery pervades relationships in the  
62 present and is a barrier to forging equitable partnerships<sup>3</sup>. The stereotype of a geoscientist as a  
63 white man, compounded by the perception that geoscience is an outdoors only activity (and  
64 perpetuated by marketing materials that feature white students in rugged backgrounds), is  
65 particularly discouraging to those from minority ethnic backgrounds.

66

67 In a recent Geological Society of London survey, 60% of undergraduate Geology students  
68 mentioned a lifelong interest in the natural environment. Natural environments are less

69 accessible to children from urban settings (which are more ethnically diverse; over 98% of Black  
70 African, Pakistani and Bangladeshi people live in urban locations in the UK<sup>8</sup>) and children from  
71 low-income households (more likely to be Pakistani, Bangladeshi, Chinese or Black than white  
72 in the UK<sup>9</sup>). The UK Department for Environment, Food and Rural Affairs report that 18% of  
73 children living in the most deprived areas never visit the countryside, with Black and Asian  
74 families the least likely group to visit rural areas.

75  
76 Furthermore, a career in postgraduate geoscience research may not be seen to offer the  
77 financial security of other professions, such as Medicine, by some communities<sup>10</sup>.

### 78 79 ***Retention into postgraduate research and beyond***

80 BAME students applying to high-tariff, research-intensive, institutions are less likely to be  
81 accepted than white students with comparable qualifications. For example, BAME applicants to  
82 Mathematical, Physical and Life Sciences subjects at Oxford are 5.8% less likely to receive an  
83 offer than their white counterparts, even after accounting for prior attainment and course  
84 choice<sup>11</sup>. In 2018/19, Black students made up just 3.9% of students at high-tariff universities,  
85 compared to 12.2% at low-tariff universities<sup>6</sup>. Once at university, BAME students are less likely  
86 to gain a first or 2:1 degree classification than their white peers. A range of factors have been  
87 proposed to explain this but an *unexplained* gap still exists, likely due to unconscious bias and  
88 inequitable frameworks within HE that disadvantage Black and minority ethnic students<sup>12</sup>.

89  
90 Aspects of the PhD application process, such as preference for high-tariff university graduates  
91 and selection using metrics that reflect access and resource availability more than student  
92 achievement, disproportionately detriment marginalised and underrepresented students<sup>13</sup>. Just  
93 9% of UKRI (UK national funding body) studentships were awarded to ethnic minorities in  
94 2018/19<sup>14</sup>; a dismal statistic considering that 19.4% of 18-34 year olds identify as BAME<sup>15</sup>.  
95 These numbers are even lower for NERC (UK national funder of natural science), with just 6%  
96 of studentships going to ethnic minorities<sup>14</sup>.

97  
98 Having role models to identify with is important to foster a sense of belonging in the scientific  
99 community; a lack of BAME representation at faculty level has been linked to BAME students  
100 not continuing to PGR. Across the UK just 10.8% of professors are BAME<sup>16</sup>, but of the 2,390  
101 staff working in Earth, Marine and Environmental Sciences in 2018/19 only 90 (3.9%) were  
102 BAME; the second lowest figure of all Science, Engineering and Technology disciplines<sup>17</sup>. This

103 'institutional whiteness' can result in feelings of isolation, and the few BAME staff present being  
104 relied upon to be representative of all BAME issues and burdened with advancing equality  
105 without meaningful reward.

106

107 The geosciences have additional subject-specific hostile environments<sup>3</sup> that may deter BAME  
108 students from continuing in PGR. Fieldwork requirements create barriers to ethnic minorities, for  
109 reasons including cultural sensitivity (e.g. co-ed residential trips), cost, inclusivity and racial  
110 harassment<sup>18,19</sup>. The 'alcohol culture' in many geoscience departments and at conferences  
111 presents barriers to inclusivity for students who do not drink, who are more likely to be from  
112 BAME backgrounds<sup>10</sup>.

113

114 Note that some of the above issues are intersectional; BAME students may experience  
115 overlapping barriers depending on their gender, sexuality, disability, class, or nationality<sup>20</sup>,  
116 particularly in the field. Building a culture more inclusive to BAME students can broaden  
117 participation to a range of minority groups.

118

## 119 **What can we do about it?**

### 120 ***Decolonisation***

121 There has been a growing demand for the academy to contend with its colonial links and  
122 institutional whiteness<sup>21</sup>. In geoscience we reference the likes of Adam Sedgwick and Henry de  
123 la Beche in our teaching but rarely mention their links to slavery, which are now being  
124 recognised. We teach mapping, surveying, and mining geology but we rarely explain how these  
125 activities link to the growth of the British Empire<sup>1</sup>, or modern destruction of indigenous sites.  
126 Moving forward geoscientists must reflect and engage with social scientists and historical  
127 scientists to explore these links, teaching them through the positive lens of geoethics<sup>22</sup>.

128

129 The relationship of field-based disciplines with the land has typically taken a colonial approach,  
130 of white, western field scientists visiting a location, removing samples (often with the help of  
131 local people), then extricating this knowledge and publishing it in paywalled, western journals  
132 (often without local co-authors). This work may disrespect the customs and beliefs of indigenous  
133 communities<sup>23</sup>. In a study focussed on First Nation communities, Datta<sup>24</sup> explains successful,  
134 sustainable 'land-based education', which understands the land as dynamic, as relational (e.g.  
135 spiritual), and as linked to well-being. We can learn from studies like this and be more cognizant

136 of the cultural backgrounds of both our field sites and students during fieldwork, particularly if  
137 work is conducted in the Global South or indigenous lands.

138

### 139 ***Inclusive teaching***

140 Geoscience is vital in developing a more sustainable society, and a critical aspect of sustainable  
141 development is the reduction of inequalities (Goal 10, UN Sustainable Development Goals).

142 Sustainability in Geography, Earth and Environmental Science HE education is considered by

143 Gormally (2019), who advocates for interdisciplinarity, diversity of approach, and moving

144 beyond environmental sustainability to include social, cultural and political perspectives.

145

146 By teaching a geoscience curriculum more focussed on global perspectives of sustainability,  
147 and less on (typically white) traditional geoscience perspectives, we can create a more relevant  
148 and inclusive curriculum to students of all races and ethnicities<sup>25</sup>.

149

### 150 ***Representation***

151 We can invest resources in racially diverse promotional materials and ambassador schemes  
152 that reward outreach work<sup>4</sup> and do not disproportionately place the burden on BAME students<sup>26</sup>.

153 We can also support grass-roots initiatives to amplify BAME voices in geoscience (e.g. Black In

154 Geoscience and Black Geographers), and invite diverse Geoscience researchers to deliver

155 departmental seminars and showcase innovative science. Crucially, we must increase the

156 diversity of our faculty staff, by implementing BAME staff development opportunities (like

157 StellarHE) to counterbalance structural racism, mitigating underrepresentation and facilitating

158 career progression.

159

### 160 ***Subject awareness***

161 By working further back along the student lifecycle, we can make it easier for those from BAME

162 communities to connect with nature. Natural heritage organisations need to work closely with

163 community leaders to welcome and nurture positive experiences for BAME children and young

164 people in green spaces. Black2Nature camps run by youth campaigner and environmentalist

165 Mya-Rose Craig have opened pathways that have enabled young people from deprived areas in

166 Bristol to learn about birding, conservation and wildlife; universities can play a part in similar

167 activities through outreach.

168

### 169 ***Removing barriers***

170 A variety of practical steps can be taken to make fieldtrips more inclusive for ethnic minority  
171 students. By fully subsidising trips and equipment costs departments can remove barriers to  
172 students from low-income backgrounds. To ensure students feel safe from discrimination, field  
173 leaders can incorporate recommendations laid out by Anadu and others<sup>19</sup>, including racial risk  
174 assessments, antidiscrimination and allyship training, and full documentation of race-related  
175 incidents. Trips should be developed with a careful focus on the skills and learning outcomes  
176 needed for modern geoscience employment, with mitigations in place to allow all students to  
177 achieve them. Professional bodies should reform accreditation requirements around mandatory  
178 days in the field. We can create a more inclusionary space by promoting positive accounts and  
179 perspectives of fieldwork from minority groups, challenging and disrupting the dominant white,  
180 male image of fieldwork.

181  
182 Ring-fenced opportunities, such as funded research experiences, summer schools, internships,  
183 and studentships, are clear and evidenced pathways to increased chances of progression for  
184 underrepresented groups<sup>27</sup>. Working collaboratively with schools, colleges and other universities  
185 can make such initiatives more viable and increase their reach.

186  
187 We can hold funding organisations and institutions accountable for transparency in their  
188 recruitment processes<sup>13</sup> and form interview panels that understand these barriers, helping  
189 ensure improved diversity in successful applicants<sup>27</sup>. We can push for the publication of  
190 candidate demographic data at application, interview, offer and acceptance stages, to provide a  
191 clearer picture of postgraduate recruitment diversity<sup>13</sup>.

192

### 193 ***Effective, long-lived initiatives***

194 Initiatives do not end at recruitment. Allocating more resources to training in equity and  
195 inclusion, and creating more 'champions' of diversity to support the interests of minority groups  
196 and encourage reflection within Geoscience departments, would be a significant step forward in  
197 removing hostile environments.

198

199 To ensure our efforts are effective and long-lived, we must submit funding bids for evidence-  
200 driven action research that works to address data gaps, advocates for real change, and  
201 develops strategies to broaden participation. We can work with other subjects and bodies facing  
202 similar challenges, sharing transferable solutions across the HE sector.

203

204 Crucially, we need to acknowledge the hostile environments that deter BAME students from  
205 both applying to, and continuing with, our discipline. These problems are real and felt by  
206 many<sup>28</sup>. We must address personal and structural biases, and go beyond this to be actively anti-  
207 racist. The less diverse a field is, the more prevalent implicit biases become<sup>5</sup>. We must act now,  
208 and have those difficult conversations, to create a modern geoscience research culture that  
209 reflects the diverse nature of the planet we study.

210

211 **Acknowledgements:** Many thanks to Catherine Souch of the Royal Geographical Society,  
212 Liam Herringshaw, Lis Gallant and three Nature reviewers for positive and constructive  
213 feedback on this piece.

214

215 The authors declare no competing interests.

216

### 217 **Box 1 – The data**

218 While the absolute number of UK-domiciled students who identify as BAME (defined as 'Black',  
219 'Asian', 'Mixed' and 'Other' in UK Census and HESA ethnicity data) in UK Higher Education  
220 (HE) has grown by >150,000 since 2003, there remain pronounced disparities between white  
221 and BAME students in their retention into postgraduate research<sup>29</sup>. These disparities vary  
222 between disciplines, and between ethnic groups within the BAME identifier.

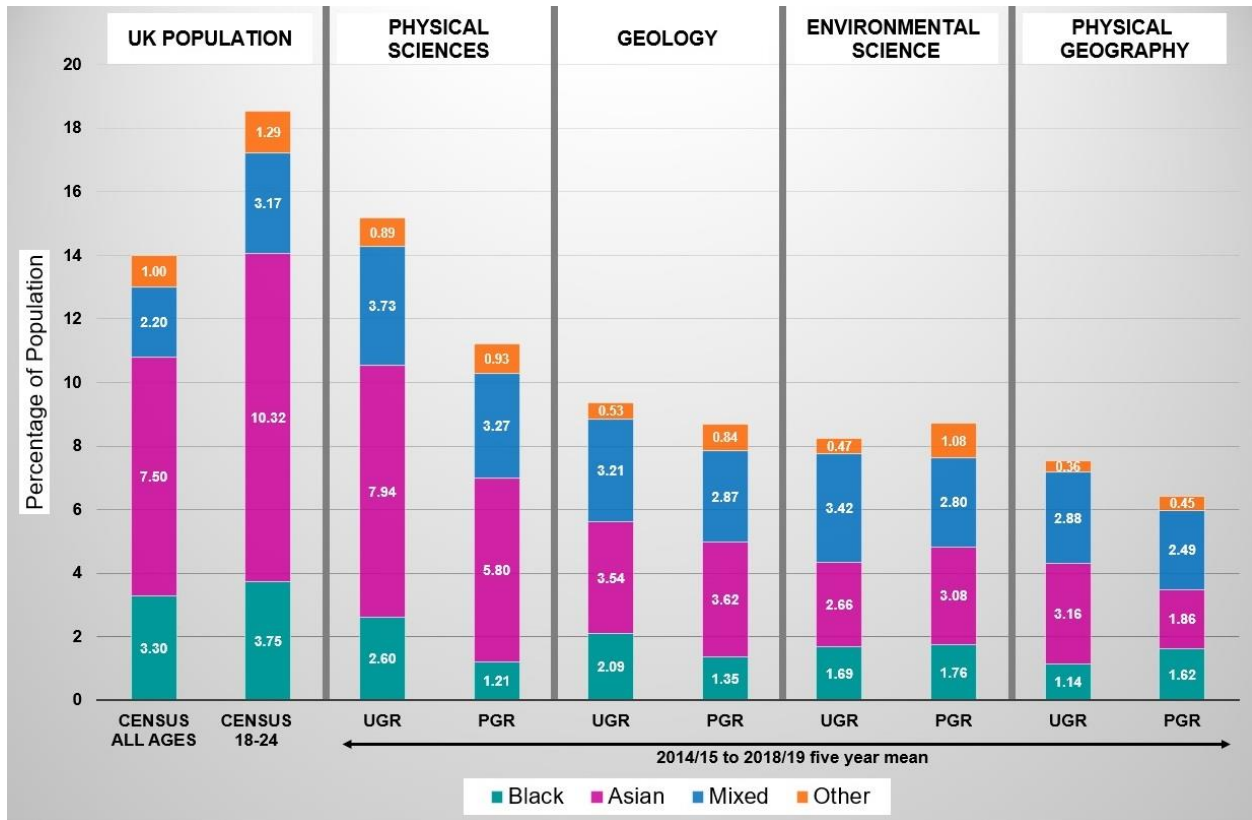
223

224 Physical Geography, Geology and Environmental Sciences are the three worst Physical  
225 Science subjects for BAME student undergraduate participation in UK HE, and are very poor for  
226 retention of these students into PGR<sup>6</sup>. In the 2011 UK Census, 18.5% of UK 18-24 year olds  
227 were from Black, Asian or Minority Ethnic backgrounds<sup>15</sup>. However, just 5.2% of Physical  
228 Geography, 6.86% of Environmental Science and 10.4% of Geology PGR students identified as  
229 BAME in 2018/19. These statistics are far lower than Physical Science subjects with the highest  
230 BAME PGR representation (22.5% in Materials Science and 14.8% in Chemistry).

231

232 On average, over the past 5 years just 1.4% of Geology PGR students were Black<sup>6</sup>, even  
233 though 3.8% of UK 18-24 year olds identify as Black<sup>15</sup>. During the last five years, there have  
234 been two years for both Geology and Physical Geography when **no** Black women took up full  
235 time PGR study. Retention of BAME Physical Geography and Environmental Science students  
236 into PGR was worse in 2018/19 than over the five years from 2014/15 to 2018/19 (mean  
237 averages shown in figure); the situation is not improving with time<sup>6</sup>.





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Representation of BAME (Black, Asian, Mixed and Other ethnic minorities) students in Physical Sciences, Geology, Environmental Science ('Science of Aquatic & Terrestrial Environments') and Physical Geography ('Physical Geographical Sciences') from Higher Education Statistics Agency data<sup>6</sup>, alongside ethnicity data from the 2011 UK Government Census<sup>15</sup>. HESA data are based on full-time "all undergraduate" (UGR) and full-time "postgraduate research" (PGR) categories and are a five-year mean average of data from 2014/15 to 2018/19.

*Notes on the data*

HESA publish 'subject of study by ethnicity' data broken down by level of study for 2014/15 to 2018/19 on their website<sup>6</sup>. Data from 1994/95 to 2014/15 are available<sup>30</sup>, but are not broken down by type of postgraduate study (research versus taught), or fully by ethnicity ("Mixed" and "Other" ethnic categories are grouped); this archive data is therefore not used here. We use the term "geoscience" here to group Physical Geography, Geology and Environmental Science (due to HESA categories), but recognise our recommendations are applicable to a variety of allied disciplines. Although we present quantitative data up front, we acknowledge that qualitative studies (some of which we reference herein), voices and insights are vital in this discussion.

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