Manuscript Submission Requirements Checklist

Correspondence should be addressed to the Editor-in-Chief at EIC@est.acs.org

- Cover letter
- Title: Titles should be clear and concise; they must match between manuscript file and electronic submission.
- Author list with affiliations: must match between electronic entry and manuscript file
- Abstract
- Manuscript File: Clean with no highlighting or comments and all changes accepted. Line numbers are not required.
- (Highly encouraged) Have a colleague in another field read as test for accessibility.
- Tables/Schemes/Figures: Text should be clear and legible, with fonts no smaller than 8 pt.
- Figures: must be labeled sequentially and match numbered references in article (manuscript and Supporting Information). Where appropriate, label all subsections by letter.
- Supporting Information (if any) must be included in the electronic submission.
- Table of Contents Graphic
- References: no specific format is required, but it must be sufficient to aid referees in their reviewing duties.

Journal Scope

*Environmental Science & Technology (ES&T)* is an impactful environmental science and technology research journal that aims to be transformational and direction-setting publishing rigorous and robust papers for a multidisciplinary and diverse audience of scientists, policy makers, and the broad environmental community. For more than 50 years, *ES&T* has been a foundational focus for thought-leading, policy-changing contributions and will continue to serve as the home for significant, broadly relevant, and generalizable research that serves to inform decision-making. The journal advances rigorous scholarship on complex environmental phenomena, particularly with respect to fate, transport, and transformation in natural and engineered systems, while simultaneously facilitating the solution of critical environmental problems. In addition to novelty and significance of research, *ES&T* considers the relevance of submitted manuscripts to its broad readership.

*ES&T* has been at the forefront of the environmental science and technology movement, serving the environmental community as a top-tier, respected, reliable, and pivotal venue for exceptional, world-class environmental research across a broad and diverse range of environmentally relevant topics. Prospective authors are encouraged to review recent issues of *ES&T* to gain an understanding of the topics that are of greatest interest to the journal’s readers, and they are expected to establish in their cover letters the relevance of their submissions to the *ES&T* community.

Note: Due to the volume of manuscripts we receive, *ES&T* is unable to accept pre-submission inquiries.
Thematic Section Headings

Current ES&T topical categories for research articles are as follows:

- Occurrence, Fate, and Behavior of Aquatic and Terrestrial Contaminants in Natural Systems
- Physico-Chemical Treatment and Resource Recovery
- Ecotoxicity and Public Health
- Occurrence, Fate, and Behavior of Contaminants in Indoor Air and Atmosphere
- Energy and Climate
- Biogeochemical Cycling
- Sustainable Systems
- Bioremediation and Biotechnology
- Data Science

These categories are periodically reviewed and may be changed.

Manuscript Types

ES&T accepts the following manuscript types: Research Articles, Features, Viewpoints, Reviews, Policy Analysis, Spotlights, Perspectives, Letters to the Editor, and Correspondence/Rebuttals. A full description of each manuscript type is shown below:

Research Article
Research Articles (length limit: 7,000 word-equivalents). Research articles in ES&T must report original research that is expected to have a definable impact on the advancement of environmental chemistry, science, technology, and policy. ES&T welcomes rigorous scholarship on complex environmental processes and phenomena, particularly those affected by human activities. This includes chemical, biological, and physical phenomena in natural and engineered environmental systems, as well as mathematical and computational methods that are directly relevant to the understanding, protecting, restoring, and managing of the natural environment, including eliminating, minimizing, and mitigating human impacts. The journal also publishes articles that describe significant scientific advances or novel technologies for facilitating the solutions of critical environmental problems, including pollution remediation, control, prevention, and avoidance. Papers in the area of ecotoxicology and human environmental health should provide novel information on effects of chemicals or lead to new insights into the mechanisms and processes underlying effects of chemicals and other stressors. ES&T also encourages submission of studies that address challenges associated with the "Replacement, Reduction and Refinement" of animal studies. At submission, authors must provide a short synopsis statement (approximately 20 words), placed after the abstract, stating the environmental relevance and significance of their research work. Authors are also expected to provide an explanation in their cover letter why they believe the manuscript belongs in ES&T and why their research will interest our readers with an emphasis on the novelty and environmental relevance of the contribution.

ES&T Expectations
ES&T strives to publish novel research of scientific significance and high environmental importance. Insufficient novelty is common reason manuscripts are declined. Novelty is defined as new experimental data, new interpretations of existing data, or new analyses of environmental phenomena that provide important new insights into environmental processes. Significance is judged with respect to the breadth of impact of the reported findings. Manuscripts that report data
of a routine nature or that address topics that are already well understood will not be considered. Whenever possible, research on new measurement technologies should include results with authentic environmental samples, and evaluations should be performed under environmentally realistic conditions. The expectations of manuscript novelty and quality are further described in the recent ES&T editorials ‘Making Waves’ and ‘Evolving Today to Best Serve Tomorrow’.

ES&T Minimum Requirements

- All studies must clearly articulate the environmental relevance of the study to the broad ES&T community.
- Studies should provide novel insights into relevant environmental processes or mechanisms, i.e., studies that only describe the outcomes of standard laboratory or field tests or commercially available products are not appropriate for publication in ES&T.
- An assessment of uncertainty or sensitivity analysis should be included in reported data where applicable, with adequate quality assurance/quality control reported. New analytical methods should be thoroughly developed and quality ensured.
- Manuscripts should include evaluations performed under environmentally realistic conditions and concentrations. Concentrations should be reported as measured and not nominal. Ensure that key variables are measured and reported if relevant, e.g., pH.
- Manuscripts on toxicity and ecotoxicity should include positive and negative controls, and consider multiple concentrations relevant to environmental exposures and/or a time-course study. Results should inform AOPs or mechanisms of action.
- The scope of the reported data in ambient monitoring studies must yield conclusions applicable to more than the particular site or time when the data were taken, i.e., findings should not be location specific representing a case study, but rather generalizable and/or transferable to other contexts.
- Studies on environmental contaminants should provide information that is clearly related to that compound’s fate, transport, transformation and/or effects in the environment.
- Manuscripts on adsorption should consider kinetics as well as isotherms. First-principle models of mass transfer are preferred over purely empirical models.
- Manuscripts that emphasize chemical engineering, new catalysts synthesis or analytical chemistry must provide a concise argument that the research represents an advance that is of primary importance to the environmental field and include comparison to state-of-the-art approaches where appropriate.
- Manuscripts on novel materials (e.g., sorbents or catalysts) should demonstrate the materials have been tested under at least one environmental condition using relevant concentrations of target contaminant.
- Manuscripts on air quality and particulate matter should include adequate characterization of the particles relevant to the study.
- Articles describing advances in treatment technologies for remediation of contaminated environments or control of emissions should go beyond kinetics and treatability studies by exploring the mechanisms of the technology, or develop process models to describe the technique.
- If a manuscript proposes a new application, a general energy analysis or life-cycle assessment should be provided and compared against conventional methods.
- Articles that describe laboratory-scale studies should make meaningful and unbiased comparisons to existing approaches but should not make claims about the economics or relative advantages of the technology without pilot- or full-scale validation studies or properly validated models.
Manuscripts that report on initial findings of an urgent nature may be submitted to *Environmental Science & Technology Letters (ES&TL)*.

Research articles are reviewed initially by the Executive Editor team. If appropriate, manuscripts are then assigned to an associate editor for review, who may then, if appropriate, send the manuscript for full peer review by other scientists who assess the significance, originality, and validity of the work. The Editor-in-Chief, executive editors, and associate editors, listed in the *ES&T* masthead, make final decisions about all research material published in *ES&T*.

**Feature**

Feature articles (length limit: 5,000 word-equivalents) are written in a magazine or journalistic style rather than as a scientific article. This article type should provide a balanced examination of significant developments and issues affecting the environmental community. The assessment of timely topics from multiple perspectives—scientific, regulatory, technical—should provide readers with an authoritative and up-to-date understanding of the subject. Features will undergo peer review, with reviewers providing comments on the factual accuracy, clarity, and significance of the contribution. Prospective authors are encouraged to review already published Feature articles in *ES&T* to understand style and content. At submission, authors must provide a short synopsis statement (approximately 20 words), placed after the abstract, stating the environmental relevance and significance of their research work. Corresponding authors of accepted articles will also be requested to provide a short biography (up to 200 words) and headshot for inclusion at the end of the published article. Model release and copyright forms are required for author photographs and will be provided by the Journal office.

**Viewpoint**

Viewpoints (length limit: 1,000 word-equivalents + author affiliations + 5 references + 1 single-frame figure with 50-word caption OR a 350-word table) are short opinion-style manuscripts, written in the style of an opinion piece in a newspaper or magazine. They provide authors with a venue to comment on an issue of pressing importance to *ES&T*’s readership. Viewpoint articles should express an opinion of a clear scientific nature, based on rigorous scientific research in an environmental discipline. They should not be wholly political or summary in nature. Viewpoints should not include new scientific data. Viewpoints are not peer-reviewed but are reviewed internally by at least 2 members of the *ES&T* Editorial team. Corresponding authors of accepted articles will also be requested to provide a short biography (up to 200 words) and headshot for inclusion at the end of the published article. Model release and copyright forms are required for author photographs and will be provided by the Journal office. A TOC graphic is not required for this manuscript type.

**Review**

Review manuscripts (length limit: 10,000 word-equivalents) are thoroughly documented, forward-looking comprehensive assessments of particular areas in the environmental science and technology research domain. Reviews should increase readers’ knowledge through discriminating analysis and insightful organization of the material. Reviews are not intended to consist of catalogues of prior research and must go beyond synthesis to include analysis. Factors considered when evaluating Reviews include the current and likely future importance of the field under review, thoroughness of the literature coverage, clarity of the presentation, and identification of future research needs.

Please note: Potential authors of Reviews must first submit a proposal and cover letter (via the *ES&T* submission site in the ACS Paragon Plus Environment). The proposal, to be uploaded as a
single manuscript file, should include the following details:

1. Proposed title
2. Author names and affiliations
3. Corresponding author’s email address, profile on institutional website (if available), and Google Scholar, Web of Science, or Scopus profile
4. Abstract (length limit: 500 words)
5. Topical outline (length limit: three pages), indicating the headings of sections and subsections, a brief discussion of the proposed content of each section, and key references for each section
6. List of up to five of the authors’ papers related to the review topic
7. List of key previous reviews on the subject in the past 10 years
8. Justification for the need for another review on the topic targeting the broader readership of ES&T

An assigned editor will issue a decision on the proposal, and in exceptional cases may be sent for peer review. If approved, the authors will be invited to submit a full Review for further consideration. If the full review is favorably received by the assigned editor, the manuscript will then undergo peer review.

**Perspective**
Perspectives (length limit: 4,000 word-equivalents) are personal reviews of a field or area, and they are focused, rather than comprehensive. Perspective authors are asked to assess the current status of a chosen field with an emphasis toward identifying key progress being made and research that is needed to advance a sub-discipline, theory, or technology. Perspectives should be based on scientifically sound statements with sufficient references and scientific underpinning to substantiate the views expressed. At submission, authors must provide a short synopsis statement (approximately 20 words), placed after the abstract, stating the environmental relevance and significance of their research work. Perspectives will undergo peer review. Perspective articles can be submitted directly through the ES&T submission site without prior approval. Corresponding authors of accepted articles will also be requested to provide a short biography (up to 200 words) and headshot for inclusion at the end of the published article. Model release and copyright forms are required for author photographs and will be provided by the Journal office.

**Policy Analysis**
Policy Analysis manuscripts (length limit: 7,000 word-equivalents) typically focus on the interface of science and engineering with public policy and provide new insight for understanding and managing human–environmental systems. Topics of particular interest include risk assessment, critical evaluations of environmental regulations, and environmental cost-benefit analyses. At submission, authors must provide a short synopsis statement (approximately 20 words), placed after the abstract, stating the environmental relevance and significance of their research work. Policy analysis articles will undergo peer review.

**Spotlight**
Spotlight articles (length limit: 800 word-equivalents + author affiliations + 5 references + 1 single-frame figure with 50-word caption OR a 350-word table) are short summary-style manuscripts to highlight a previously published paper in ES&T that has been influential in shaping global environmental policy and technology through its citation in policy papers, patents, or by receiving considerable international media attention. Spotlights should briefly describe the essence and
context of the research article presented, and how the work has been influential. Spotlight articles do not undergo external peer reviewed, but they are reviewed by at least two members of the ES&T editorial team. Corresponding authors of accepted articles will be requested to provide a short biography (up to 200 words) and headshot for inclusion at the end of the published article.

**Letter to the Editor**
Letter to the Editor contributions (length limit: 500 word-equivalents + author affiliations + 250 words of references) provide comments on the following already-published journalistic article types only: Features, Viewpoints, and Editorials (Comments). Letters to the Editor should be submitted within two months of the publication date of the original material. The author(s) of the original material will be given an opportunity to reply. If appropriate, both articles will be published in the same issue. These articles are not peer reviewed.

**Please note:** Contributors wishing to comment on research content (this includes Research Articles, Policy Analysis, Reviews, Perspectives, Correspondence/Rebuttals, and Additions and Corrections), please submit a Correspondence/Rebuttal.

**Correspondence/Rebuttal**
Correspondence/Rebuttal manuscripts (length limit: 1,000 word-equivalents each including citations) provide scholarly comment on papers appearing in the research section (Research Articles, Policy Analyses, Reviews, Perspectives, Correspondence/Rebuttals, and Additions and Corrections). Correspondence should be submitted within twelve months of the publication date of the original paper and must raise substantive scientific or technical questions. Well-justified exceptions to this timeframe will also be considered. Correspondence that consists mainly of opinion will not be considered. The author(s) of the original paper will be given an opportunity to prepare a response within one month of receiving the Correspondence. Correspondence on previously published Correspondence will not be considered, and personal invective will not be tolerated. Correspondence/Rebuttal may undergo peer review at the determination of the assigned editor. The correspondence and the rebuttal will be published consecutively in the same issue.

**Special Issues**
ES&T has a required template that must be completed for all proposals for special issues. If you would like to propose a special issue, please contact the managing editor via email: managing.editor@est.acs.org.

**ACS Publishing Center**
While this document will provide basic information on how to prepare and submit the manuscript as well as other critical information about publishing, we also encourage authors to visit the ACS Publishing Center for additional information on everything that is needed to prepare (and review) manuscripts for ACS journals and partner journals, such as

- Mastering the Art of Scientific Publication, which shares editor tips about a variety of topics including making your paper scientifically effective, preparing excellent graphics, and writing cover letters.
- Resources on how to prepare and submit a manuscript to ACS Paragon Plus, ACS Publications’ manuscript submission and peer review environment, including details on selecting the applicable Journal Publishing Agreement.
- Sharing your research with the public through the ACS Publications open access program.
- ACS Reviewer Lab, a free online course covering best practices for peer review and related
ethical considerations.

- **ACS Author Lab**, a free online course that empowers authors to prepare and submit strong manuscripts, avoiding errors that could lead to delays in the publication process.
- **ACS Inclusivity Style Guide**, a guide that helps researchers communicate in ways that recognize and respect diversity in all its forms.

## Manuscript Preparation

### Submit with Fast Format

All ACS journals and partner journals have simplified their formatting requirements in favor of a streamlined and standardized format for an initial manuscript submission. Read more about the requirements and the benefits these serves authors and reviewers [here](#).

Manuscripts submitted for initial consideration must adhere to these standards:

- Submissions must be complete with clearly identified standard sections used to report original research, free of annotations or highlights, and include all numbered and labeled components.
- Figures, charts, tables, schemes, and equations should be embedded in the text at the point of relevance. Separate graphics can be supplied later at revision, if necessary.
- When required by a journal's structure or length limitations, manuscript templates should be used.
- References can be provided in any style, but they must be complete, including titles. For information about the required components of different reference types, please refer to the [ACS Style Quick Guide](#).
- Supporting Information must be submitted as a separate file(s).

### Document Templates and Format

The templates facilitate the peer review process by allowing authors to place artwork and tables close to the point where they are discussed within the text. Learn more about document templates [here](#).

General information on the preparation of manuscripts may also be found in the [ACS Guide to Scholarly Communication](#).

### Acceptable Software, File Designations, and TeX/LaTeX

See the list of [Acceptable Software](#) and appropriate [File Designations](#) to be sure your file types are compatible with ACS Paragon Plus. Information for manuscripts generated from [TeX/LaTeX](#) is also available.

### Cover Letter

A cover letter must accompany every manuscript submission. During the submission process, you may type it or paste it into the submission system, or you may attach it as a file.

In your cover letter, please provide a rationale for publication in *ES&T*, making the environmental relevance clear. A substantial fraction of submissions to *ES&T* are not sent out for review because
an editor concludes that the manuscript does not meet the journal's standards for novelty, scientific merit, or environmental importance. The cover letter is your opportunity to convince the editor that this is not the case. Citations of previous related work published within ES&T also can be useful to the reviewing editor.

The cover letter should list the authors and their affiliations, give the manuscript title, and provide complete contact information for all authors. If you have a non-preferred editor, you may explain your reason for making the request in your cover letter.

**Manuscript Text Components**

Assume ES&T readers are professionals who are not necessarily experts in your particular field. Spell out all acronyms on first use in the abstract and in the body of the article. ES&T does not allow footnotes, with the exception of an author information footnote on the title page and table detail/definition footnotes.

The various sections of the manuscript are described in detail below:

- Title and Authorship
- Abstract, Keywords and Synopsis
- Introduction
- Materials and Methods
- Results and Discussion
- Abbreviations
- Acknowledgment
- References
- Formulae and Equations

**Title**

Use a brief, specific, and informative title. Keywords in titles assist in effective literature retrieval. If trade names are used, give generic names in parentheses.

**Authorship**

List the full first name, middle initial(s), and last name of each author. Omit professional and official titles. An author’s affiliation should be based on where they were when the work was performed. When the present address of an author is different, include the new information in a footnote. In a paper with more than one author, the name of the corresponding author, to whom post-publication inquiries should be addressed, carries an asterisk (*). Provide an email address for the corresponding author.

Many funders and institutions require that institutional affiliations are identified for all authors listed in the work being submitted. ACS facilitates this requirement by collecting institution information during the manuscript submission process in ACS Paragon Plus (Step 3 in Paragon Plus: Authors & Institutions).

Include as co-authors all those who have made a substantial contribution to the work. Addition or deletion of an author(s) after submission of the manuscript requires justification from the corresponding author and is subject to editorial approval. Deceased persons who meet the criteria for inclusion as coauthors should be included, with an 'Author Information' note, indicating the date
Abstract, Keywords, and Synopsis

Abstract
A 150–200-word clear and concise abstract must accompany Research Articles, Review, Policy Analysis, and Perspective manuscripts. As a one-paragraph summary, describe the purpose, methods or procedures, significant new results, and implications. Define any abbreviations or acronyms used in the abstract. Include major quantitative data if they can be stated briefly, but do not include background material. Do not include reference numbers in the abstract.

For Features, include a shorter 3–5 sentence Abstract, written at a level comprehensible to the scientifically literate general public. An abstract is not required for Viewpoint manuscripts.

Keywords
Research Articles, Policy Analysis, Reviews, Perspectives and Features must be accompanied by 5–8 keywords. Authors are encouraged to include significant keywords that do not appear in the title to expand discoverability and aid the reader in literature retrieval. The keywords are published immediately before the text, following the abstract.

Synopsis
A synopsis is a succinct, simple, non-technical statement (~30 words) articulating the environmental context and environmental impact of your research or policy. The synopsis is mandatory for Research Articles, Policy Analysis, Perspectives, and Features and must be present at submission. The synopsis should use complete sentences. The synopsis is NOT a repeat of the abstract or a description of the TOC/Abstract graphic.

Example of an ES&T synopsis: ‘Minimal research exists on microplastics exposure from indoor air. This study reports microplastics at higher concentrations in indoor air and dust compared to outdoors with implications for human health.’

Introduction
The introduction should clearly and concisely explain the motivation for the work, its importance and originality, where it fits in the development of the field and why it should be of interest to ES&T readers. Discuss relationships of the study to previously published work, but do not reiterate or provide a complete literature survey. Current findings should not be included or summarized in this section. Introduction sections are typically around 500 words in length.

Materials and Methods
Describe pertinent and critical factors involved in the experimental work but avoid excessive description. Details not essential for understanding the paper can be placed in Supporting Information (SI). Specific experimental methods should be sufficiently detailed for others to repeat the experiments unequivocally. List devices of a specialized nature or instruments that may vary in performance or affect the quality of the data obtained (e.g., spectroscopic resolution), including
the vendor. If the procedures are already published, provide citations to previous publications and expand only on differences in the current work. Authors must emphasize any unexpected, new, and/or significant hazards or risks associated with the reported work and this safety information must be included in the Materials and Methods section.

Results and Discussion

Be complete but concise. Discuss your findings, postulate explanations for the data, elucidate models and compare your results with those of others. Avoid irrelevant comparisons or contrasts, any speculation unsupported by the data presented and verbose discussion. A separate conclusion is not to be used; any concluding statements are to be incorporated under Results and Discussion.

Abbreviations

Specialized abbreviations may be used provided they are placed in parentheses after the word(s) at first point of use. Do not include a separate Abbreviations list. Use SI units and consult the ACS Guide to Scholarly Communication for lists of SI units and preferred forms of commonly used abbreviations.

Acknowledgment

Include only essential credits to acknowledge financial or professional assistance to the conduct of research. Sources of financial support must be acknowledged. Omit academic and social titles.

Author Information

A section may be included, as needed, entitled “Author Information” to provide pertinent information on the authors, such as the names of authors who contributed equally to the article, or details of the date of death of a deceased author.

References

Literature references in ES&T must be numbered in order of appearance, and the corresponding numbers placed at the appropriate locations in the text as superscripted numerals. The accuracy of the References is the responsibility of the authors, who are encouraged to avoid references to works that have not been peer reviewed. DOI numbers are helpful but not mandatory unless they are the only identifying information available (e.g., for recently published articles). Excessive self-citation is not permitted. Any references in publications that would be difficult for most reviewers to obtain or are unpublished should be uploaded into the ES&T Paragon Plus submission site as Information for ‘Review Only’.

Formulae and Equations
Chemical formulas should be embedded in the text at the point of relevance and should correspond to the ACS Guide to Scholarly Communication. Chemical equations should be balanced and numbered consecutively along with mathematical equations. Mathematical arguments should be as brief as possible.

Components Described Elsewhere in these Guidelines

- TOC/Abstract Graphic
- Funder Reporting Requirement
- Tables, Figures, and Chemical Structures
- Web Enhanced Objects (WEO)
- Supporting Information
- Cover Art

Supporting Information

This information is provided to the reviewers during the peer-review process (for Review Only) and is available to readers of the published work (for Publication). Supporting Information must be submitted at the same time as the manuscript. See the list of Acceptable Software by File Designation and confirm that your Supporting Information is viewable.

If the manuscript is accompanied by any supporting information files for publication, these files will be made available free of charge to readers. A brief, nonsentence description of the actual contents of each file, including the file type extension, is required. This description should be labeled Supporting Information and should appear before the Acknowledgement and Reference sections. Examples of sufficient and insufficient descriptions are as follows:

Examples of sufficient descriptions: “Supporting Information: \(^1\text{H}\) NMR spectra for all compounds (PDF)” or “Additional experimental details, materials, and methods, including photographs of experimental setup (DOC)”.

Examples of insufficient descriptions: “Supporting Information: Figures S1-S3” or “Additional figures as mentioned in the text”.

When including supporting information for review only, include copies of references that are unpublished or in-press. These files are available only to editors and reviewers.

Research Data Policy

All ACS journals strongly encourage authors to make the research data underlying their articles publicly available at the time of publication. Research data is defined as materials and information used in the experiments that enable the validation of the conclusions drawn in the article, including primary data produced by the authors for the study being reported, secondary data reused or analyzed by the authors for the study, and any other materials necessary to reproduce or replicate the results. The ACS Research Data Policy provides additional information on Data Availability Statements, Data Citation, and Data Repositories.

Data Requirements
Nomenclature
Use abbreviations and acronyms sparingly, and all usage should be defined at the first occurrence in the text. Whenever possible, use systematic nomenclature as recommended by IUPAC and IUBMB for chemical compounds and biomolecules, and SI units. The ACS and IUPAC websites have links to nomenclature recommendations. Usually, the chemical name or composition should be given in parentheses or in a reference at the first occurrence of such a name. Names of organisms should comply with genetic conventions, with genus and species names written in italics and spelled out in full on first appearance. Trademark names should be defined at the point of first use and registered trademark names should be capitalized whenever used. Registration marks are not required to ensure legal protection for the trademark. Trade and trivial names should not be capitalized.

Data Presentation
Data should be presented in a way that makes interpretation clear to the reader.

For more information on data presentation, see:
1. Quantifying the Interactions between Biomolecules: Guidelines for Assay Design and Data Analysis
2. Beyond Bar and Line Graphs: Time for a New Data Presentation Paradigm
3. Reporting standards and availability of data, materials, code and protocols.
4. MIQE guidelines for ddPCR and QPCR by Bustin et al. 2009 and Hugget et al. 2020; EMMI guidelines by Borchardt et al. 2021
5. Best practice for 16S Microbiome studies

Biological Assays
Exposure protocols and methods must be referenced or described in sufficient detail to permit the experiments to be repeated by other investigators. This includes for example information on the preparation of the test materials, medium components, and duration of exposure. In addition, the applied dose or dose range should be given in a meaningful unit and the relevance of the applied dose should be substantiated. Doses and concentrations should be expressed as molar quantities (e.g., mol/kg, mM, etc.), particularly when comparisons of potencies are made on compounds having large differences in molecular weights. The routes of administration of test compounds and vehicles should be indicated. Benchmarks should be included in form of appropriate positive or negative control substances or reference materials. Especially for studies on nanomaterials, assays should be checked for interference induced by nanomaterials, e.g., optical or chemical interference, masking of the analyte or other interference mechanisms by inclusion of appropriate controls. Also, for studies on nanomaterials, sterilization procedures and specification of dilution steps as well as the order of addition should be provided, and as far as possible, various measuring units related to dose (e.g., surface area, mass, particle number per surface area, volume, cell number) should be given to increase comparability with other studies. Data may be presented as numerical expressions or in graphical form. Statistical limits (statistical significance) for the biological data are usually required. If statistical limits cannot be provided, the number of determinations and some indication of the variability and reliability of the results should be given. References to statistical methods of calculation should be included.

Use of Human Subjects or Animals in Research
The American Chemical Society Publications rules and ethical guidelines provide mandatory standards of practice in experimental studies performed using biological samples obtained from animals or human subjects. Studies submitted for publication approval must present evidence that the described experimental activities have undergone local institutional review assessing safety
and humane usage of study subject animals.

**Research Involving Animals**

An indication that all animal experiments have undergone ethical review and were carried out with appropriate permissions or licenses from national or institutional committees that cover the research must be provided. Relevant details listed in the latest version of the ARRIVE (Animal Research: Reporting of In Vivo Experiments) guidelines should be given, especially the description of animals (e.g., source, sex, age, species, and strain), experimental design (e.g., number of groups, number of animals in each group, how animals were divided, and a flow chart of the study protocol) and procedures (e.g., drug or chemical formulation, dose, treatment time and frequency). The numbers of animals for each experiment used in the research should be clearly stated in the Materials and Methods section in manuscript and legends of relevant Tables and Figures. Justifications for the doses used in the research should be included, and where appropriate, the relationship between these doses and relevant environmental or human exposure or intake levels is encouraged to be provided.

**Research Involving Human Subjects**

Authors must provide a statement that study samples were obtained through the informed consent of the donors, or in lieu of that evidence, by the authority of the institutional board that licensed the use of such material. The institution’s name and approved IRB number must be listed in the paper. Details listed in the latest version of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines and description of informed consent protocols must also be provided. Papers that include any aspect of Community-Based Participatory Research (CBPR) or citizen science must include information on practices employed to protect vulnerable populations.

**Database Deposition**

Advancing scientific discoveries can be enhanced when data and materials are made available and readily exchanged. *ES&T* requires for all published articles that authors make materials, data, and protocols available to readers through deposition in a public database. A statement must appear in the submitted manuscript confirming submission of the data and indicating the data bank and any pertinent accession codes/ID.

To identify the repository that meets your particular needs, you may find FAIR Sharing Databases, Registry of Research Data Repositories, and Repository Finder helpful. Authors may also want to further investigate unstructured and/or large data repositories, such as Dryad Digital Repository, figshare, Open Science Framework, and Zenodo, or institutional repositories for depositing data. If there is no appropriate repository available, general publicly available repositories should be used.

In addition, ACS Publications’ figshare houses all Supporting Information within the HTML presentation of the paper and at acs.figshare.com. Authors also agree to make available to interested academic researchers for their own use any materials reported in the manuscript that are not otherwise obtainable. Any restrictions to the availability of materials or information must be stated at the time of submission. The ACS Math Style Sheet and NMR Guidelines are available on the ACS Publishing Center.

**Sequence Data**

DNA and RNA sequence data can be submitted to suitable public repositories such as GenBank, European Nucleotide Archive (ENA), the DNA Data Bank of Japan (DDBJ), dbSNP, dbVar, Database of Genomic Variants archive (DGVa), MGNify, miRBase, NCBI Sequence Read Archive (SRA), and NCBI Trace Archives. Protein sequence data should be deposited with the Protein.
Identification Recourse at Georgetown University Medical Center, Washington, the European Bioinformatics Institute (EBI), the Swiss Institute of Bioinformatics, or UniProt.

Omics Data
Manuscripts that present microarray data should follow the MIAME (Minimum Information About a Microarray Experiment) guidelines. Data should be submitted to suitable public repositories such as ArrayExpress, Database of Interacting Proteins (DIP), dbGaP, Genomic Expression Archive (GEA), Gene Expression Omnibus (GEO), IntAct Molecular Interaction Database, Global Natural Products Social Molecular Networking (GNPS), MassIVE, MetaboLights, Proteomics Identifications (PRIDE) Archive, and ProteomeXchange.

For sequence data and microarray data, the relevant accession numbers should be available at the time that the revision is submitted and should be listed at the end of the Materials and Methods section in the revised version of the manuscript.

Proteomics Data
Proteomic experiments must meet the standards established by the Journal of Proteome Research. More information is available in the Publication Guidelines for the Analysis and Documentation of Peptide and Protein Identifications. Protein sequences should be handled in the same way as described above, and accession number and database source should be included.

Computer Codes
When computer codes are developed or used and are an essential part of a manuscript, sufficient detail must be given, either within the paper or in the SI. Types of languages that are used in the computer codes, compiler/interpreter, and operating system with a specific version must be provided or properly cited. Upon request, after appropriate material transfer agreements to restrict the use of the materials so as to protect the legitimate interests of the authors, codes and input data must be made available for others to validate the calculations. Regardless of whether the source code is open or closed source, it must be properly cited in the References.

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When computational chemistry calculations are performed, input data—including force field parameters, equations defining the model (or references to where such material is available in the open literature), methods and approaches, and basis sets—must be given either within the paper or in the SI. If the software used for calculations is generally available, it must be properly cited in the References. References to the methods upon which the software is based must also be provided.

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**Appendix 2: Preparing Graphics**

**Resolution**

Digital graphics pasted into manuscripts should have the following minimum resolutions:

- Black and white line art, 1200 dpi
- Grayscale art, 600 dpi
- Color art, 300 dpi

**Size**

Graphics must fit a one- or two-column format. Single-column graphics can be sized up to 240 points wide (3.33 in.) and double-column graphics must be sized between 300 and 504 points (4.167 in. and 7 in.). The maximum depth for all graphics is 660 points (9.167 in.) including the caption (allow 12 pts. For each line of caption text). Lettering should be no smaller than 4.5 points in the final published format. The text should be legible when the graphic is viewed full-size. Helvetica or Arial fonts work well for lettering. Lines should be no thinner than 0.5 point.

**Color**

Color may be used to enhance the clarity of complex structures, figures, spectra, and schemes, etc., and color reproduction of graphics is provided at no additional cost to the author. Graphics intended to appear in black and white or grayscale should not be submitted in color.

**Type of Graphics**

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Consult the Guidelines for Table of Contents/Abstract Graphics for specifications.
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**Figures**

A caption giving the figure number and a brief description must be included below each figure. The caption should be understandable without reference to the text. It is preferable to place any key to symbols used in the artwork itself, not in the caption. Ensure that any symbols and abbreviations used in the text agree with those in the artwork.

**Charts**

Charts (groups of structures that do not show reactions) may have a brief caption describing their contents.

**Tables**

Each table must have a brief (one phrase or sentence) title that describes the contents. The title should be understandable without reference to the text. Details should be put in footnotes, not in the title. Tables should be used when the data cannot be presented clearly in the narrative, when many numbers must be presented, or when more meaningful inter-relationships can be conveyed by the tabular format. Tables should supplement, not duplicate, information presented in the text and figures. Tables should be simple and concise.

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- 3D Sketchup Software
- Solidworks
- ArcGIS
- Affinity Designer (v 1.7, Serif Europe Ltd.)
- dreamgenerator.com
- XCrySDen
- National Gallery of Art/NGA Images. With the launch of NGA Images, the National Gallery of Art in Washington, DC implements an open access policy for digital images of works of art that the Gallery believes to be in the public domain. Images of these works are now available free of charge for any use, commercial or non-commercial. Users do not need to contact the Gallery for authorization to use these images as long as credit is given to the National Gallery of Art, Washington, DC. The images are available for download at the NGA Images website (images.nga.gov).