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Original article

Gender balance and geographical diversity in editorial boards of *Geochimica et Cosmochimica Acta* and *Chemical Geology*

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Competing interests

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 of a special issue of *Geochimica et Cosmochimica Acta*, and has provisionally agreed to serve as a guest editor for future special issue(s) of this journal.

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Authorship contributions

OP: conceptualization, data curation, formal analysis, visualization, writing original draft, revising, reviewing, and editing. All other authors (listed alphabetically and not in the order of their intellectual contribution): data curation, formal analysis, writing original draft, revising, reviewing, and editing.

Data sharing statement

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

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Abstract

Background: Members of editorial boards of academic journals are often considered gatekeepers of knowledge and role models for the academic community. Editorial boards should be sufficiently diverse in the background of their members to facilitate publishing manuscripts representing a wide range of research paradigms, methods, and cultural perspectives.

Objectives: To critically evaluate changes in the representation of binary gender and geographic diversity over time on the editorial boards of *Chemical Geology* and *Geochimica et Cosmochimica Acta*, flagship geochemistry journals, respectively, from the European Association of Geochemistry and the Geochemical Society – Meteoritical Society partnership.

Methods: The composition of editorial boards was ascertained as given in the first issue of each year, over 1965–2021 for *Chemical Geology* and 1950–2021 for *Geochimica et Cosmochimica Acta*, and members of the editorial boards were coded for their country of affiliation (the country of origin may have been different) and for their binary gender.

Results: Gender parity, limited to men and women, and the number of countries of affiliation increased steadily between the late 1980s and 2021. However, the geographic distribution remained dominated by affiliations from North America and Western Europe. The editor-in-chief or board of editors had a significant impact on the diversity of the editorial boards, and both geographic and gender diversity may evolve with nearly every newly appointed editor. However, the persistently substantial under-representation on editorial boards of affiliations outside 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 geographic diversity is increased and maintained in the future.

Conclusion: Improving diversity and inclusion of editorial boards of academic journals and strengthening journal and disciplinary reputations are mutually reinforcing. Instituting a rotating editorship with emphasis on embedding broader geographic networks and more equitable international recruitment could ensure sustained and wider geographic representation and gender balance of editorial boards and promote originality and quality of published research, representing our global communities.

Keywords:

Editorial boards, gender diversity, geographic diversity, geochemistry, journal publishing

Introduction

Members of the editorial board (EB) of academic journals significantly influence what is published and, hence, what informs theory development, research, methods, and practice.^{1,2} Therefore, EBs should be sufficiently diverse in terms of the background of their members to ensure publication of research that represents a wide range of scientific paradigms, methods, and cultural perspectives.³ Indeed, Cummings et al.⁴ believe that greater diversity among members of EBs and among authors produces better knowledge because “cognitive diversity represents progress and improvements to our pool of knowledge.”

A recent study of 18 journals, including *Geochimica et Cosmochimica Acta (GCA)* and *Chemical Geology (CG)*, in geochemistry, cosmochemistry, mineralogy, and petrology shows that the strength of the EBs in 2021 ranged from 4 to 120 (the average was 38) members, of which 21% were women and 79% were men.⁵ Another key finding was the distribution of their affiliations, which was dominated by institutions in Western Europe (39%) and North America (29%), followed by those in East and South East Asia (16%) and Oceania (5%).⁵

Historically, geochemists have published much of their work in journals affiliated to professional societies such as the Geochemical Society (GS) and the European Association of Geochemistry (EAG),⁶ a preference that gives the governance and practices of these two journals a significant influence over the discipline of geochemical studies. The first issue of *GCA* appeared in 1950 and, in 1957, the journal became the official publication of GS following its founding in 1955. Later, in 1970, *GCA* became the official journal also of the *Meteoritical Society*. A joint publication committee

supervises the journal and appoints its associate editors. The first issue of *CG* appeared in 1966 and *CG* became the journal of the EAG following its founding in 1985. Initially, *GCA* was managed by a board comprising three directors and since the early 1970s has been managed by a sole editor-in-chief (EiC), whereas *CG* was led until 1985 by a single EiC, who was then replaced by a board of directors (comprising four to nine individuals).

The present study looks in detail at changes over time in the composition of the EBs of the two journals in terms of binary gender balance and geographic diversity with a view to identify imbalance and to suggest appropriate interventions to make research publications in geochemistry more diverse, inclusive, and equitable.

Methods

The composition of the EBs was ascertained from the first issue of each year (over 1965–2021 for *CG* and 1950–2021 for *GCA*) and each member was coded for country affiliation and binary gender. Following the method of Cummings and Hoebink,⁷ all members of the EBs of journals were included regardless of title (e.g. Editor, Editor-in-Chief, Associate Editor, Assistant Editor, Member of the Editorial Board, etc). However, guest editors were excluded. This method leaves out, because such information is not available, individuals who were invited to such roles but declined. The number of articles and the country of affiliation of their authors were also noted using the Scopus database.

We focused our analysis on the editors' country of affiliation, which was determined based on each member's university affiliation. This coding method is unlikely to accurately reflect the nationality of the member in question because the member could be

affiliated to a university in a country different from her or his country of origin (nationality). Without collecting personal information on an editor's nationality – information that may be unavailable or protected by privacy laws – it is impossible to establish the nationality. Thus, although a study of the editors' nationalities would be of great interest, it is beyond the scope of this study. Members of the EBs were then assigned to a region based on the country of their affiliation, using the 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>).

The binary gender (that is, either woman or man) was determined based on the member's given name wherever possible. If the first name or the given name was gender neutral, the gender was inferred by searching the Internet, although the gender assigned thus may not be always true, nor could this first-stage analysis consider minority-gender identities (for example non-binary or transgender people) owing to lack of relevant information. Such information may be absent altogether or suppressed as a matter of policy, and it is also possible that only a few members of EBs belong to minority-gender identities. With the possible exception of transgender people, minority-gender identities have become more widely accepted in a number of countries only recently. This trend could mean that in the future more and more people (1) may realize they do not identify themselves either as a man or as a woman or (2) may publicly claim a gender identity other than these two options. Similarly, data on groups such as the following have never been collected or were prohibitively difficult to obtain retrospectively for the two

journals: Black, Asian, and minority ethnic (BAME); Black, Indigenous, and other people of colour (BIPOC); and lesbian, gay, bisexual, transgender, intersex, queer (LGBTIQ+). Data on other facets of identity (disabilities if any and socio-economic background, for example) and on any overlap among the groups are also hard to obtain. It is, however, important to start collecting these data from now on so that they can be used in developing and proposing appropriate interventions to remove any cultural and systemic barriers to diversity and inclusion and, in turn, to strengthen wider 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 shows the strength (number of members) of the EBs and the number of articles published every year from 1950 to 2020. The increase on both counts indicates the diversification in the subfields in geochemistry. Between 1950 and 2021, the size of *GCA* EB increased 20-fold, from 6 to 120 members. In particular, the strength increased substantially in 1973, 1990, 2000, 2013, and 2020, but also decreased markedly in 1998 following a change in the journal's *EiC*. The strength of *CG* EB increased from 27 in 1966 to 100 in 2017 but decreased sharply to 7 in 1985, a drop that coincided with the creation of the *EAG*. Since the establishment of the journals, *CG* EB has had 286 individuals as members, of which as many as 144 were added over the last 10 years (2012–2021); the corresponding numbers for *GCA* were 445 and 217.

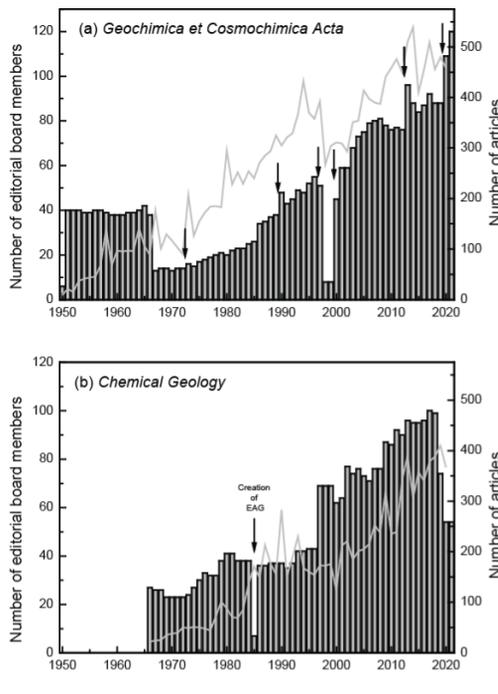


Figure 1. Year to year changes in the strength of editorial boards (no. of members, left vertical axis) and in the number of articles published (right vertical axis and the grey line) for (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology*: 1950–2020. Black arrows indicate change in the journal's editor-in-chief (data accessed from Scopus on July/01/2021).

Geographical diversity and gender divide

Figure 2 captures the geographic diversity of EBs of (a) *GCA* and (b) *CG*.

Geochimica et Cosmochimica Acta

During the first decade after inception, the majority of *GCA* EB members were affiliated to institutes in Europe (>70%) with the rest mostly to institutes in North America (~20%); only a minority (<10%) showed affiliation to institutes in East and South East Asia and other regions (the Middle East, North Africa, Sub-Saharan Africa, and South and Central America). After the formation of the GS, the proportions of EB members with European or North American affiliations switched within 15 years: during most of the 1970s,

1980s, and 1990s, 70%–90% were affiliated to institutes in North America; 10%–20%, to those in Europe; <10% to those in Oceania and other regions; and 0%, to those in East and South East Asia. In the late 1990s, however, the proportions began to change again, initially to coincide with the marked shrinking in the strength of *GCA* EB (Figure 1a): Europe's representation decreased to <5% whereas that of Oceania increased to >10%. When the EB expanded later, the proportions reverted to approximately match those before the shrinking. Over the next two decades, between 2000 and 2021, the proportion of members with North American affiliations decreased steadily from 70% to 40%, while that of members with European affiliations increased from 10% to 40%. During this period, the proportion of EB members affiliated to institutes from the remaining regions fluctuated between <5% and 10% (Oceania and Other regions) and 0% and 5% (East and South East Asia). Finally, beginning in 2020, the proportion of members affiliated to institutes in East and South East Asia increased rapidly to reach 11%.

Chemical Geology

For *CG*, the proportion of EB members from North America and Europe fluctuated between about 35% and 50% since 1966 (Figure 2b) and that of members from Oceania, between 4% and 17% (with 11% in 2021). Members from Oceania were markedly fewer around 1985, the year in which the strength of board decreased sharply (Figure 1b), following the founding of the EAG and *CG* becoming its journal, when the EiC was replaced by a board of directors. The proportion of members from other regions and from East and South East Asia fluctuated between 0% and 10%, with the proportion from the latter region peaking at 14% around 1985 (when the EAG was founded).

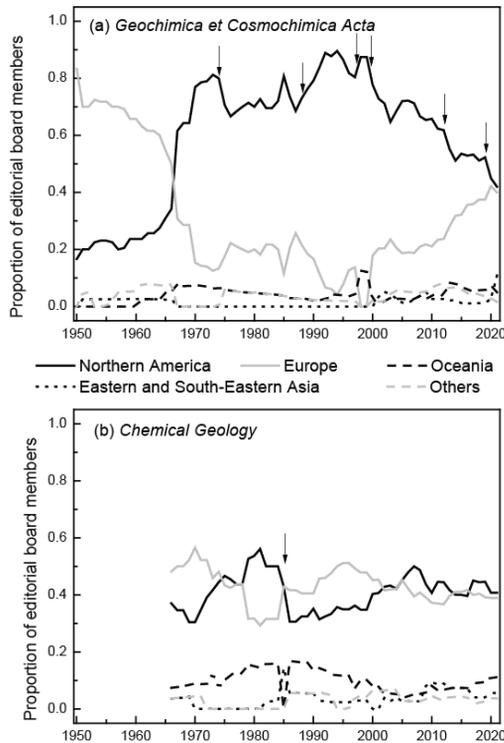


Figure 2. Year to year changes in the diversity of members of the editorial boards of (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology*, by region: 1950–2020. ‘Others’ comprises the following regions: Latin America and the Caribbean, Sub-Saharan Africa, North Africa and West Asia, and Central and South Asia. Black arrows mark the change in the journal’s editor-in-chief in (a) and the creation of EAG in (b).

Overall, *GCA* and *CG* have always had geographically diverse EBs if we consider the number of countries represented (>15). However, although the *CG* EB increased in strength from 20 to about 60 between the beginning and the mid-2000s, its composition did not change significantly in terms of the proportions of different regions represented on the EB. However, *GCA* increased its geographic diversity substantially since 2005 (when >70% of its members were affiliated to institutes in North America). The large increase in the proportion of members representing regions other than North America accompanied the substantial increase in the strength of the EB itself, from 76 in 2012 to 120 in 2021.

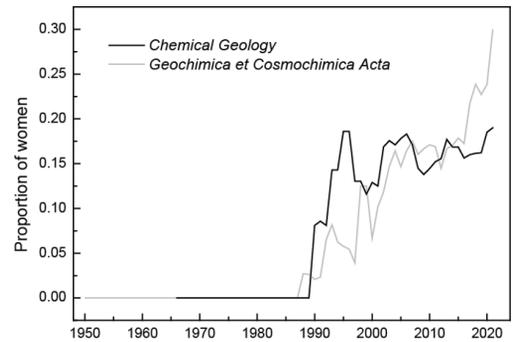


Figure 3. Changes in proportion of women members of editorial boards of *Geochimica et Cosmochimica Acta* and *Chemical Geology*: 1950–2020.

Before the late 1980s, members of the EBs of both the journals were exclusively men (Figure 3). It was only at the end of the 1980s that women began to join the EBs, and the gender diversity of each journal has evolved since (Figure 3): the first woman was appointed to *GCA* EB in 1988 and three women were appointed to *CG* EB in 1990. The proportion of women on *GCA* EB increased steadily, reaching 15% in the early 2000s and 30% in 2021; that on *CG* EB increased rapidly in the 1990s and then stabilized, fluctuating between 13% and 18%.

Discussion

Making the EB more diverse to better represent the academic and general population is the right and just thing to do. Besides, such diversity promotes innovation right from framing a hypothesis through peer review to final publication⁸ and should be set as a standard for scientific quality, as emphasized by, for example, the Royal Society of Chemistry.⁹ Personal identities, including racial identity, country of origin, physical, mental and learning (dis)abilities, gender orientation (LGBTIQ+), and lived experience (for example poverty, bullying, marginalization, racism, homo/biphobia, and transphobia¹⁰)—all affect how we engage

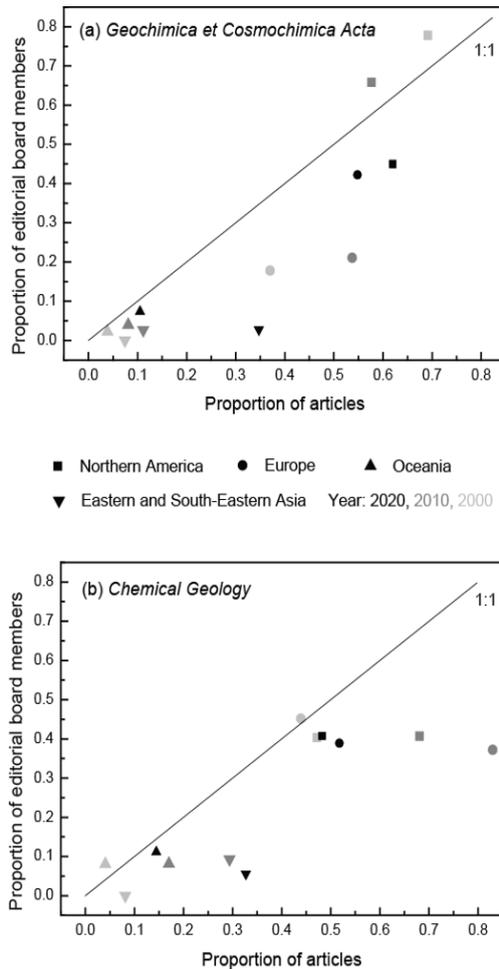


Figure 4. Relationship between proportion of articles from a given region and affiliations of members from that region on editorial boards in 2000 (light grey), 2010 (dark grey), and 2020 (black) of (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology* (data accessed from Scopus on July/01/2021). Others regions (namely Latin America and the Caribbean, Sub-Saharan Africa, North Africa and West Asia, and Central and South Asia) are not represented because they were represented in very low numbers. The sum of the proportion of articles from each region can be greater than 1 because the same article may be attributed to several regions depending on the numbers of authors and their affiliation.

with our science: these factors influence how we approach a problem, process and connect information, what we value, what we

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.¹¹

Geographical diversity

Members of EBs are usually academics who have authored and reviewed publications for a particular journal.¹² Historically, articles published in *GCA* and *CG* were written predominantly by researchers from North America and Europe. Since the 2010s, a marked increase was observed in articles written by researchers from East and South Asia (data not shown). Moreover, Pico et al.¹³ showed that 28% of the first authors of articles from 2013 to 2019 in *GCA* were women.

In 2020, as shown in Figure 4, a relationship becomes discernible between the number of articles and the number of EB members from a given geographic region. Two contrasting sets of data deviate from the 1:1 reference line in Figure 4. Although the proportion of members from North America is greater, the proportion of articles published by Asian authors in 2020 compared to that in 2010 is notably higher than the corresponding percentage of EB members from Asia. This finding may indicate a growing scientific community in Asia and emphasizes the under-representation of Asian scientists on the EB.

Gender representation

Members of an EB can influence the journal's direction and its success through their influence on the affiliations of the authors and on the topics of articles covered by the journal. In addition, differences in research networks could be a core reason for the persistence of implicit bias in the EB, as shown recently with regard to gender.¹⁴ It took until the late 1980s for *GCA* and *CG* to feature women on their EBs, and only now is the

representation on the EBs approaching the binary gender composition of the attendees at the Goldschmidt conference from 2018 to 2020 (36% women and 64% men among the professionals, excluding students).¹⁵ Based on this binary gender distribution, we would expect the proportion of mid-career to senior women in the geochemistry community to be about 25%–35%. Data from She Figures 2021 (Gender in research and innovation: statistics and indicators, from the European Union)¹⁶ show almost total gender parity at PhD level and 26% of women holding the highest academic positions in Europe. However, these estimates should be treated with caution (as not considering the same population) and are likely to be only of minimum value. Because baseline demographic data on their members are not being collected by the EAG and GS at present, the proportions of women among their members and for a given professional rank are unknown. Participants in meetings such as the Goldschmidt conference are unlikely to be representative of the community as a whole because of, for example, well-recognized gender gaps and barriers encountered by other underrepresented people in attending meetings.¹⁷

As women may not make up 50% of the current mid-career to senior geochemists, having 50% women as EB members could potentially result in a disproportionate service burden and may affect 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 the criteria and the attitudes that otherwise act as barriers to progress are also well recognized in other disciplines.^{18,19}

Geographical diversity over time

Historically, articles published in *GCA* and *CG* were written mostly by researchers from

North America and Europe. As shown by Walters,¹² members of EBs are often chosen from academics who have authored and reviewed publications for the journal in question, a pattern that is observed for *GCA* and *CG*. Moreover, in 2019, 77 countries were represented among the members of GS: 51% of them were from North America, 22% from Europe, 19% from Asia and the Middle East, and 9% from Central and South America, Africa, Australia, and Oceania. Members of EAG were distributed across 83 countries, although 56% of the members were from Europe. This predominance of Europe and North America is directly related to the link with GS and EAG and the high representation of both the regions in the members of both societies. Members from other countries are still under-represented on the EBS of *GCA* and *CG*. This lack of regional diversity might be due to the ‘pipeline effect’,²⁰ which maintains that increase in diversity earlier in the career increases diversity later in the career. For example, many EAG members from underrepresented geographic regions may have joined recently and consequently could be at a relatively junior level. Alternatively, the 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.²¹ In either case, before inviting professionals from regions under-represented in the geochemical community, irrespective of whether they are members of EAG or GS, to serve as members of the EBs, we must move towards a structure that set a higher value on the braided-river model of the geochemical workforce,²² as already suggested.^{5,23,24}

Editorial bias, an absence of relatable role models, or perceived and implicit editorial

bias can exclude or discourage certain groups, consequently widening the historic inequities related to under-representation of geochemists across entire continents, Africa and South America for example, within the geoscience literature.²⁵ Hedding and Breetzke²⁴ show how the glaring lack of equity, diversity, and inclusion in higher education relates to under-representation of certain individuals and/or regions (especially Africa and South America) in the scholarly publication process. Hedding and Breetzke²⁴ 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 the place of choice for geologists and for environmental and soil scientists worldwide for substantial research activities and fieldwork. Yet, involvement of local scientists is often required more for assistance in the field and local research logistics than for mutual and equal contribution as part of a balanced scientific collaboration. As a result, local scientists often remain acknowledged and are not associated with scientific publications.^{25,26} Such 'helicoptering' practices²⁶ benefit both fundamental and applied research in the West as well as resource mining by Western companies. A long-held concern is that these practices could perpetuate the brain drain from affected geographical regions, thereby widening economic inequities between the respective regions. Hence, for an EB to be inclusive, to reduce biases, and to help set the tone for good scientific conduct more generally, the EB needs – at a minimum – to be as diverse as the research community it represents, to be mindful of diversity among global societies that we serve, and to be active in engaging members of regions subject to 'helicoptering' practices.

Impact of Editor-in-Chief and board of directors

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

The composition of the EB changed markedly following the appointment of a new EiC (Figures 2 and 3). At inception, *GCA* had a board of three directors, one each from the USA, the UK, and Germany. Today, the EiC of *GCA* is responsible for and controls the scientific content of the journal, consistent with 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 through authors and reviewers and through the sponsoring societies and the publisher.

From 1996 to 1998, Karl Turekian (Yale University, Connecticut, USA) renewed the Editorial Advisory Board of *GCA*, composed of seven members, and the board was an important part of the way he chose to manage the journal. In 1999, Frank A Podosek (Washington University in St. Louis, Missouri, USA) returned to the system of associate editors used by Dennis M Shaw (McMaster University, Canada, from 1972 to 1988) and Gunter Faure (Ohio State University, Columbus, USA, from 1989 to 1995) and had a capable international group of scholars to assist him.²⁷ With the appointment of Marc Norman (Australian National University, Canberra) in 2012, the increase in geographic diversity among members of the EB was due to the decision made to appoint associate editors not only for content areas but also for geographic areas. This idea was further

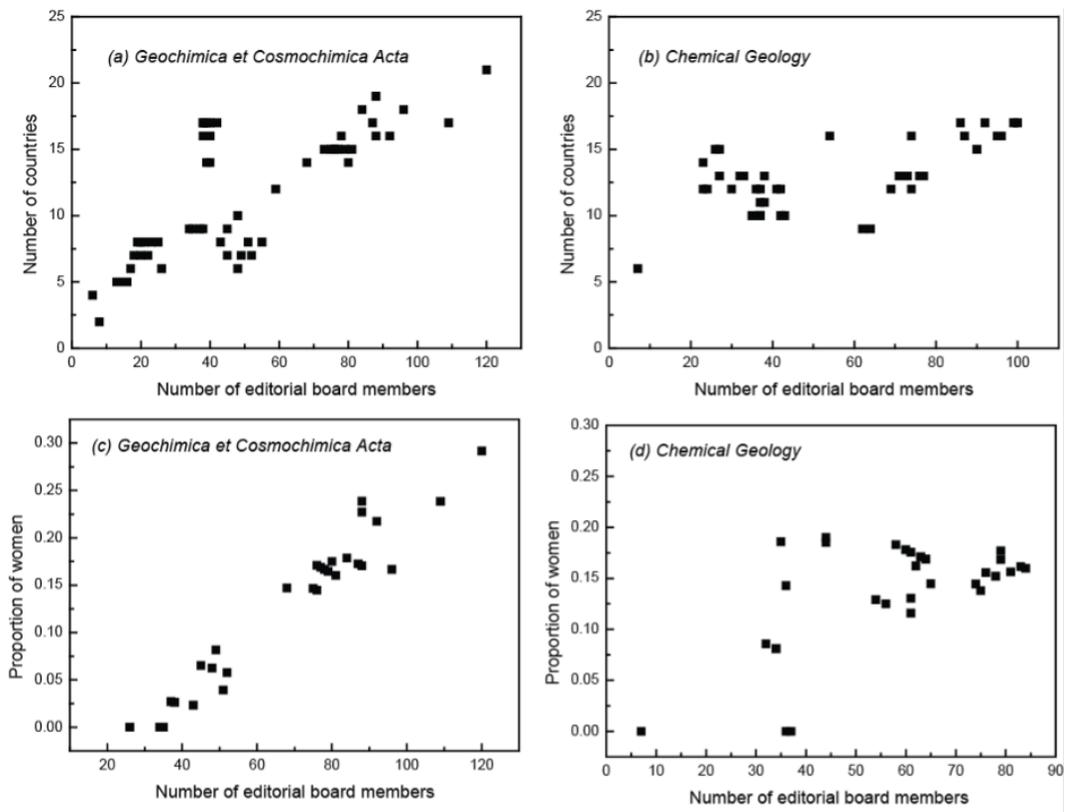


Figure 5. Number of countries as a function of the strength (no. of members) of the editorial board of (a) *Geochimica et Cosmochimica Acta* and (b) *Chemical Geology*. The proportion of women on the editorial board as a function of its strength in (c) *Geochimica et Cosmochimica Acta* and (d) *Chemical Geology*.

extended, especially for members from East and South East Asia, in the early 2020s under the leadership of Jeffrey Catalano (Washington University, St. Louis, USA), who was appointed in 2019 for an initial 3-year term. It is worth noting that no woman has ever served as the EiC of *GCA* and, to our knowledge, none representing BAME / BIPOC, non-binary, LGBTQ+, and/or disabled people: The EiCs of *GCA* have been all men from North America or trained or educated in North America.

In 1970, William Sefton Fyfe (University of Manchester, UK) was appointed as the 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, the number of members of the EB

members from Canada increased from 2 to 8. Gunter Faure (Ohio State University, USA) was the EiC of the associated journal *Isotope Geoscience* from 1982 to 1989. Peter Deines succeeded him and continued 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 ensure broad representativeness by their variety of age, country of residence and professional interests.”²⁸ After more than 18 years as editors, Claude Allègre stepped down from the team of editors of *CG* in January 2004. Since the mid-2000s, the board of directors of *CG* has been gender balanced. However, the board does not play a direct role in choosing members for the EB and thus not in the EB’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 the EiC to recruit, hire, and manage academic editors for the journals.

Our findings indicate that journals such as *GCA*, which have a rotating editorship, exert more direct influence on the binary gender and geographic diversity of the EBs than journals such as *CG* that do not rotate the editorship (Figure 5).

Recommendations

Recommendations to improve the scientific excellence and diversity of EBs of journals are listed in Boxes 1 and 2, which are built on the existing guidance from the Committee on Publication Ethics,²⁹ our earlier work,⁵ and insights from the present study.

One-time actions to tackle diversity are not enough. As emphasized in our earlier work,⁵ achieving representative diversity on EBs requires sustained effort and systemic changes. Journals and scientific communities must monitor the impact of their efforts to promote diversity. It is only through accessible open and annual reporting that real change can be scrutinized by all global scholars, and continued progress can be better informed, supported, and ensured. Indeed, increasing geographic diversity with low gender parity may decrease gender diversity.

Box 1. Existing recommendations from the Committee on Publication Ethics on how to diversify an editorial board

- Be proactive: do not rely on your existing networks and 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 and asking existing board members to mentor those with less experience;
 - asking existing board members for recommendations (make it clear that you are particularly interested in nominations from countries or groups not currently well-represented on the board);
 - approaching people whom 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 applications and assess those fairly, with clear and consistent selection criteria. Involve others in decision-making 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 continue 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 would like to see represented on the board and proactively seek out individuals with those areas of expertise to improve representation or diversity.
- We all have unconscious biases; challenge yourself and check your assumptions, for example about institutional location, professional status, and language skills.

Box 2. Additional recommendations for diversifying journal leadership and composition of editorial boards

- Set up a diversity advisory or working group that can help identify potential qualified EB members and EiCs, while also scrutinizing the 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 or the journal can be conducted either annually or every six months. Any increase in the diversity of EBs needs to go beyond binary gender diversity and 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 that they should emphasize at the journal's society meetings their results and actions taken to enhance diversity, equity, and inclusion while promoting diversity among EB members.
- Present an annual or biannual infographic of diversity of the EB and/or the geographical or regional distribution of published articles. This may attract attention from, and improve engagement with, diverse researchers, as well as raise diversity, equity, and awareness of inclusion in 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 or prepare them to participate in their role as a member of an EB.
- Encourage individual EB members to act as mentors to newly appointed editors from under-represented identities (BAME/BIPOC, women, LGBTIQ+, minority-gender identities and socio-economic backgrounds, disabled people and intersections thereof) if this has been requested (see the previous point).
- Invite identified people (see the previous point) to serve as guest editors to special issues or to join the EB when a position is available (such expansion is not a necessity but may accelerate changes; see Figure 5).
- Allow authors to publish articles in several languages as GCA and CG did in the past (English, German, French).

Editors too influence the level of diversity in EBs. With every newly appointed editor, both geographic and gender diversity appears to have changed. To ensure that 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 EBs in comparison with a board of editors with more stable, but possibly less innovative, strategy. New EiCs tend to increase the diversity of their EBs at the start of their terms—only to regress to the previous level later in their tenure. It appears that the diversity of EBs needs to be actively pursued and monitored if it is not to slip back to its traditionally low levels. Hence, these findings support the case for limiting the length of an EiC's term so that new governing or managing editors may bring with them new experiences, networks, and perspectives that result in positive change.

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