Evolution of diversity in the editorial boards of *Geochimica et Cosmochimica Acta* and *Chemical Geology*

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Abstract

Background: Editorial board members of academic journals are often considered gatekeepers of knowledge and role models for the community. Editorial boards should have sufficiently diverse backgrounds to facilitate the publication of manuscripts with a wide range of research paradigms, methods, and cultural perspectives.

Objectives: This study critically evaluates changes in the representation of binary gender and geographic diversity over time for the editorial boards of *Chemical Geology* and *Geochimica et Cosmochimica Acta*. These are the two flagship geochemistry journals from the European Association of Geochemistry and the Geochemical Society - Meteoritical Society partnership, respectively.

Methods: Composition of editorial boards was taken from the first issue of the year in question and editorial board members were coded for country of affiliation (country of origin may be different) and binary gender.

Results: Gender parity, limited to men and women, and geographic representation of the editorial boards of *Chemical Geology* and *Geochimica et Cosmochimica Acta*, have steadily increased between the late 1980's and 2021. However, geographic distribution remains largely dominated by affiliations from North America and Western Europe. The Editor-in-Chief or board of editors have a significant impact on the level of diversity of the editorial board. With nearly every newly appointed editor, both geographic and gender diversity may evolve. However, the persisting substantial underrepresentation of editorial board members from affiliations outside of North America and Europe is of concern and needs to be the focus of active recruitment and ongoing monitoring. This approach will ensure that traditionally low levels of geographic diversity are mitigated and representation of our global communities is improved and maintained in the future.

Conclusions: Improving diversity and inclusion among editorial boards as well as strengthening journal and disciplinary reputations will reinforce one another. Instituting a rotating editorship with an emphasis on embedding broader geographic networks and more

equitable international recruitment could ensure sustained and improved geographic, gender, and wider representation. In consequence, this approach may lift scientific originality and the quality of published research.

Keywords: editorial boards, gender diversity, geographic diversity, geochemistry

Introduction

Editorial board (EB) members of academic journals have significant influence on what is published and, hence, what informs theory development, research, methods and practice (Harzing and Metz, 2013; Boerckel et al., 2021). Therefore, EBs should have sufficiently diverse backgrounds to ensure the publication of research that covers a wide range of scientific paradigms, methods and cultural perspectives (Demeter, 2020). Indeed, Cummings et al. (2021) expect greater diversity of editorial board members and authors will lead to better knowledge production because "cognitive diversity represents progress and improvements to our pool of knowledge."

A recent study across 18 journals in geochemistry, cosmochemistry, mineralogy and petrology (including *Geochimica et Cosmochimica Acta, GCA* and *Chemical Geology, CG*), shows that the number of people among studied EBs in 2021 range from 4 to 120 (average of 38) of which 21% of EB members are women and 79% are men. Another key finding was that these EB members are affiliated primarily with institutions in Western Europe (39%), North America (29%), Eastern and South-Eastern Asia (16%), and Oceania (5%) (Demeter, 2020; Pourret et al., 2021b).

Historically, geochemists have published much of their work in journals affiliated with professional societies such as the *Geochemical Society* (GS) and the *European Association of Geochemistry* (EAG) (Holland and Turekian, 2013). Hence, giving the governance and

practices of these two journals significant influence over the geochemical discipline. The first issue of *GCA* appeared in 1950, and when the GS was founded in 1955 it adopted *GCA* as its official publication in 1957. Later, in 1970, *GCA* also became an official journal of the *Meteoritical Society*. A joint publication committee supervises the oversight of the journal *GCA*, which includes approval of associate editors. The first issue of *CG* appeared in 1966 and it became the journal of the EAG, after its foundation in 1985. At its inception, the journal *GCA* was driven by a board of three directors and since the early 1970's by a solo Editor-in-Chief (EiC), whereas *CG* was led by a single EiC until 1985, after which the EiC was replaced by a board of directors (ranging from 4 to 9 in number).

This study looks in detail at changes in inferred binary gender and geographic diversity of EB members over time for *GCA* and *CG*, the flagship journals for the GS and EAG, respectively. An assessment of both gender and geographic diversity of these journals is timely to identify deficiencies and suggest interventions to make geochemistry, in this instance the publication of research, more diverse, inclusive, and equitable.

Methods

Journals EBs' compositions were compiled from the first issue of each year (from 1965 to 2021 and 1950 to 2021, respectively, for *CG* and *GCA*) and all EB members were coded for country affiliation and binary gender. Following the method of Cummings and Hoebink (2017), all members of the academic EBs of journals were included regardless of title (e.g. Editor, Editor-in-Chief, Associate Editor, Assistant Editor, Editorial Board, etc). Guest editors were not included. This approach does not include individuals who were invited to board roles but declined, since no such information is available. The number of articles and country of authors' affiliation of articles published in *GCA* and *CG* were assessed using the Scopus database.

We focus our analysis on editors' country of affiliation. Country was determined based on the EB member's university affiliation. This coding method is unlikely to accurately reflect the nationality of the EB member in question, because an editor could be affiliated with a university in a country that is different from their country of origin (nationality). Without collecting personal information about an editor's nationality, which may be unavailable or protected by privacy laws, it is impossible to establish editor nationality. Thus, while a study of editor nationality would be of great interest, it is beyond the scope of this contribution. Editorial board members were then assigned a region using the country of their affiliation, with regional grouping based on the geographic regions defined under the Standard Country or Area Codes for Statistical Use of the United Nations Statistics Division (https://unstats.un.org/unsd/methodology/m49).

Binary (*i.e.* woman or man) gender was determined based on the EB member's given name, wherever possible. If first/given names were gender neutral, gender was inferred through an Internet search. This approach has important limitations, in that in some cases inferred gender could be inaccurate. However, this first-stage analysis could not consider those with minority gender identities, (*e.g.* non-binary or transgender people), due to a lack of available information. This could be due to an absence of information available on editor's gender identity, lack of editors with minority gender identities, or non-disclosure of gender identities of editors. With the possible exception of trans-gender, minority gender identities (*e.g.* non-binary) have only in recent years become more widely accepted in a number of countries. This evolution could in the future mean that (i) more people may realize they do not identify as man or woman and (ii) more people may publicly identify as having a gender identity other than man and woman. Similarly, data on groups such as Black, Asian and minority ethnic (BAME), Black, Indigenous, and other Black, Indigenous, and people of color **(**BIPOC), lesbian, gay, bisexual, transgender, intersex, queer (LGBTIQ+), other facets of identity (e.g. disability, socio-economic background) and intersections thereof have never been collected and are currently prohibitively difficult to assemble retrospectively for both

journals. Critically, efforts on the collection of data on these attributes should be made - at present and in the future - so that they can be taken into consideration when developing and proposing interventions to remove cultural and systemic barriers to diversity and inclusion, in turn strengthening community representation in geochemical science.

The data underpinning the analysis reported in this paper are deposited at https://doi.org/10.5281/zenodo.7110935.

Results

Size of the editorial board

Figure 1 summarizes the size of the EBs through time as well as the number of articles published. The figure shows an obvious increase in the size of the EBs of both *GCA* and *CG*, and of the total number of articles, which illustrate the diversification of the subfields in geochemistry. Between 1950 and 2021, the size of *GCA* EB increased 20-fold, from 6 to 120 members. In particular, a substantial increase in the membership size took place in 1973, 1990, 2000, 2013 and 2020, while 1998 saw a significant decrease of EB members which was preceded by a change in EiC. The size of *CG* EB evolved from 27 in 1966 to 100 in 2017, with a major drop to 7 in 1985 that coincided with the creation of the EAG. Since the establishment of the journals, *CG* EB had 286 different members with 144 in the last 10 years (2012-2021), whereas *GCA* had 445 different members with 217 in the last 10 years.

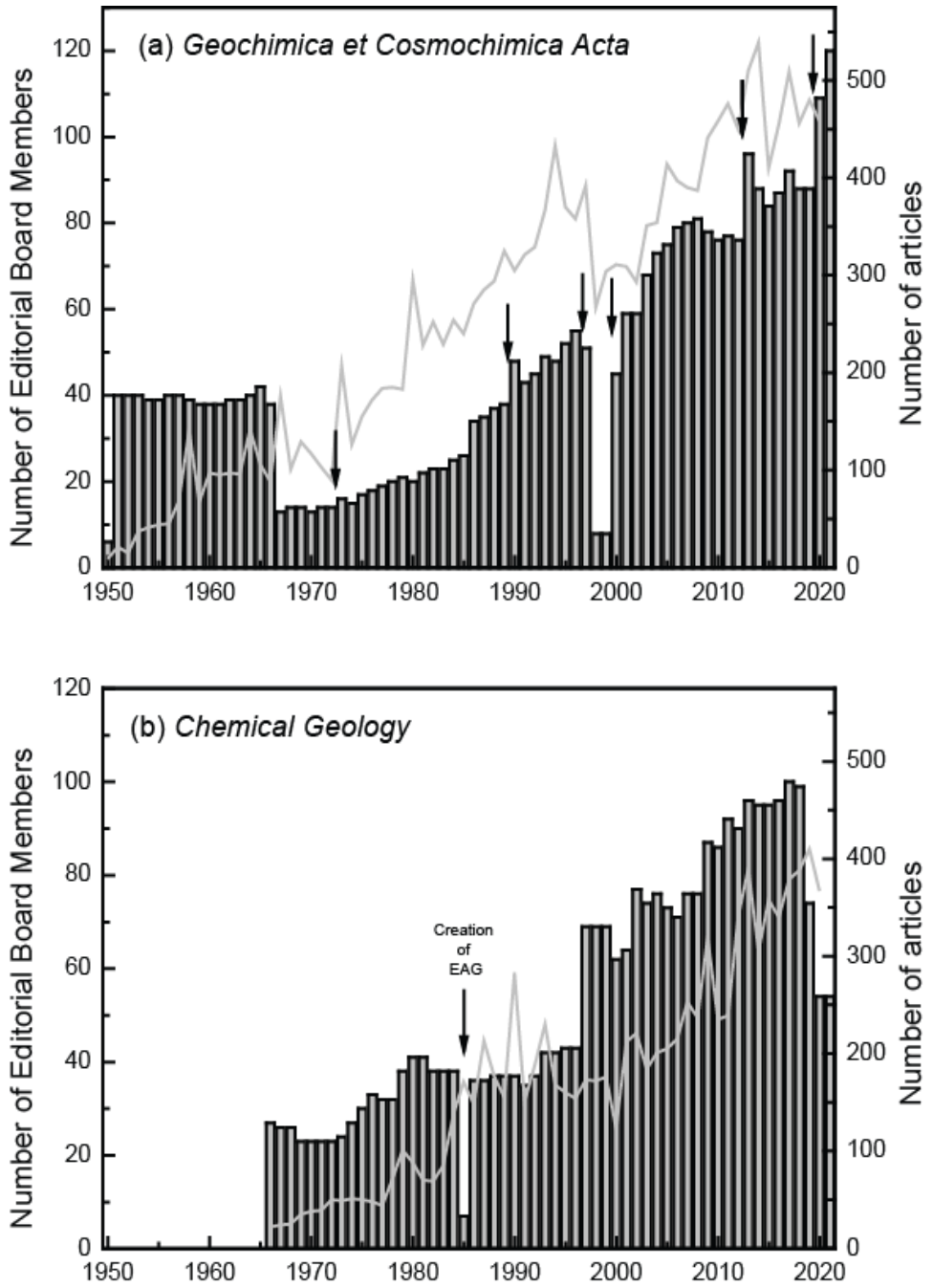

Figure 1 Left panel: size evolution of (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology* editorial boards over time. Black arrows in (a) correspond to the change of Editor in Chief. Right panel (grey line) evolution of number of published articles (data accessed on Scopus on 07/01/2021).

Geographical diversity and gender divide

Figure 2 summarizes the geographic diversity of (a) *GCA* and (b) *CG* EBs. During the first decade, after its inception, the majority of *GCA* EB members were affiliated with institutes in Europe (>70%) with the remaining EB members largely affiliated with institutes in North America (~20%) and substantially less affiliated with institutes in Eastern and South-Eastern Asia and other regions (including Middle East, North & Sub-Saharan Africa, and South & Central America) (<10%). After the formation of the *GS*, the proportion of EB members affiliated in Europe and North America reversed within 15 years. During most of the 1970's, 1980's and 1990's, EB consisted of 70-90% of editors affiliated with institutes in North America, 10-20% in Europe, <10% in Oceania and other regions, and 0% in Eastern and South-Eastern Asia. In the late 1990's this started to change, first concomitant with the large decrease of *GCA* EB size (Figure 1a) the proportion of EB members from Europe decreased to <5% and from Oceania increased to >10%. When the EB size increased again, this reverted back to approximately the proportions from before the EB decrease. Over the following two decades, between 2000 and 2021, the proportion of North American EB members steadily decreased from 70% to 40%, while the proportion of European EB members increased from 10% to 40%. During this period, the proportion of EB members of the remaining regions fluctuated between <5% and 10% (Oceania and Other regions) and 0% and 5% (Eastern and South-Eastern Asia). Finally, beginning in 2020 the proportion of Eastern and South-Eastern Asian EB members rapidly increased to 11%.

For *CG*, the proportion of EB members from North America and Europe have fluctuated between ca. 35% and 50% since 1966 (Figure 2b) and from Oceania between 4% and 17% for *CG* (with 11% in 2021). There was a markedly low number of EB members from Oceania around 1985, concomitant with the decrease in the EB size (Figure 1b), which occurred when the EAG was formed and *CG* became the journal of the EAG. At this time the EiC was replaced by a board of directors. Editorial board members for *CG* from other regions and

Eastern and South-Eastern Asia fluctuated between 0% and 10%, with Eastern and South-Eastern Asian EB members peaking at 14% around 1985 (when the EAG was formed).

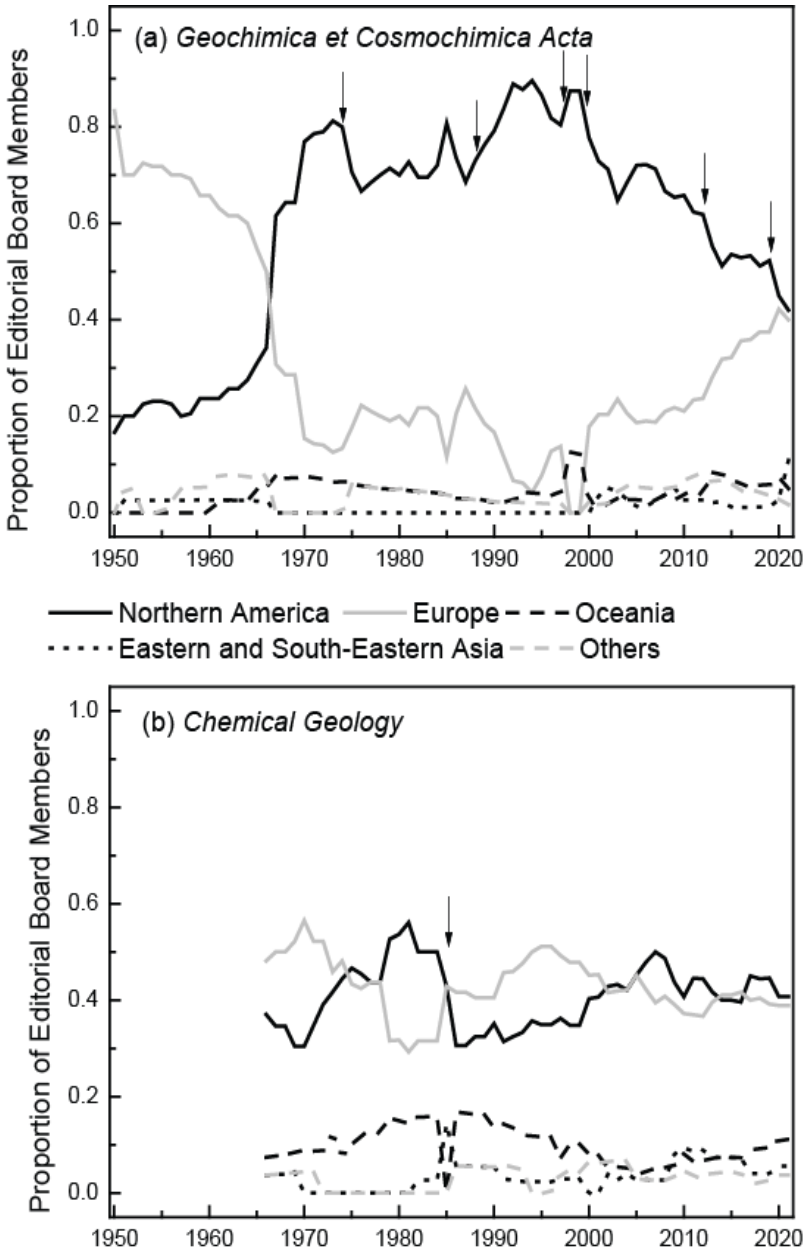

Figure 2 Evolution in geographic diversity of (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology* editorial boards over time. “Others” category corresponds to Latin America and the Caribbean, Sub-Saharan Africa, Northern Africa and Western Asia, and Central and Southern Asia. Black arrows in (a) correspond to the change of Editor in Chief and in (b) to the creation of EAG.

Overall, *GCA* and *CG* have always had a geographically diverse EB, if we consider the number of countries represented (>15). However, even if there was an increase of the EB size for *CG* from 20 to ca. 60 between the beginning and the mid 2000's, there was no significant change in geographical proportions during this period. Albeit, *GCA* has substantially increased its geographic diversity since 2005 (when it had a >70% North America board membership). The large non-North American board membership accompanied the substantial increase in the EB size between 2012 and 2021 (from 76 to 120).

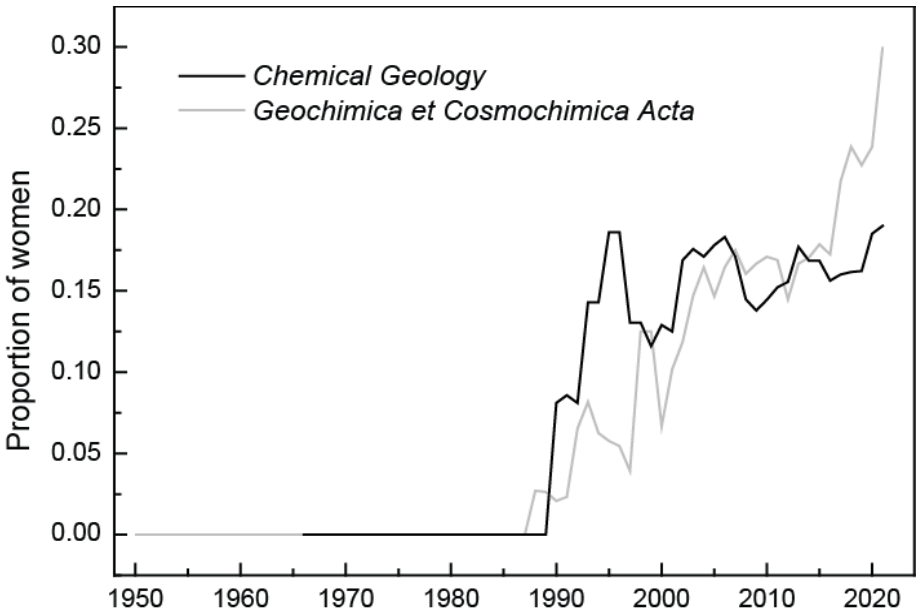

Figure 3 Evolution of proportion of women in *Geochimica et Cosmochimica Acta* and *Chemical Geology* editorial boards over time.

Before the late 1980's, *GCA* and *CG* EBs were exclusively composed of men (Figure 3). It was only at the end of the 1980's that women editors started to be present on these boards, and the gender diversity of each journal has since evolved (Figure 3): the first woman was appointed to *GCA* EB in 1988, whereas three women were appointed to *CG* EB in 1990. The proportion of women on *GCA* EB has steadily increased, reaching 15% in the early 2000's

and 30% in 2021; whereas, after a rapid increase in the 1990's, it stabilized and fluctuated between 13% and 18% for *CG.*

Discussion

Increasing diversity of EB membership to represent the academic and general population at large is the right and just thing to do. Plus, diversity promotes innovation from hypothesis through peer review to final publication (Hofstra et al., 2020), and should be set as a standard for scientific quality, as emphasized by - for example - the Royal Society of Chemistry (2022). Personal identities (including racial identity, nation of origin, physical, mental and learning (dis)ability, and LGBTIQ+ and gender identity) and lived experiences (e.g. poverty, bullying, marginalization, racism, homo/biphobia, transphobia; EAG DEI Committee, 2021) all affect how we engage with our science; these factors influence how we approach a problem, process and connect information, what we value, study, and how and what we write. Identity influences how we select journals and corresponding associate editors and suggest reviewers, how we review, and ultimately what is successfully published (Goyanes and Demeter, 2020).

Editorial board members are usually academics who have authored and reviewed publications for a particular journal (Walters, 2016). Articles published in *GCA* and *CG* were historically written predominantly by researchers from North America and Europe. Since the 2010's, a marked increase of articles written by researchers from Eastern and Southern Asia can be observed (data not shown). Moreover, Pico et al. (2020) show that 28% of first authors of articles from 2013 to 2019 in *GCA* were women.

In 2020, as depicted on Figure 4, a relationship between the number of articles and the number of EB members from a geographic region becomes discernible. There are two contrasting sets of data that deviate from the 1:1 reference line. While North America contains proportionally more EB members, the proportion of articles published by Asian

authors in 2020 compared to 2010 is notably higher than the corresponding percentage of EB members. This finding may represent the growing scientific community in Asia, and emphasizes how Asian scientists are under-represented on EB.

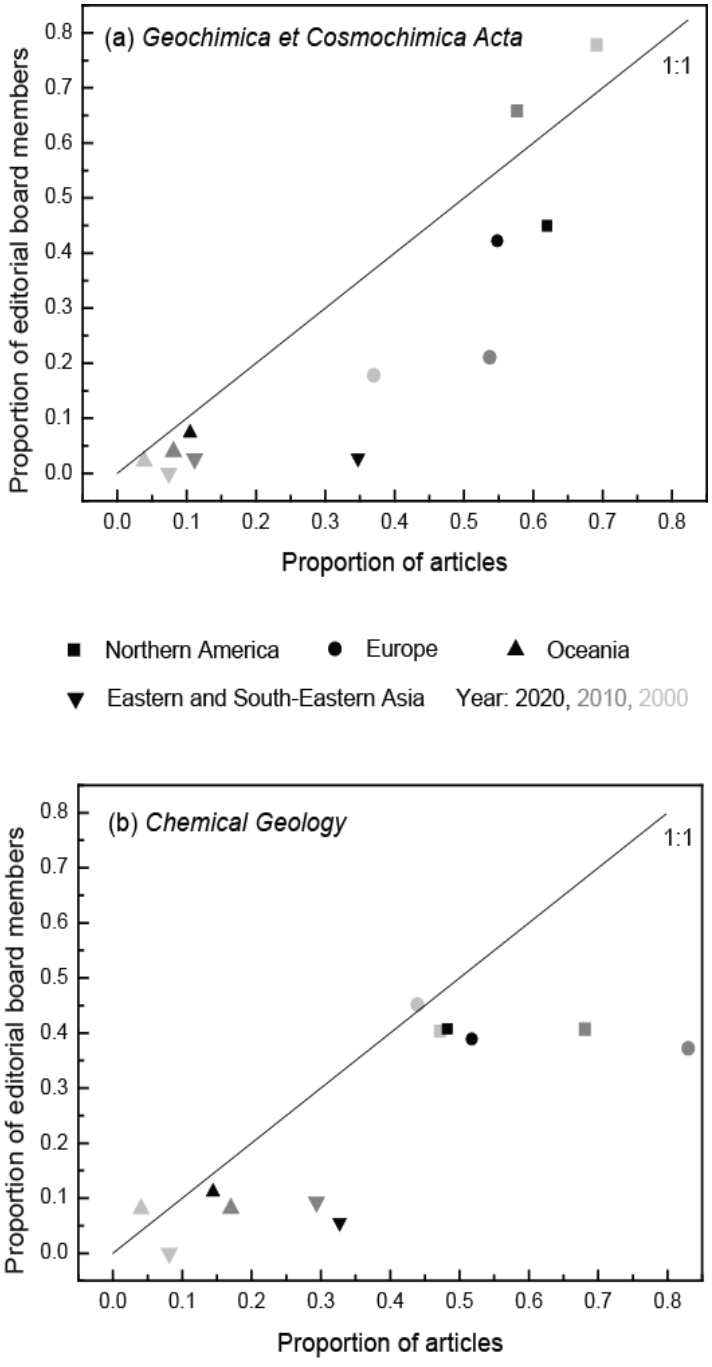

Figure 4 Relationship between proportion of articles and editorial board members by geographic regions (as symbols) in 2000 (grey patterns), 2010 (dark grey patterns) and 2020 (black patterns) for (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology* (data

accessed on Scopus on 07/01/2021). Others categories (*i.e.* Latin America and the Caribbean, Sub-Saharan Africa, Northern Africa and Western Asia, and Central and Southern Asia) are not represented due to low numbers. The sum of the proportion of articles from each region is higher than 1 as an article may be attributed to several regions depending on numbers of authors.

Gender representation evolution of editorial board members

The EB members can shape direction and success of a journal, and influence articles' authorship and what is published within the journal. In addition, differences in scientific networks could be a core reason for persistence of implicit bias from EB, as shown recently with regard to gender (Hanson et al., 2020). It took until the late 1980's for *GCA* and *CG* to feature women on their EB, and only now is representation approaching the binary gender composition estimated for the 2018 to 2020 Goldschmidt conference attendee distribution, (Pourret et al., 2021a) (where professional, excluding students from the total, women represent 36% and men 64%). Based on this binary gender distribution, we would estimate the proportion of mid-career to senior women of the geochemistry community to be around 25% to 35%. She Figures 2021 data show almost gender parity at PhD graduate level and 26% of women holding the highest academic positions in Europe. However, these estimates should be treated with caution and likely provide a minimum value. Because baseline demographic data is not presently collected by the EAG and GS for its members, the proportion of women among all members of these societies, and for a given professional rank, is unknown. Participants in meetings such as the Goldschmidt Conference ar7e unlikely to be representative of the community as a whole as, for example, gender-gaps and barriers encountered among other underrepresented people with regard to meeting attendance are well recognized (Niner et al., 2020).

As women may not make up 50% of the current mid-career to senior geochemists population, having 50% women EB members could potentially result in disproportionate service burden, at compromise to other activities, thereby emphasizing the importance for the community and employers to value service and a diversity of types of contributions among all geochemists. This situation and the need to address criteria and attitudes that otherwise pose a barrier to progress is also well recognized in other disciplines (Fox et al., 2019; Liévano-Latorre et al., 2020).

Representativeness of editorial board with regards to geography through time

Articles published in *GCA* and *CG* were historically mostly written by researchers from North America and Europe. As shown by Walters (2016), EB members are often chosen from academics who have authored and reviewed publications for the journal, a pattern that is observed for *GCA* and *CG.* Moreover, in 2019, 51% of GS members were from North America, 22% from Europe, 19% from Asia and Middle East, and 9% from Central and South America, Africa, Australia and Oceania coming from a total of 77 countries. In the meantime EAG members were 56% from Europe and from 83 countries overall. This predominance of EB members from Europe and North America is directly related to the link with GS and EAG and the high representation from members from both learned societies. Members from other countries are still under-represented on the *GCA* and *CG* EBs. This lack of regional diversity might be caused by a “pipeline effect” (Gewin, 2019), where increases in diversity at earlier career stages increase diversity at (more) established career stages in the future. For example, many EAG members from under-represented geographic regions may have joined recently and consequently could be at a relatively junior level. Alternatively, a “pipeline” concept may be flawed and models that consider the “obstacle course” that historically excluded groups face - including financial, cultural, or other barriers to traditional forms of networking opportunities - could be of greater relevance (Berhe et al., 2022). In either case, before underrepresented members of the geochemical community,

whether EAG / GS members or not, are invited to be EB members we must move towards a structure that better values the braided river model of the geochemical workforce (Batchelor et al., 2021) as already suggested (Espin et al., 2017; Hedding and Breetzke, 2021; Pourret et al., 2021b).

Editorial bias, an absence of relatable role models, or perceived and implicit editorial bias can exclude or discourage certain groups, consequently exacerbating historic inequities regarding under-representation of geochemists across entire continents within the geoscience literature, e.g., Africa and South America (North et al., 2020). Hedding and Breetzke (2021) show how the glaring lack of equity, diversity, and inclusion in higher education relates to the under-representation of certain individuals and/or regions in the scholarly publication process (especially Africa and South America). Hedding and Breetzke (2021) highlighted the outdated and exclusionary practices that pervade the scholarly publication process in science in general and link to wider problematic practices. Some countries in Africa and South America remain a place of choice for geologists, and environmental and soil scientists worldwide for substantial research activities and fieldwork. Yet, involvement of the local scientists is often required for assistance in field and local research logistics rather than mutual and equal interest in a balanced scientific collaboration. As a result, local scientists are not often acknowledged and associated with scientific publications (Minasny et al., 2020; North et al., 2020). Such ‘helicoptering’ practices (Minasny et al., 2020) benefit both fundamental and applied research in the West and as well as resource mining for western companies. A long-held concern is that these practices could perpetuate the brain drain from affected geographical regions thereby exacerbating the economic inequities between the respective regions. Hence, for an EB to be inclusive, reduce biases, and help set the tone for good scientific conduct more generally it needs - at minimum - to be as diverse as the research community it represents, be mindful of diversity among the global societies that we serve, and be active in engaging members of regions subject to ‘helicoptering’ practices.

Impact of Editor-in-Chief and board of editors

The governance of a journal is key to setting its mode and ethos of operation, its scope, rigor and reputation, and establishes key role models for the scholarly community.

Major changes in EB membership tend to take place after a new EiC is appointed (Figures 2, 3). At its inception, *GCA* had a board of three directors, originating from the USA, UK and Germany. Today, the *GCA* EiC is responsible for and has control over the scientific content of the journal, taking into account the aims and scope of the journal, the publisher's editorial policies, and guidance from the sponsoring societies. The duties of the EiC are to oversee the editorial process, provide and defend final decisions on all manuscripts, establish editorial policies for the journal, and communicate with the scientific community both directly via authors and reviewers, and through the sponsoring societies and the publisher.

From 1996 to 1998 Karl Turekian (Yale University, USA) renewed the Editorial Advisory Board of *GCA*, composed of seven members and was an important part of the way he chose to execute the journal. In 1999, Frank A. Podosek (Washington University in St Louis, USA) returned to the system of Associate Editors used by Dennis M. Shaw (McMaster University, USA, from 1972 to 1988) and Gunter Faure (Ohio State University, USA from 1989 to 1995), and had a capable international group of scholars to assist him (Drake, 2000). With the appointment of Marc Norman (ANU, Australia) in 2012, the increase in geographic diversity was due to the decision made to appoint Associate Editors not only for content areas, but also for geographic areas. This was further extended, especially for Eastern and South-Eastern Asia EB membership, in the early 2020’s (under the leadership of of Jeffrey Catalano, Washington University in St Louis, USA, who was appointed in 2019 for an initial 3-year term). It is worth noting that there have been zero women serving as *GCA* EiC, and to our knowledge no BAME / BIPOC, non-binary, LGBTIQ, and/or disabled people. The geographic diversity among *GCA* EiCs has been exclusively male, North American and a person of North American training / origin.

In 1970 William Sefton Fyfe (University of Manchester, UK) was appointed as EiC of *CG* and occupied this position until *CG* became the journal of the EAG in 1985. In 1973, he moved from the UK to Canada (University of Western Ontario). During his term, EB members from Canada increased from 2 to 8. Gunter Faure (Ohio State University, USA) was EiC of the associated journal *Isotope Geoscience* from 1982 until 1989. Peter Deines followed in this role until 1993, when *Isotope Geoscience* merged with *CG*. In 1985 Claude Allègre (Institut de Physique du Globe de Paris, France) wrote in his first editorial that *CG* "is the official journal of the new European Association of Geochemistry. At the same time, the journal will remain international and Authors from anywhere in the world are invited to submit their papers. [...] With its seven Editors, it assures the Authors the democracy of choice. The geographical and national variety of the origin of the Editors signifies its ambition to attract the attention of scientists from around the world. These Editors will be assisted by a team of Associate Editors who will insure broad representativeness by their variety of age, country of residence and professional interests." After more than 18 years of Editorship, Claude Allègre stepped down from the Team of Editors for *CG* in January 2004. Since the mid 2000's, the Board of Directors of *CG* has been gender balanced. However, the Board of Directors of CG does not have a direct role in the EB members choice and thus on the board's representativeness (Figure 5b and 5d). The work is delegated to an Associate Publisher from Elsevier currently dedicated to a pool of 12 journals in Geochemistry and Planetary Sciences who helps EiC to recruit, hire, and manage academic editors for journals.

Our study findings indicate that journals with rotating editorship, like *GCA*, have more direct influence on the binary gender and geographic diversity of the EBs than boards with non-rotating editors such as *CG* (Figure 5).

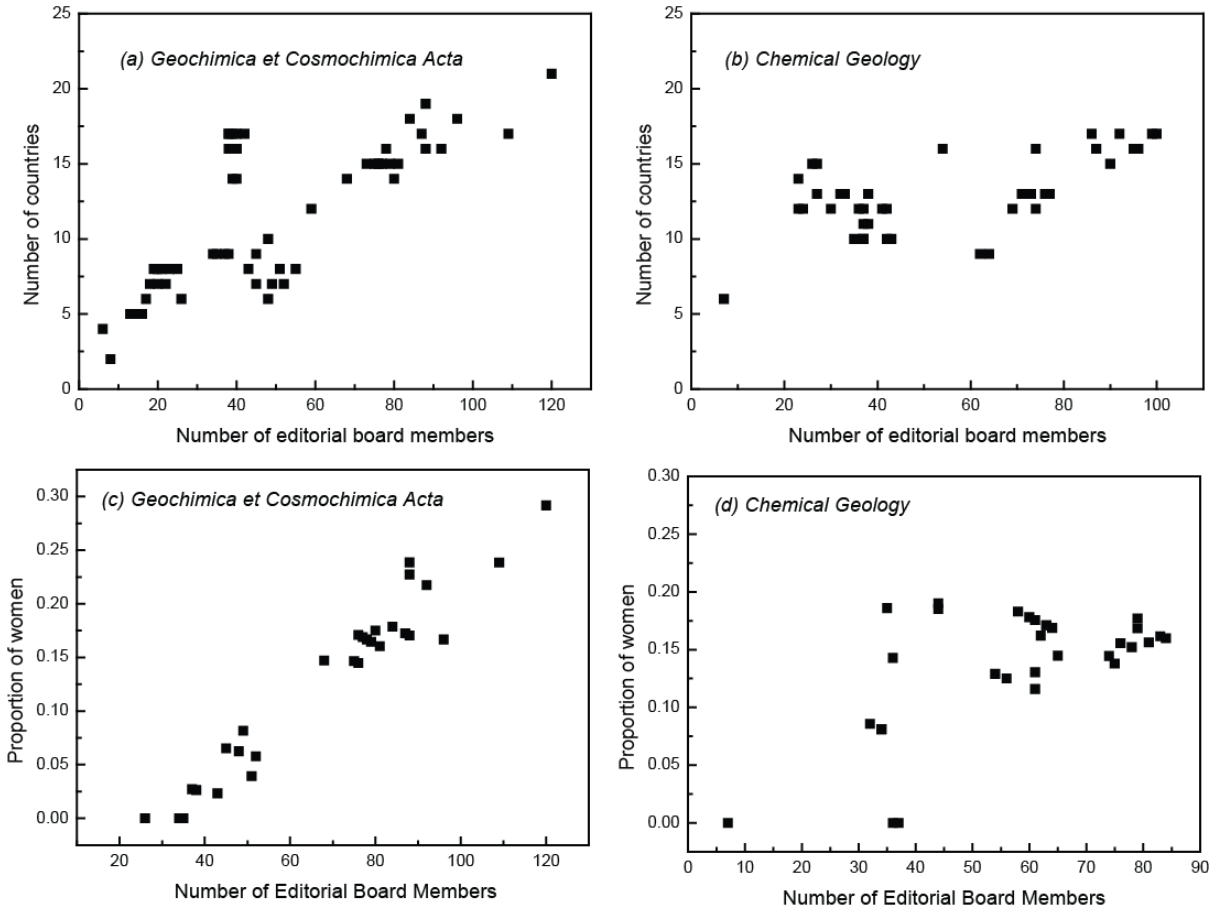

Figure 5 Numbers of countries as a function of total number of editorial board members for (a) *Geochimica et Cosmochimica Acta*, and (b) *Chemical Geology*. Proportion of women in editorial board as a function of total number of editorial board members for (c) *Geochimica et Cosmochimica Acta*, and (d) *Chemical Geology*.

Recommendations

Recommendations to improve scientific excellence and EB diversity among journals are listed in Tables 1 and 2 and are built on existing guidance by the Committee on Publication Ethics (COPE, 2021), our previous work (Pourret et al., 2021b), and additional ones coming from this study.

Table 1 Existing COPE recommendations on how to diversify an Editorial Board

- Be proactive – don't rely on your existing networks, be prepared to reach out broadly and seek out candidates from under-represented groups, for example by:
    - Approaching early career researchers and others who have contributed to the journal as reviewers or authors. Ask existing board members to mentor those with less experience.
    - Asking existing board members for recommendations (be clear that you are particularly interested in nominations from countries or groups not currently well-represented on the board).
    - Approaching people who you have seen presenting at conferences or workshops, or whose work you have read.
- Advertise vacancies for editorial positions, or post open calls for expression of interest to join your board. Use social media to spread the word and encourage colleagues to do the same. Invite application letters and assess those fairly, with clear and consistent selection criteria. Involve others in the decision-making, in order to mitigate any unconscious biases.
- Put diversity targets in place in order to hold yourself and your editorial board to account over time. Think about the gender and ethnic mix within your particular field – your board should at a minimum reflect this. Progress can be iterative and develop as board members come and go.
- Appoint one or more board members to act as diversity champions, who can actively support your aims.

- Put fixed terms in place for editorial board members, enabling you to regularly review and refresh your board.
- Think broadly about the areas of expertise you'd like to see represented on the board, and proactively seek out individuals with those areas of expertise, with a view of improving representation/diversity.
- We all have unconscious biases; challenge yourself and check your assumptions – for example about institutional location, professional status and language skills.

Table 2 Additional recommendations for diversifying journal leadership and Editorial Board

- Set up a diversity advisory/working group that can help identify potential qualified EB members and EiCs, while also scrutinizing a journal's strategy in the form of steps taken by the EiC(s) to improve diversity. The open access reporting of progress made by the EiC/journal can be conducted either annually or bi-annually. Any increase in diversity among EBs needs to go beyond binary gender diversity, must include broader groups such as global majority BAME/BIPOC people and other under-represented groups (including LGBTIQ+, minority gender identities, disabled people) while also taking into account intersectionality as well as diverse career paths.

- Inform the geochemical community, EiCs and other journal leaders should emphasize at the journal's society meetings their results and actions taken to enhance diversity, equity, and inclusion while progressing diversity among EB members.
- Present an annual or biannual infographic of diversity of the EB and/or the geographical/regional scope of published articles. This may attract attention from- and improve engagement with diverse researchers, as well as raising diversity, equity, inclusion awareness in the scientific publishing space.

- Engage and prompt dialogue with scientists from under-represented groups and nations with the purpose of building understanding of how to attract and how to better support / prepare them to participate in an EB role.

- Encourage individual EB members to act as mentors to newly appointed editors from underrepresented identities (BAME/BIPOC, women, LGBTIQ+, minority gender identities and socioeconomic backgrounds, disabled people and intersections thereof), if this has been requested (see previous point).

- Invite identified people (see previous point) to serve as guest editors to special issues and/or to join their EB when a position is available (no necessity of expansion, but expansion may accelerate the changes; see Figure 5).
- Allow authors to publish articles in several languages like *GCA* and *CG* did in the past (English, German, French).

One-time actions to tackle diversity are not enough. As emphasized by our earlier work (Pourret et al., 2021b) achieving representative diversity on EBs requires sustained effort and systemic changes. Journals and scientific communities must monitor the impact of diversity efforts, it is only through accessible open and annual reporting that real change can be scrutinized by all global scholars and continued progress better informed, supported, and ensured. Indeed, increasing geographic diversity of regions with low gender parity may decrease gender diversity.

Editors also influence the level of EB diversity. With every newly appointed editor, both geographic and gender diversity appears to have evolved. To ensure that positive progress in diversifying EBs broadens and accelerates, further targeted efforts will need to be "designed" to raise the visibility of these actions with respect to countries beyond North America and Europe, as well as wider matters of identity.

The appointment of each new EiC can act as the spark for improving diversity in the EB in comparison with a board of editors with a more stable, but possibly less innovative strategy. New EiCs tend to increase the diversity of their EB at the start of their terms, diversity of EB membership often regressed at a later stage during their tenures. It appears that diversity of EB membership needs to be actively pursued and monitored if it is not to slip back to

traditionally low levels. Hence, these findings support the case for limiting the length of an EiC's term on the basis that new governing/managing editors might bring with them new experiences, networks, and perspectives that result in positive change.

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Conflict of interest

OP and AD are members of the Editorial Board of *Chemical Geology*. AD was a member of the Editorial Board of *Geochimica et Cosmochimica Acta.* Until recently, KJ was an associate editor of *Geochimica et Cosmochimica Acta* and is currently one of the editors-in-chief of *Chemical Geology*. SL was a member of the Editorial Board of *Geochimica et Cosmochimica Acta*. AR previously assembled and steered an editorial team while serving as Guest Managing Editor to a Special Issue of *Geochimica et Cosmochimica Acta,* and has provisionally agreed a further Special Issue(s) with this journal.

Credit authorship contribution statement

OP: Conceptualization, Data Curation, Formal Analysis, Visualization, Writing Original draft, Writing - review & editing. All other authors are listed in alphabetical not order of intellectual contribution: Data Curation, Formal Analysis, Writing Original draft, Writing - review & editing.

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