DIVERSITY AMONG EDITORIAL BOARDS OF *ELEMENTS* AND OTHER SELECTED GEOCHEMISTRY, COSMOCHEMISTRY, MINERALOGY AND PETROLOGY JOURNALS

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The publication of scientific work is foundational to our disciplines. To ensure equitable publication standards during the global flow of knowledge production, professional societies and publishers must take positive steps to avoid biases that might hinder the publication of scientific work (see Liévano-Latorre et al. 2020). Biases among editors and reviewers can be unconscious and be influenced by different aspects of an author's identity: country of origin, first language, affiliation, gender identity, ethnicity, and/or other factors. These biases could result in challenges to publication rates and visibility in key journal forums for under-represented groups (Lerback et al. 2020). Ensuring that there is diversity in the peer review and publishing process, and on editorial boards, may help to eliminate bias.

Diversity promotes innovation from hypothesis through peer review to final publication (e.g., Hofstra et al. 2020) and should be set as a new standard, as shown by the Royal Society of Chemistry (https://www.rsc.org/new-perspectives/talent/joint-commitment-for-action-inclusion-and-diversity-in-publishing/). Personal identity has an impact on how we engage with our science; it impacts how we approach a problem, and what we value, study, and write. It influences how we select reviewers, how we review, and, ultimately, what is successfully published. Therefore, the limited diversity of major editorial boards will act as a barrier to representation of all academic members. The members of editorial boards shape the direction and success of a journal, and they influence the authorship of papers and what is published within the journal. Differences in scientific networks may be a core reason for the persistence of implicit bias from editorial boards, particularly with regard to gender (Hanson et al. 2020). Therefore, editorial bias, or perceived editorial bias, can exclude certain groups and exacerbate historical inequities regarding under-representation of entire continents within the geoscience literature (e.g., Africa, see North et al. 2020). Hence, for an editorial board to be inclusive and unbiased, it needs to be as diverse as the research community it represents, which we know does not exactly reflect the general population.

In this piece, we provide an exploration of diversity among editorial boards by presenting data for *Elements* in terms of gender and geographic affiliation. We further compare these data with editorial board data from journals that are published by the societies that jointly publish *Elements* (hereafter termed the "journals of the participating societies").

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Historically (from 2005 to 2021), 19 principal editors (PEs) have served with *Elements*: among them, four were women (21%). In the past 10 years, there have been 11 PEs, 3 of which have been women (27%). These numbers, though falling short of gender parity, are representative of the proportion of the mid- to late-career women in the field and are indicative of the wider challenges to diversity in our discipline. The executive editor is also considered part of the editorial board: both executive editors have been women. So, *Elements*' editorial board (executive and principal editors) has always had 25%–50% women at any one time. All serving editors are white and are affiliated with institutions in Northern America (n = 13; 62%; USA and Canada) or Western Europe (n = 8; 38%; UK, France, Germany, Denmark).

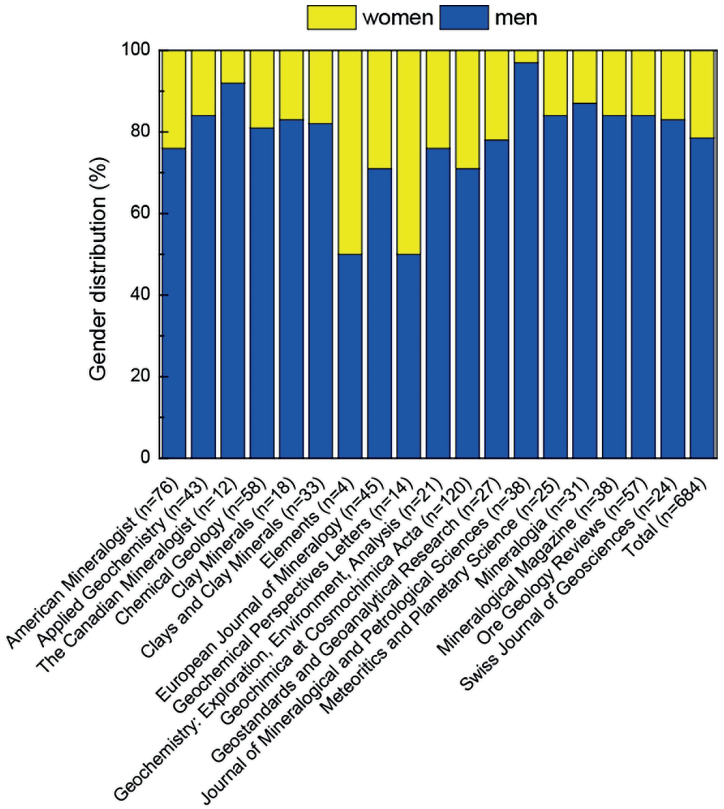

FIGURE 1 Gender breakdown of editorial board members from selected journals; data accessed on journal websites on 8 April 2021. Editorial board members were assigned a binary gender using first names and, in some cases, based upon the authors' own perceptions and knowledge. Abbreviation: n = number of editorial board members. There are two notable limitations to this analysis: (i) it may misgender people; (ii) gender is not binary, and non-binary people were not included in this first-stage analysis due to lack of available information.

Examination of the editorial team among the journals of the participating societies highlights the pervasiveness of a lack of editorial diversity within our field (17 journals published and edited by various commercial publishers and learned societies) (FIG. 1). Here, we identify that, as of April 2021, the current editorial boards span a range of gender representation from 7 (50%) men and 7 (50%) women for *Geochemical Perspectives Letters* to 37 (97%) men and 1 (3%) women for the *Journal of Mineralogical and Petrological Sciences*. Of the 683 editorial board members in total, 142 (21%) are women and 539 (79%) are men. These numbers are comparable to the February 2021 Elsevier Benchmark Gender Diversity distribution of portfolio editors across the fields that Elsevier term "Geochemistry & Planetary Science" (25% women, 74% men and 1% preferred not to disclose) and "Applied Geosciences" (14% women, 86% men). It must be noted that numbers from Elsevier are from an incomplete voluntary survey of the editors, yet these do provide a good indication of gender distribution. Moreover, in some of the journals (i.e., those with larger editorial boards), turnover happens more quickly and, thus, numbers can fluctuate up to a few percent in six months.

As with gender distribution, geographic distribution is also strongly biased (FIG. 2). A given country is based on the affiliation of editors and implicitly may create a bias when an editor originates from one country and moves to another country. Journals such as *Chemical Geology* (36% from Northern America, 41% from Western Europe, 2% from Sub-Saharan Africa, 2% from Northern Africa and Western Asia, 2% from Central and Southern Asia, 5% from Eastern and South-Eastern Asia, and 12% from Oceania) and *Geochemistry: Exploration, Environment, Analysis* (14% from Northern America, 10% from Latin America and the Caribbean, 38% from Western Europe, 10% from Eastern Europe, 5% from Sub-Saharan Africa, 10% from Eastern and South-Eastern Asia, and 14% from Oceania) are the more geographically diverse, whereas *Elements* (75% from USA and 25% from Western Europe), *Journal of Mineralogical and Petrological Sciences* (79% from Japan) and *Swiss Journal of Geosciences* (79% from Switzerland) are more limited in geographic representation among editors. Such differences, in spite of ongoing efforts by participating societies to progress scientific excellence via improved diversity and inclusion, may be explained by unconscious bias arising from legacy influences and the current management of expectations for editorial roles. Most journals are published in English and editors are expected to be native or fluent in English; therefore, most editorial boards would consist of individuals who originate from countries where English is an official language (e.g., United Kingdom, United States). Moreover, the regional scope of some journals, such as the *Swiss Journal of Geosciences* (readership from Switzerland) and *Journal of Mineralogical and Petrological Sciences* (readership from Japan), can also explain a distribution biased towards a specific region.

Overall, editorial board members are predominantly from Western Europe (39%), Northern America (29%), Eastern and South-Eastern Asia (16%), and Oceania (5%). If we look at gender distribution among regional groupings, Latin America and Caribbean editorial board members are 46% women and 54% men (but represent less than 2% of the total), whereas Northern America and Western Europe have a distribution of 23%–77% women and 26%–74% men. Eastern and South-Eastern Asia distribution is far less balanced: 5% women and 95% men. The observed differences in gender distribution likely reflect regional or local progress towards gender equality (Hori 2020).

The results presented in this Triple Point show that there is a persistent diversity imbalance in editorial boards compared to the research community as a whole, something that was identified more than a decade ago by Mukasa (2009). This inequitable representation is being exacerbated because our community demographics do not demonstrate gender

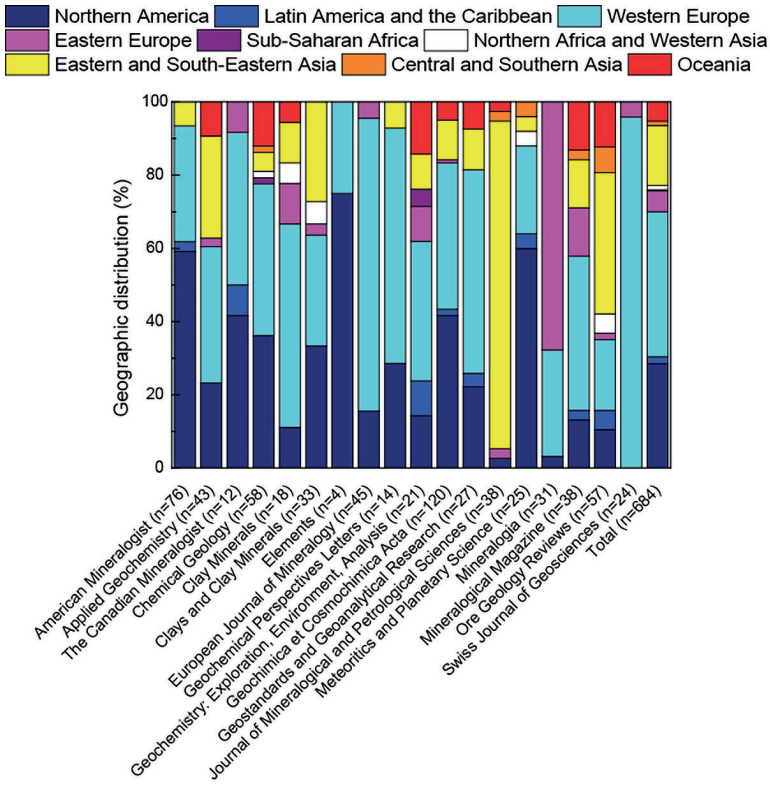

FIGURE 2 Geographic distribution of editorial board members by journal, with regional groupings based on indicators of sustainable development goals; data accessed from journal websites on 8 April 2021. Editorial board members were assigned a region using the country of their affiliation. Abbreviation: n = number of editorial board members.

or racial parity (Bernard and Cooperdock 2018; Pourret et al. 2021) and because women are also under-represented as first authors relative to their representation in the field of geoscience (Pico et al. 2020). Scientific excellence may suffer as a consequence of this imbalance. There needs to be more women and under-represented groups in the field (which is happening, albeit slowly), and there needs to be an equity lens used for assigning workloads (rewards and professional progression) that reflects different service loads. Otherwise, it is inevitable that early career, mid-career, and senior scientists from under-represented groups will have to carry unduly heavy workloads in order to fill the diversity needs of committees and editorial boards. It is not uncommon for invitations to serve on an editorial board to be rejected by women and scientists of under-represented groups because they are already too busy with other service activities that may provide more immediate community and professional benefit.

To improve scientific excellence and diversity, journals could implement the following:

(1) Set up a diversity working group that can help identify potentially qualified editorial board members and editors-in-chief, while also targeting an increase in diversity.

(2) Editors-in-chief may invite identified people (see point 1) to join their editorial board when a position is available (no necessity of expansion, but growth may accelerate the changes). They should emphasise their results and efforts toward diversity/equity/inclusion at the journal's society meetings and in doing so educate members about editorship diversity.

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A BRIEF HISTORY OF MINERAL SYMBOLS

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Laurence N. Warr

At some stage you may have abbreviated the name of a mineral when writing a thesis, report, or publication. This could have been for a common mineral such as quartz (Qz) or muscovite (Ms). But there are some more notoriously long mineral names for which a shortened version can be rather useful. Take, for example, the 34 letter-long potassic-magnesio-fluoro-arfvedsonite (usefully abbreviated to "Pmfarf", where "arf" represents "arfvesonite"). Our friends the chemists long ago got their act together and developed a universally accepted system for abbreviating the chemical elements in a system that uses either one or two letters as symbols. This scheme was first proposed by chemist Jöns Jacob Berzelius (1779–1848) and is still applied over 200 years later under the auspices of the International Union of Pure and Applied Chemistry.

So, what about minerals? Adopting the very same idea of using letter symbols as abbreviations, Ralph Kretz (University of Ottawa, Canada) presented a pioneering short paper in 1983 entitled "Symbols for rock-forming minerals". Known as Kretz symbols, he used two- or three-letter symbols to represent 192 of the more common mineral species. This list was later modified and updated to 371 minerals by Whitney and Evans (2010), which today has become the more widely applied set of abbreviations.

However, the buck didn't stop here. Because available abbreviation listings are recommendations rather than rules, there has been a bit of a free-for-all in abbreviation use by the mineral community. According to a survey of published clay mineral abbreviations conducted in 2020 (Warr 2020), only 30% of authors used the recommended Kretz symbol for kaolinite ("Kln"). For this mineral, and for many other common species, there were no less than 8 different symbols in use for the same name. And what about the many minerals that have not been allocated a recommended abbreviation? Currently, there are over 5,700 approved minerals but less than 18% have been included in any published list of symbols.

Things, however, are set to change. The Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA) has recently approved a complete list of >5,700 mineral symbols that cover all approved IMA mineral species (Warr 2021). This listing is 91% compatible with Kretz (1983) and 97% compatible with Whitney and Evans (2010). In the future, any new symbols for new minerals will need to be approved simultaneously by the CNMNC committee and be reported in related publications (e.g., Mills 2010; Pasero 2021). This step will finally bring us a universally consistent system of standardized minerals symbols that will be compatible with the very same system used for the chemical elements.

For fun: there are 30 natural elements listed as minerals. Can you work out which ones?*

Happy symbolizing.

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* Elements listed as minerals are Al, Sb, As, Bi, Cd, Ce, Cr, Cu, Au, In, Ir, Fe, Pb, Hg, Ni, Os, Pd, Pt, Rh, Ru, Se, Si, Ag, S, Te, Sn, Ti, W, V, Zn

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(3) Individual editorial board members may give personal encouragement, and act as mentors, to potential editors who are of diverse backgrounds and identities.

(4) Ask scientists from under-represented groups how they could be supported in order to participate on an editorial board, for example through workloads that are set using principles of equity.

(5) Journals editorial boards present an infographic of diversity of the editorial board and/or the geographical scope of the published articles. This may attract attention from diverse researchers, as well as raise awareness of diversity/equity/inclusion in the scientific publishing space.

One-time actions to tackle diversity are not enough. Journals must monitor the impact of new diversity efforts to ensure real change is happening on their boards.

Recent shifts towards more equal gender and geographic representation for *Elements*, *Geochemical Perspectives Letters* or *Geochimica et Cosmochimica Acta* are very encouraging, but this is not the case for all the journals from the participating societies. Achieving representative diversity on editorial boards needs sustained effort. Furthermore, we recommend that the editorial boards of the journals published by *Elements* participating societies should consider prioritizing and establishing a mentoring approach to address negative and unconstructive critiques of articles. Finally, the barriers to publishing must be minimized. This is particularly important given the unequal impacts of the COVID-19 pandemic on submissions by men and women and their geographical location of origin.

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