

# Considering Intergroup Emotions to Improve Diversity and Inclusion in the Geosciences

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## **ABSTRACT**

The future viability of the geosciences is challenged, since as a community we continue to lack demographic diversity representative of the wider population. Fundamentally, dominant cultural, historical, and socioeconomic factors contribute to the lack of diversity and those factors typically change slowly over generations. Proposals for more immediate changes have had some effect but have not led to large-scale changes in the demographics of the geosciences. In this commentary, we discuss the concept of intergroup emotions and recommend its use as a strategy for improving diversity and inclusion within the geosciences. Intergroup emotions are emotions that arise as a result of an individual's identification with one or more social groups, which makes them particularly pertinent in the context of diversity and inclusion. While we call on the geoscience community to conduct discipline-based research in collaboration with educational and social psychologists, we argue that there is sufficient evidence to also begin implementing interventions in classrooms, laboratories, and in the field. We believe strategies based on intergroup emotions will make significant improvements in diversity and inclusion within the geosciences.

## 1.0 INTRODUCTION

The geosciences community is one of the least demographically diverse within science, technology, engineering, and mathematics (Velasco & de Velasco, 2010; Stokes et al., 2014; Glass, 2015; King et al., 2018; Vila-Concejo et al., 2018). This has been the case for decades as evidenced by calls for special issues on diversity and inclusion in the *Journal of Geoscience Education* (Riggs & Alexander, 2007; Gates et al., 2019) and funding granted by federal agencies such as the National Science Foundation (e.g., Opportunities for Enhancing Diversity in the Geosciences [OEDG] and Improving Undergraduate STEM Education: Pathways into the Earth, Ocean, Polar and Atmospheric & Geospace Sciences [IUSE:GEOPATHs]). While there is some indication that the gender gap has decreased over the past 40 years, racial and ethnic diversity has not improved, as quantified by the demographics of those who obtained Ph.D. degrees in the geosciences (Bernard & Cooperdock, 2018) and by analyzing photographs on geoscience department websites (Sexton, et al., 2014). In a recent report by the American Geosciences Institute, there is also clear evidence of ongoing attrition after geoscience degrees are awarded (Gonzales & Keene, 2020). As such, one of the Grand Challenges identified by Riggs et al. (2018) in their report “A Community Framework for Geoscience Education Research” is improving inclusion within the geosciences.

In this work, we use the term systemically non-dominant (SND) from Jenkins (2017) instead of the term “underrepresented minority.” By using the term SND, we are explicit in stating that systemic factors are primarily responsible for the lack of diversity and inclusion in the geosciences (for reviews, see Marín-Spiotta et al., 2020 and Núñez et al., 2020). With this we are encouraging the community to further move away from the older “deficit model,” which focused on what an individual lacked (e.g., self-efficacy (Baber et al., 2010) and social capital (Callahan et al., 2015)). While it may be true that those who are SND lack certain resources, those deficiencies are symptoms rather than causes. Rather, systemic factors, which we discuss in more detail below, are largely responsible for the lack of diversity within the geosciences.

Systemic factors pertaining to gender in the geosciences are discussed in several recent works. [Dutt et al. \(2016\)](#) found that letters of recommendation written on behalf of female postdoctoral researchers were of lower quality than those written for their male counterparts. There is a gender gap in terms of first authorship on geoscience journal articles ([Pico et al., 2020](#)) and journals of the American Geophysical Union had fewer female scientists conduct peer review of articles, due to both authors and editors inviting fewer female reviewers ([Lerback & Hanson, 2017](#)).

Additionally, systemic factors pertaining to race in the geosciences can compound systemic factors related to gender when a person belongs to multiple marginalized groups (i.e., intersectionality, see [Crenshaw, 1989](#)). [Clancy et al. \(2017\)](#) found that Women of Color in astronomy and planetary science reported the highest rates of negative experiences (including harassment and assault) in the workplace. Furthermore, [Ford et al. \(2019\)](#) found that SND researchers are less likely to be offered oral presentations at geoscience conferences, with SND women being the least likely group. For intersectionality applied to the geosciences, please see the recent work by [Núñez et al. \(2020\)](#).

There are also systemic factors pertaining to those with disabilities in the geosciences. [Atchison and Libarkin \(2016\)](#) surveyed participants at geoscience conferences and found that while perceptions about access varied depending on the type of disability, there were prejudices mentioned by participants such as, “Without some field experience, an individual with a geoscience degree/career is greatly disadvantaged.” These are a few examples of systemic factors affecting diversity and inclusion within the geoscience community.

Systemic factors that contribute to the lack of diversity and inclusion, even though they need to be changed, change slowly over generations. This is evidenced by the decades-long lack of improvement within the geosciences. Proposals for more immediate changes have shown some effect but have not led to large-scale changes in the demographics of the geoscience community. It is thus clear that alternative methods of improvement are necessary.

In this commentary, we bring focus to the individual in considering how systemic factors affect a person's emotions. Particularly, we consider intergroup emotions, which are emotions individuals experience as a result of their group membership being made salient in social interactions. We focus on negative intergroup emotions since they are particularly detrimental to efforts to improve diversity and inclusion within the geosciences. We also suggest that interventions using reframing may be useful tools for improvement. This commentary is intended to introduce intergroup emotions theory (IET) to the geoscience education community, to discuss examples of IET research and interventions, and to call for discipline-based research that can test the effectiveness of using IET for improving diversity and inclusion within the geosciences.

## **2.0 INTERGROUP EMOTIONS**

Emotions have been scientifically investigated for at least 150 years (e.g., [Darwin, 1872](#); [Barrett & Satpute, 2017](#)) and have been considered in educational settings for decades (see [Pekrun & Linnenbrink-Garcia, 2014](#)). Since emotions are complex and are studied from a number of perspectives including neuroscience (e.g., [Pessoa, 2008](#)), psychology (e.g., [Öhman et al., 2001](#)), and anthropology (e.g., [Anderson, 2011](#)), we need to be specific in our treatment of emotions in order to productively address diversity and inclusion in the geosciences. As such, here we bring focus to *intergroup emotions*, which can be defined as “emotions that arise [in an individual] when [they] identify with a social group and respond emotionally to events or objects that impinge on the group” ([Smith & Mackie, 2016, p. 412](#)).

Central to intergroup emotions is the vital concept of *identity*, which, to simplify, is the answer to the question: ‘Who am I?’ *Identity* can be divided into *personal identity* and *social identity*. *Personal identity* involves aspects of the psychological self that are unique to an individual, while *social identity* relates to an individual's group membership (e.g., race, ethnicity, biological sex, sexual orientation, gender, age, place of birth, marital status, disability, religion, and socioeconomic status). An individual would consider people as ingroup members when they

share one or more social identities and would consider others as outgroup members when they do not share social identities. Inspired by social identity theory (Tajfel, 1978) and self-categorization theory (Turner et al., 1987), researchers developed intergroup emotions theory (IET) over several decades (e.g., Mackie et al., 2000; Mackie et al., 2008; Ray et al., 2014). The crux of IET is that when group membership is made salient, emotions experienced by an individual tend to be dominated by intergroup emotions.

A number of studies have shown that emotions in intergroup settings can be destructive. For example, early work by DeSteno et al. (2004) showed that when anger was induced in participants during experiments, they showed automatic bias (viz. prejudice) towards outgroup members (who were only randomly assigned that role). Gordijn et al. (2006) showed that undergraduate students (who were residents of Colorado) deemed a fee increase aimed at out-of-state students to be unfair when they thought of themselves more as students, but fair when they thought of themselves as residents of Colorado. Similarly, Ray et al. (2008) found that undergraduate students were less angry and more respectful towards Muslims when they were conditioned to think of themselves as students, compared to thinking of themselves as Americans. These studies give credence to the possibility of altering perceptions based on intergroup emotions to improve diversity and inclusion. To that end, recent work in human resources considered the connection between intergroup emotions and diversity. Tufan et al. (2017) used IET to study how failure to meet diversity-related promises by employers resulted in higher anxiety and avoidant behavior by ethnic minority employees.

### **3.0 POSSIBLE INTERVENTIONS**

Diversity and inclusion in the geosciences require intergroup *contact* since it is crucial for people of different backgrounds to interact with one another. Both direct interaction between members of different social groups (Pettigrew & Tropp, 2006) and indirect (i.e., vicarious) contact

(e.g., [Vezzali et al., 2019](#)) can improve relations. Nevertheless, daily human conflicts from around the world demonstrate that intergroup contact alone is not sufficient to improve relations.

Effective means of improving intergroup relations are still developing (e.g., [Schellhaas & Dovidio, 2016](#) and references therein), but it is important to consider a few nascent strategies that may help in the context of geoscience education. Previous works showed there to be less bias towards outgroups when individuals are designated into multiple groups (i.e., *multiple categorization*) than when they are classified into two dichotomous groups (e.g., [Crisp et al., 2001](#)). Another strategy of reducing bias is to encourage people to classify themselves and their outgroups into a *superordinate common ingroup* (e.g., human beings or college students; [Gaunt, 2009](#)). [Albarello and Rubini \(2012\)](#) found that combining those two methods was the most effective way of lessening dehumanization of those who identify as Black. As we qualified earlier, while these methods have been shown to work, they are not invariably effective. For instance, [Schellhaas and Dovidio \(2016\)](#) noted that the process of recategorization into a superordinate common ingroup is not effective when a group feels that they are losing their identity in the process. As such, an effective strategy may be to encourage seeing commonalities between groups while being careful not to discourage group identifications. Experiments by [Bruneau and Saxe \(2012\)](#) support another strategy to improve intergroup dynamics. They suggest that attitudes toward outgroups can be improved when members of the dominant group (e.g., White Americans and Israelis) are ‘perspective-taking,’ while those in the nondominant group (e.g., Mexican immigrants and Palestinians) are ‘perspective-giving.’ These three intergroup interventions (i.e., multiple categorization, superordinate common ingroup, and perspective-taking/giving) are listed in [Table 1](#) (see [Section 4.0](#) for recommendations).

There are other interventions that have not yet been explicitly connected to intergroup emotions that may be helpful for improving diversity and inclusion in the geosciences. An example is building trust. Consider that SND students likely come into an institution with mistrust due to past unfair experiences in academic settings (e.g., [Okonofua & Eberhardt, 2015](#)). [Yeager et al.](#)

(2017) note that an institution is seen as trustworthy when it is recognized by an individual to be “procedurally just” in that it is fair, and the institution has “personal regard” in that they care about the wellbeing of that person. In their study, they found that African American and Latino/a/x middle school students’ awareness of bias was predictive of their decrease in trust in the institution. Another intervention is to provide specific encouragement to SND students. Yeager et al. (2014) found that African American students who were provided feedback along with specific encouragement that indicated the instructor was giving feedback because they knew the student was capable of high achievement were more likely to persist and performed better than those who only received feedback on their schoolwork. Future research should explore these and other interventions that can help improve intergroup emotions among SND students in the geosciences.

#### **4.0 RECOMMENDATIONS FOR GEOSCIENCE EDUCATORS AND RESEARCHERS**

We encourage geoscience educators to begin by reflecting on their current teaching practices and the departmental or university contexts within which their teaching occurs. The simple step of recognizing that student emotions, including the kind of intergroup emotions discussed in this commentary, are an unavoidable dimension of teaching and learning may help instructors identify ways that their teaching practices could encourage participation among SND students. We encourage educators to consider implementing intergroup emotions-based interventions that we have outlined.

We do recognize that it will be challenging for educators to implement intergroup emotions-based practices on their own. To that end, it is vital that we as a community conduct discipline-based research on intergroup emotions and work to develop evidence-based pedagogies that provide specific emotional support for SND students. Research on first- and

second-year SND undergraduate students is an important area of focus since early (potentially negative) experiences may be particularly potent and since just over 50% of graduates with a bachelor's degree in the geosciences declared their major during those two years (Wilson, 2018). Research could also collect and examine the experiences of undergraduates, alumni, and, importantly, SND students who have left geoscience programs. These data could speak to the salience of intergroup emotions discussed in this commentary and provide a foundation for future interventions. Since this work is inherently interdisciplinary, we strongly recommend collaborating with researchers from educational and social psychology who have extensive expertise in emotions and intergroup relations. We have concise recommendations for geoscience educators and researchers listed in Table 1 for each of the three intergroup interventions (i.e., multiple categorization, superordinate common ingroup, and perspective-taking/giving) that we discussed in Section 3.0.

## **5.0 CONCLUSIONS**

The importance of emotions has been well-established both in educational psychology research and in pedagogy. Nevertheless, emotions are not sufficiently discussed in the context of diversity and inclusion within the geosciences (e.g., Gates et al., 2019) nor, more generally, among universities (e.g., ASU Diversity Plan, 2018; JHU Progress Report, 2018). In this commentary we focus on emotions, specifically how considering intergroup emotions may help improve diversity and inclusion in the geosciences. We believe that geoscience educators and researchers can take steps within this framework to work toward greater diversity and inclusion in the geosciences. As such, we strongly recommend incorporating the IET in future geoscience pedagogy and research in the earnest hope that within the next decade the geosciences will have made significant strides to become one of the most diverse and inclusive fields within STEM.

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