DESCRIPTION

Geochimica et Cosmochimica Acta publishes research papers in a wide range of subjects in terrestrial geochemistry, meteoritics, and planetary geochemistry. The scope of the journal includes:

1). Physical chemistry of gases, aqueous solutions, glasses, and crystalline solids
2). Igneous and metamorphic petrology
3). Chemical processes in the atmosphere, hydrosphere, biosphere, and lithosphere of the Earth
4). Organic geochemistry
5). Isotope geochemistry
6). Meteoritics and meteorite impacts
7). Lunar science; and
8). Planetary geochemistry.

If you would like more information about the Geochemical Society and Meteoritical Society, visit their Home Pages at http://www.geochemsoc.org and http://www.meteoriticalsociety.org

Benefits to authors
We also provide many author benefits, such as free PDFs, a liberal copyright policy, special discounts on Elsevier publications and much more. Please click here for more information on our author services.

Please see our Guide for Authors for information on article submission. If you require any further information or help, please visit our Support Center

AUDIENCE

Geochemists, including Terrestrial, Planetary and Meteoritical Geochemists and Oceanographers.

IMPACT FACTOR

2018: 4.258 © Clarivate Analytics Journal Citation Reports 2019
ABSTRACTING AND INDEXING

Energy Research Abstracts
INSPEC
Current Contents
BIOSIS Citation Index
Energy Data Base
International Aerospace Abstracts
Pascal Francis
Aqualine Abstracts
Current Contents - Physical, Chemical & Earth Sciences
Engineering Village - GEBASE
Geo Bib & Index
Mineralogical Abstracts
Petroleum Abstracts
Research Alert
Current Contents - Social & Behavioral Sciences
Scopus
Referativnyi Zhurnal VINTI-RAN (Russian Academy of Sciences)
Zoological Record
Web of Science
British & Irish Archaeological Bibliography
Chemical Abstracts
Academic Search (EBSCO)
Current Abstracts (EBSCO)
Environment Complete
TOC Premier
Science and Technology Collection
Compendex
OCLC Contents Alert
Personal Alert
ProQuest
Engineering Index Monthly
Arts & Humanities Search
Current Contents
Science Citation Index Expanded

EDITORIAL BOARD

Editor-in-Chief
Jeffrey Catalano, Washington University in Saint Louis, Saint Louis, United States

Associate Editors
Jeffrey Alt, University of Michigan, Ann Arbor, United States
Yuri Amelin, Australian National University Research School of Earth Sciences, Canberra, Australia
Lawrence Anovitz, University of Tennessee Knoxville Department of Earth and Planetary Sciences, Knoxville, United States
Miriam Bar-Matthews, Geological Survey of Israel, Jerusalem, Israel
Pierre Beck, Institute of Planetology and Astrophysics Grenoble, Grenoble Cedex 9, France
Ruth Blake, Yale University, New Haven, United States
Marc Blanchard, Paul Sabatier University, Toulouse, France
Janne Blichert-Toft, University College Lyon, Lyon, France
Jean-Francois Boily, Umea University, Umeå, Sweden
Audrey Bouvier, University of Bayreuth, Bayreuth, Germany
Jochen Brocks, Australian National University, Canberra, Australia
Robert Byrne, University of South Florida College of Marine Science, St. Petersburg, United States
Georges Calas, Sorbonne University, Institute of Mineralogy, Physics of Materials and Cosmochemistry, Paris, France
Andrew Campbell, University of Chicago, Chicago, United States
Elizabeth Canuel, William & Mary Virginia Institute of Marine Science, Gloucester Point, United States
Jon Chorover, University of Arizona, Tucson, United States
Rajdeep Dasgupta, Rice University, Houston, United States
James Day, University of California San Diego Integrative Oceanography Division, La Jolla, United States
Hailiang Dong, Miami University, Oxford, United States
Anthony Dosseto, University of Wollongong School of Earth Atmospheric and Life Sciences, University Of Wollongong, Australia
Matthew Fantele, Pennsylvania State University, University Park, United States
James Farquhar, University of Maryland at College Park, Baltimore, United States
Sarah J. Feakins, University of Southern California, Los Angeles, United States
Jérôme Gaillardet, Institute of Earth Physics of Paris, Paris, France
Chris Hall, University of Michigan, Ann Arbor, United States
Colleen Hansel, Woods Hole Oceanographic Institution Department of Marine Chemistry and Geochemistry, Woods Hole, United States
Chris Herd, University of Alberta, Edmonton, Canada
Gregory Herzog, Rutgers The State University of New Jersey, New Brunswick, New Jersey, USA
Rosemary Hickey-Vargas, Florida International University, Miami, United States
Ed Hornibrook, The University of British Columbia Okanagan Department of Earth Environmental and Geographical Sciences, Kelowna, Canada
Fang Huang, University of Science and Technology of China, Hefei, China
Shichun Huang, University of Nevada Las Vegas, Las Vegas, United States
Munir Humayun, Florida State University, Tallahassee, United States
Adrian Immenhauser, Ruhr University Bochum, Bochum, Germany
Dmitri Ionov, University of Montpellier, Montpellier, France
Jun-ichiro Ishibashi, Kyushu University, Fukuoka, Japan
Andrew Jacobson, Northwestern University, Evanston, United States
Rachael James, University of Southampton, Southampton, United Kingdom
Karen Johannesson, Tulane University, New Orleans, United States
Cédric M. John, Imperial College London, London, United Kingdom
Rhian Jones, The University of Manchester, Manchester, United Kingdom
Fred Jourdan, Curtin University, Perth, Australia
Sabinie Kasten, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany
Brian Kendall, University of Waterloo Department of Earth and Environmental Sciences, Waterloo, Canada
Annie Kersting, Lawrence Livermore National Laboratory, Livermore, United States
Frieder Klein, Woods Hole Oceanographic Institution Department of Marine Chemistry and Geochemistry, Woods Hole, United States
Thorsten Kleine, University of Münster Institute of Planetary Science, Münster, Germany
Christian Koeberl, University of Vienna, Wien, Austria
Alexander Krot, University of Hawai‘i at Manoa, Honolulu, United States
Timothy Lyons, University of California Riverside, Riverside, United States
Franco Marcantonio, Texas A&M University College Station, College Station, United States
Thomas M. Marchitto, Jr., University of Colorado Boulder, Boulder, United States
Horst Marschall, Goethe University Frankfurt, Frankfurt am Main, Germany
Frank McDermott, University College Dublin, Dublin, Ireland
Filip Meysman, University of Antwerp, Department of Biology – Ecosystem Management Research Group, Antwerp, Belgium
John Moreau, The University of Melbourne School of Earth Sciences, Parkville, Australia
Frédéric Moynier, Institute of Earth Physics of Paris, Paris, France
Alfonso Mucci, McGill University, Montréal, Canada
Alexander Nemchin, Curtin University, Perth, Australia
Marc Norman, Australian National University, Canberra, Australia
Martin Novak, Czech Geological Survey, Praha, Czech Republic
Shuhei Ono, Massachusetts Institute of Technology Department of Earth Atmospheric and Planetary Sciences, Cambridge, United States
Sophie Opfergelt, Catholic University of Louvain, Louvain-la-Neuve, Belgium
Dimitri Papanastassiou, NASA Jet Propulsion Laboratory, Pasadena, United States
Caroline Peacock, University of Leeds, Leeds, United Kingdom
Ann Pearson, Harvard University, Cambridge, United States
Noah Planavsky, Yale University Department of Geology and Geophysics, New Haven, United States
Gleb Pokrovski, Paul Sabatier University, Toulouse, France
Oleg Pokrovsky, CNRS Midi-Pyrénées Delegation, Paris, France
Julie Pyrtyuk, Durham University, Durham, United Kingdom
Jay Quade, University of Arizona, Tucson, United States
Eric Quirico, Institute of Planetology and Astrophysics Grenoble, Grenoble Cedex 9, France
Mark Rehkamper, Imperial College London, London, United Kingdom
Edward Ripley, Indiana University Bloomington, Bloomington, United States
Claire Rollion-Bard, Institute of Earth Physics of Paris, Paris, France
Olivier Rouxel, French Research Institute for Exploitation of the Sea Department of Physical Resources and Underwater Ecosystems, Plouzané, France
Sara Russell, Natural History Museum, London, United Kingdom
Silke Severmann, Rutgers The State University of New Jersey, New Brunswick, United States
David Shuster, University of California Berkeley, Berkeley, United States
Daniel Sinclair, Victoria University of Wellington, Wellington, New Zealand
Orit Sivan, Ben-Gurion University of the Negev, Be’er Sheva, Israel
Carl Steefel, E O Lawrence Berkeley National Laboratory, Berkeley, United States
Brian Stewart, University of Pittsburgh, Pittsburgh, United States
Claudine Stirling, University of Otago, Dunedin, New Zealand
Andreas Stracke, University of Münster, Munster, Germany
Weidong Sun, Guangzhou Institute of Geochemistry, Guangzhou, China
Damon Teagle, University of Southampton, Southampton, United Kingdom
Fang-Zhen Teng, University of Washington, Seattle, United States
Jessica E. Tierney, University of Arizona, Tucson, United States
Mike Toplis, Mid-Pyrenees Observatory, Toulouse, France
Nicholas Tosca, University of Oxford, Oxford, United Kingdom
Christophe Tournassat, Bureau for Geological and Mining Research, Orleans, France
Alexandra V. Turchyn, University of Cambridge Department of Earth Sciences, Cambridge, United Kingdom
J. James Van Orman, Case Western Reserve University Department of Earth, Environmental and Planetary Sciences, Cleveland, United States
Tina Van de Flierdt, Imperial College London, London, United Kingdom
Mario Villalobos, National Autonomous University of Mexico, Mexico City, Mexico
Thomas Wagner, Heriot-Watt University, Edinburgh, United Kingdom
Richard Walker, University of Maryland at College Park, Baltimore, United States
Dominik Weiss, Imperial College London, London, United Kingdom
Josef Werne, University of Pittsburgh, Pittsburgh, United States
Wim van Westrenen, VU Amsterdam, Amsterdam, Netherlands
Stefan Weyer, Leibniz University Hanover, Hanover, Germany
Mariette Wolthers, Utrecht University, Utrecht, Netherlands
Shucheng Xie, State Key Laboratory of Geological Processes and Mineral Resources, Wuhan, China
Qingzhu Yin, University of California Davis, Davis, United States
Zoltan Zajacz, University of Toronto, Toronto, Canada
Aubrey Zerkle, University of St Andrews School of Earth and Environmental Sciences, St. Andrews, United Kingdom
Chen Zhu, Indiana University Bloomington, Bloomington, United States
GUIDE FOR AUTHORS

*Geochimica et Cosmochimica Acta* (GCA) publishes research papers in a wide range of subjects in terrestrial geochemistry, meteoritics, and planetary geochemistry. GCA aims to present studies of fundamental significance and broad relevance for understanding geochemical systems, mechanisms, and processes, and of interest to a broad and diverse audience of geochemists. The scope of the journal includes:

1. Physical chemistry of gases, aqueous solutions, glasses, and crystalline solids
2. Igneous and metamorphic petrology
3. Chemical processes in the atmosphere, hydrosphere, biosphere, and lithosphere of the Earth
4. Organic geochemistry
5. Isotope geochemistry
6. Meteoritics and meteorite impacts
7. Lunar science; and
8. Planetary geochemistry.

If you would like more information about the Geochemical Society and Meteoritical Society, visit their Home Pages at http://www.geochemsoc.org and http://www.meteoriticalsociety.org

**Types of papers**

*Geochimica et Cosmochimica Acta* publishes original research articles, comments and replies on papers previously published in the journal, review articles (by invitation), book reviews (by invitation), and speeches or lectures (by invitation).

**Comment and Reply**

Comment and Reply submissions to GCA should be short (not exceeding 2000 words), concise discussions of major, substantive aspects of the original article. Comments will only be entertained for publication if they significantly impact the interpretation of the original article by exposing serious flaws in reasoning, deficiencies in experimental design, or other factors that significantly impact the original article's wider usage by the GCA readership. Discussion of minor errors or omissions, or presentation of alternative points of view, are not suitable for Comments. New or unpublished data or results are not to be presented as either Comments or Replies but should be submitted as research articles. The paper to which the Comment is directed should have been published in GCA within the previous 12 months. Comments and Replies should contain no more than 1 figure and 10 references; excessive use of multi-part figures is not permitted and the Executive Editor will make a decision on the suitability of such figures. Authors who are considering the submission of a Comment to GCA are encouraged to contact the editorial office (gca@elsevier.com) for additional information.

**Contact details for submission**

All papers should be submitted online by the corresponding author at http://ees.elsevier.com/gca. For any further information please visit our Support Center. The *Geochimica et Cosmochimica Acta* editorial office may be reached at gca@elsevier.com.

**BEFORE YOU BEGIN**

**Ethics in publishing**

Please see our information pages on Ethics in publishing and Ethical guidelines for journal publication.

**Declaration of interest**

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors should complete the declaration of interest statement using this template and upload to the submission system at the Attach/Upload Files step. If there are no interests to declare, please choose: 'Declarations of interest: none' in the template. This statement will be published within the article if accepted. More information.

**Submission declaration and verification**

Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in
English or in any other language, including electronically without the written consent of the copyright-holder. To verify originality, your article may be checked by the originality detection service Crossref Similarity Check.

Preprints
Please note that preprints can be shared anywhere at any time, in line with Elsevier's sharing policy. Sharing your preprints e.g. on a preprint server will not count as prior publication (see 'Multiple, redundant or concurrent publication' for more information).

Use of inclusive language
Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Articles should make no assumptions about the beliefs or commitments of any reader, should contain nothing which might imply that one individual is superior to another on the grounds of race, sex, culture or any other characteristic, and should use inclusive language throughout. Authors should ensure that writing is free from bias, for instance by using 'he or she', 'his/her' instead of 'he' or 'his', and by making use of job titles that are free of stereotyping (e.g. 'chairperson' instead of 'chairman' and 'flight attendant' instead of 'stewardess').

Changes to authorship
Authors are expected to consider carefully the list and order of authors before submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made only before the manuscript has been accepted and only if approved by the journal Editor. To request such a change, the Editor must receive the following from the corresponding author: (a) the reason for the change in author list and (b) written confirmation (e-mail, letter) from all authors that they agree with the addition, removal or rearrangement. In the case of addition or removal of authors, this includes confirmation from the author being added or removed. Only in exceptional circumstances will the Editor consider the addition, deletion or rearrangement of authors after the manuscript has been accepted. While the Editor considers the request, publication of the manuscript will be suspended. If the manuscript has already been published in an online issue, any requests approved by the Editor will result in a corrigendum.

Article transfer service
This journal is part of our Article Transfer Service. This means that if the Editor feels your article is more suitable in one of our other participating journals, then you may be asked to consider transferring the article to one of those. If you agree, your article will be transferred automatically on your behalf with no need to reformat. Please note that your article will be reviewed again by the new journal. More information.

Copyright
Upon acceptance of an article, authors will be asked to complete a 'Journal Publishing Agreement' (see more information on this). An e-mail will be sent to the corresponding author confirming receipt of the manuscript together with a 'Journal Publishing Agreement' form or a link to the online version of this agreement.

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the Publisher is required for resale or distribution outside the institution and for all other derivative works, including compilations and translations. If excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has preprinted forms for use by authors in these cases.

For gold open access articles: Upon acceptance of an article, authors will be asked to complete an 'Exclusive License Agreement' (more information). Permitted third party reuse of gold open access articles is determined by the author's choice of user license.

Author rights
As an author you (or your employer or institution) have certain rights to reuse your work. More information.

Elsevier supports responsible sharing
Find out how you can share your research published in Elsevier journals.
Role of the funding source
You are requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement then this should be stated.

Funding body agreements and policies
Elsevier has established a number of agreements with funding bodies which allow authors to comply with their funder's open access policies. Some funding bodies will reimburse the author for the gold open access publication fee. Details of existing agreements are available online.

Open access
This journal offers authors a choice in publishing their research:

Subscription
- Articles are made available to subscribers as well as developing countries and patient groups through our universal access programs.
- No open access publication fee payable by authors.
- The Author is entitled to post the accepted manuscript in their institution's repository and make this public after an embargo period (known as green Open Access). The published journal article cannot be shared publicly, for example on ResearchGate or Academia.edu, to ensure the sustainability of peer-reviewed research in journal publications. The embargo period for this journal can be found below.

Gold open access
- Articles are freely available to both subscribers and the wider public with permitted reuse.
- A gold open access publication fee is payable by authors or on their behalf, e.g. by their research funder or institution.

Regardless of how you choose to publish your article, the journal will apply the same peer review criteria and acceptance standards.

For gold open access articles, permitted third party (re)use is defined by the following Creative Commons user licenses:

Creative Commons Attribution (CC BY)
Lets others distribute and copy the article, create extracts, abstracts, and other revised versions, adaptations or derivative works of or from an article (such as a translation), include in a collective work (such as an anthology), text or data mine the article, even for commercial purposes, as long as they credit the author(s), do not represent the author as endorsing their adaptation of the article, and do not modify the article in such a way as to damage the author's honor or reputation.

Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)
For non-commercial purposes, lets others distribute and copy the article, and to include in a collective work (such as an anthology), as long as they credit the author(s) and provided they do not alter or modify the article.

The gold open access publication fee for this journal is USD 3150, excluding taxes. Learn more about Elsevier's pricing policy: https://www.elsevier.com/openaccesspricing.

Green open access
Authors can share their research in a variety of different ways and Elsevier has a number of green open access options available. We recommend authors see our open access page for further information. Authors can also self-archive their manuscripts immediately and enable public access from their institution's repository after an embargo period. This is the version that has been accepted for publication and which typically includes author-incorporated changes suggested during submission, peer review and in editor-author communications. Embargo period: For subscription articles, an appropriate amount of time is needed for journals to deliver value to subscribing customers before an article becomes freely available to the public. This is the embargo period and it begins from the date the article is formally published online in its final and fully citable form. Find out more.

This journal has an embargo period of 24 months.
Elsevier Researcher Academy

Researcher Academy is a free e-learning platform designed to support early and mid-career researchers throughout their research journey. The "Learn" environment at Researcher Academy offers several interactive modules, webinars, downloadable guides and resources to guide you through the process of writing for research and going through peer review. Feel free to use these free resources to improve your submission and navigate the publication process with ease.

Language (usage and editing services)
Please write your text in good English (American or British usage is accepted, but not a mixture of these). Authors who feel their English language manuscript may require editing to eliminate possible grammatical or spelling errors and to conform to correct scientific English may wish to use the English Language Editing service available from Elsevier's Author Services.

Submission
Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Submit your article
Please submit your article via http://ees.elsevier.com/gca.

PREPARATION

Peer review
This journal operates a single blind review process. All contributions will be initially assessed by the editor for suitability for the journal. Papers deemed suitable are then typically sent to a minimum of two independent expert reviewers to assess the scientific quality of the paper. The Editor is responsible for the final decision regarding acceptance or rejection of articles. The Editor's decision is final. More information on types of peer review.

Use of word processing software
It is important that the file be saved in the native format of the word processor used. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Line Numbers
Line numbers should be added to your file, numbered continuously throughout the main text.

Subdivision - numbered sections
Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Appendices
If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information
• Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
• **Author names and affiliations.** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

• **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**

• **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

**Highlights**

Highlights are optional yet highly encouraged for this journal, as they increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the examples here: example Highlights.

Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

**Abstract**

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself. **NOTE:** The abstract should be limited to 500 words; 200-300 words is preferred.

**Results and Discussion**

Results should be clearly distinguished from Discussion, and should written as separately numbered sections in the manuscript. The Results should provide a concise description of the data or outcomes of the measurements and experiments presented in the manuscript, with adequate reference to tables and figures. Information provided as Results should form the observational basis for the Discussion and Conclusions. The Discussion should critically analyse and evaluate the Results in relation to the problem, hypotheses, and approach that provide the justification and demonstrate the significance of the study as presented in the manuscript.

**Abbreviations**

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

**Acknowledgements**

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

**Formatting of funding sources**

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].
It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Meteorite nomenclature**

New meteorite names must be approved by the Meteorite Nomenclature Committee of the Meteoritical Society before submission of the manuscript to the journal (https://www.lpi.usra.edu/meteor/). All meteorite discoveries should in the first instance be submitted for consideration by the Meteorite Nomenclature Committee (at the Committee's website, https://www.lpi.usra.edu/meteor/naming.php). You may direct inquiries to the Meteorite Bulletin Editor (metbulleditor@gmail.com): Discovery papers may subsequently be submitted to Meteoritics and Planetary Science.

Existing meteorite names should conform to those in the Meteoritical Bulletin Database (https://www.lpi.usra.edu/meteor/). The full (unabbreviated) names of meteorites should be used in titles, headings and at first mention in the text. Abbreviations, including those published in the Antarctic Meteorite Newsletter and the Meteoritical Bulletin Database, may be used in tables and elsewhere. Note that the abbreviated form of numbered meteorites, including Antarctic and many Saharan specimens, should have a blank space between the abbreviated place name and the number (e.g., MacAlpine Hills 88105 is abbreviated MAC 88105), except that some Antarctic meteorites recovered prior to 1981 may have an "A" instead of the blank space (e.g., Elephant Moraine A79001 is abbreviated EETA79001). A list of standard abbreviations and examples of their proper usage can be found at the Meteoritical Society website page maintained for this purpose (http://www.lpi.usra.edu/meteor/DenseAreas.php). Geochimica et Cosmochimica Acta will normally not consider publication of manuscripts purporting to describe the discovery of new meteorites.

When applicable, any available collection numbers for meteorite samples should be provided with the corresponding dataset, and acknowledgements of meteorite loan sources are encouraged. Such additional information may be used to track samples and data sources, to ensure that research on meteorites is reproducible and to prevent confusion in the literature. The article "Best practices for the use of meteorite names in publications" by Heck et al. (2019) (Meteoritics & Planetary Science, 54, 7, 1397-1400) details such requirements for the publication of meteorite research.

**Equations**

Please note that equations should be supplied in one of the following ways:

1. As a .pdf file
2. As a 2003 Word .doc file. If the source file was a Microsoft Word 2007 document (.docx), re-save the original document as a Word 2003 file (.doc) by opening the document and selecting 'Save As', then 'Word 97-2003 Document'.

**Footnotes**

Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors can build footnotes into the text, and this feature may be used. Otherwise, please indicate the position of footnotes in the text and list the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

**Artwork**

**Electronic artwork**

**General points**

- Make sure you use uniform lettering and sizing of your original artwork.
- Embed the used fonts if the application provides that option.
- Aim to use the following fonts in your illustrations: Arial, Courier, Times New Roman, Symbol, or use fonts that look similar.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files.
- Provide captions to illustrations separately.
- Size the illustrations close to the desired dimensions of the published version.
Submit each illustration as a separate file.
Ensure that color images are accessible to all, including those with impaired color vision.
A detailed guide on electronic artwork is available.

You are urged to visit this site; some excerpts from the detailed information are given here.

**Formats**

If your electronic artwork is created in a Microsoft Office application (Word, PowerPoint, Excel) then please supply 'as is' in the native document format.

Regardless of the application used other than Microsoft Office, when your electronic artwork is finalized, please 'Save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):

- **EPS (or PDF):** Vector drawings, embed all used fonts.
- **TIFF (or JPEG):** Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.
- **TIFF (or JPEG):** Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 1000 dpi.
- **TIFF (or JPEG):** Combinations bitmapped line/half-tone (color or grayscale), keep to a minimum of 500 dpi.

**Please do not:**

- Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); these typically have a low number of pixels and limited set of colors;  
- Supply files that are too low in resolution;  
- Submit graphics that are disproportionately large for the content.

**Color artwork**

Please make sure that artwork files are in an acceptable format (TIFF (or JPEG), EPS (or PDF), or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) regardless of whether or not these illustrations are reproduced in color in the printed version. **For color reproduction in print, you will receive information regarding the costs from Elsevier after receipt of your accepted article.** Please indicate your preference for color: in print or online only. [Further information on the preparation of electronic artwork.](#)

**Figure captions**

Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

**Tables**

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

**Data references**

This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

**Reference management software**

Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. [More information on how to remove field codes from different reference management software.](#)
Reference style

Citations presented as "in preparation," "unpublished data," "personal communication," "in/under review," etc. goes against journal style. Authors must either publish cited data within the submitted manuscript including a full accounting of the Methods (Electronic Supplements are fine) or cite a published paper. Alternatively, the reference and any material supported by the citation must be removed. Each citation in text, tables or figure captions must be entered in the References section, showing all authors, year, title and source (journal, book, thesis, etc., with inclusive page numbers. Each reference must be a hanging-indent paragraph. Author names should be given surname first, followed by initials (without intervening commas). Names of journals and of books should be in italics; names of journals should be abbreviated following standard conventions. Journal and serial volume numbers, if applicable, should be in bold font. The following examples show formats for various types of sources.


For multiple references by the same (first) author, first list chronologically all single-author works (e.g., Black (1988), Black (1989a), Black (1989b)), then two-author papers alphabetically (Black and Brown (1991), Black and Brown (1992), Black and Greene (1987)), then three or more authors chronologically (Black, Brown and Blue (1989), Black, Blue and Brown (1991)). Authors should take care that all literature citations, in figure captions and tables as well as main text, have accompanying entries in the References, and also that there are no superfluous entries.

Data visualization

Include interactive data visualizations in your publication and let your readers interact and engage more closely with your research. Follow the instructions here to find out about available data visualization options and how to include them with your article.

Supplementary data

Elsevier accepts electronic supplementary material to support and enhance your scientific research. Supplementary files offer the author additional possibilities to publish supporting applications, high-resolution images, background datasets, sound clips and more. Supplementary files supplied will be published online alongside the electronic version of your article in Elsevier Web products, including ScienceDirect: [http://www.sciencedirect.com](http://www.sciencedirect.com). In order to ensure that your submitted material is directly usable, please provide the data in one of our recommended file formats. Authors should submit the material in electronic format together with the article and supply a concise and descriptive caption for each file. For more detailed instructions please visit our artwork instruction pages at [https://www.elsevier.com/artworkinstructions](https://www.elsevier.com/artworkinstructions).

NOTE: Supplementary files published online only in GCA are referred to as Electronic Annexes. Use of an Electronic Annex is required for extensive supplementary materials such as large data tables, sample descriptions, multiple figures, etc that would otherwise occupy a large amount of printed space. GCA strongly encourages authors to include their manuscript title within their Electronic Annex files.
Research Data
This journal requires you to share the data that supports your research publication where appropriate. Research data refers to the results of observations or experimentation that validate research findings. This requirement includes providing access in a numerical, text-based format to all data that appear solely in figures along with relevant metadata. To facilitate reproducibility and data reuse, the journal also encourages you to share your software, code, models, algorithms, protocols, methods and other useful materials related to the project.

During submission, you will be given the choice between attaching your data to the submission file as an Electronic Annex or by providing a DOI link to a repository location hosting the data in your manuscript.

If you choose to include the data as an Electronic Annex, then this must be contained in a single file, which may be a text, spreadsheet, or document file or a data packaged assembled into a single ZIP file. In addition, you must indicate in the file description during submission that this Electronic Annex is specific the Research Data associated with your manuscript.

If you decide to submit this data via a repository, please ensure that you include a separate section in your manuscript file with the heading "Research Data" that is inserted immediately before your reference section. Under this heading, enter text that reads "Research Data associated with this article can be accessed at https://doi.org/XXXX", where "XXXX" is replaced with the actual DOI. Note that it is expected that these data can be accessed during the review process and your linked repository file should thus be made public prior to submission. The journal accepts data from all major repositories and other locations provided that they are open access, permanently available, and provide a DOI link. Posting data on a university or institutional website is not allowed except in cases where the university or institution hosts a DOI-linked open-access repository. Please note that Mendeley Data provides an open access repository available to all authors. For more information, visit the Mendeley Data for journals page.

Data statement
To foster transparency, we require you to state the availability of your data in your submission if your data is unavailable to access or unsuitable to post. This may also be a requirement of your funding body or institution. You will have the opportunity to provide a data statement during the submission process. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page..

AFTER ACCEPTANCE
Availability of accepted article
This journal makes articles available online as soon as possible after acceptance. This concerns the Journal Pre-proofs (both in HTML and PDF format), which have undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but are not yet the definitive versions of record. A Digital Object Identifier (DOI) is allocated, thereby making it fully citable and searchable by title, author name(s) and the full text. The article's PDF also carries a disclaimer stating that it is an unedited article. Subsequent production stages will simply replace this version.

Online proof correction
Corresponding authors will receive an e-mail with a link to our online proofing system, allowing annotation and correction of proofs online. The environment is similar to MS Word: in addition to editing text, you can also comment on figures/tables and answer questions from the Copy Editor. Web-based proofing provides a faster and less error-prone process by allowing you to directly type your corrections, eliminating the potential introduction of errors.
If preferred, you can still choose to annotate and upload your edits on the PDF version. All instructions for proofing will be given in the e-mail we send to authors, including alternative methods to the online version and PDF.
We will do everything possible to get your article published quickly and accurately. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. It is important to ensure that all corrections are sent back to us in one communication. Please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility.
**Offprints**
The corresponding author will, at no cost, receive a customized Share Link providing 50 days free access to the final published version of the article on ScienceDirect. The Share Link can be used for sharing the article via any communication channel, including email and social media. For an extra charge, paper offprints can be ordered via the offprint order form which is sent once the article is accepted for publication. Both corresponding and co-authors may order offprints at any time via Elsevier's Author Services. Corresponding authors who have published their article gold open access do not receive a Share Link as their final published version of the article is available open access on ScienceDirect and can be shared through the article DOI link.

**AUTHOR INQUIRIES**
Visit the Elsevier Support Center to find the answers you need. Here you will find everything from Frequently Asked Questions to ways to get in touch. You can also check the status of your submitted article or find out when your accepted article will be published.

© Copyright 2018 Elsevier | https://www.elsevier.com