Submit to the *Proceedings of the National Academy of Sciences* (PNAS) and have your research discovered by millions of researchers in the Biological, Physical, and Social Sciences.

**About PNAS**

PNAS has been at the forefront of scientific research for over a century. Established in 1914 as the peer reviewed journal of the US National Academy of Sciences (NAS), PNAS is now one of the largest and most-cited multidisciplinary scientific journals in the world, with a global readership and more than 3,500 research articles published annually.

**Why Submit to PNAS?**

**Comprehensive scientific coverage**

PNAS publishes exceptional research in all branches of the Biological, Physical, and Social Sciences. We find that innovation often happens at the margins, and we are particularly interested in research that crosses disciplinary bounds, answers questions with broad scientific impact, or breaks new ground.

**Broad scientific audience**

With one of the largest scientific audiences in the world, PNAS articles reach millions of top researchers each year. Our lower-income countries and open access programs further our mission to make scientific research accessible to all.

**Rapid, high-quality peer review**

PNAS is edited by members of the NAS, a private, nonprofit society of distinguished scholars. Scientists are elected by their peers to membership in the NAS for outstanding contributions to research. Nearly 200 members of the NAS have won Nobel Prizes. The NAS is committed to furthering science in America, and its members are active contributors to the international scientific community.

On average, a full review takes just 46 days, and most articles publish within 6 months of submission.

**High impact**

PNAS publishes some of the most highly cited research in the world. Learn more about our 2021 article- and journal-level metrics.

<table>
<thead>
<tr>
<th>h-5-index</th>
<th>Eigenfactor</th>
<th>Cited Half-life</th>
<th>SNIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>268</td>
<td>0.740</td>
<td>10.4</td>
<td>3.063</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CiteScore</th>
<th>Article Influence</th>
<th>Impact Factor</th>
<th>immediacy Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.1</td>
<td>4.654</td>
<td>12.779</td>
<td>2.813</td>
</tr>
</tbody>
</table>
Submitting Your Manuscript
PNAS welcomes submissions in all scientific disciplines from researchers worldwide. Information on submitting your manuscript is included below. Please contact us if you have any questions about the submission process. Click here for information about submitting to PNAS Nexus.

PNAS Article Types

<table>
<thead>
<tr>
<th>Unsolicited Article Types</th>
</tr>
</thead>
</table>
| **Research Reports** describe the results of original research of exceptional importance. The preferred length of these articles is 6 pages, but PNAS allows articles up to a maximum of 12 pages. A standard 6-page article is approximately 4,000 words, 50 references, and 4 medium-size graphical elements (i.e., figures and tables).
| • **Direct Submissions**: Most PNAS articles are Direct Submissions.
| • **Contributed Submissions**: NAS members may contribute two research manuscripts annually within their area of expertise in which they had a direct, significant role in the design and execution of the work. Learn more about the Contributed Submissions process. |

| **Brief Reports** describe observations of immediate impact that may hold potential to initiate new avenues of research, provide compelling new data on controversies of broad interest and long-standing questions, or present a concise conceptual advance.
| • **All Brief Reports are published open access.**
| • Brief Reports are limited to 3 pages, which is approximately 1,600 words (including the manuscript text, title page, abstract, and figure legends), and 15 references. They typically include no more than 2 graphical elements.
| • Supporting information (SI) is limited to extended methods, essential supporting datasets, and videos (no additional tables or figures).
| • All Brief Reports follow the Direct Submission mode of review and are not eligible as member-contributed submissions. |

| **Letters to the Editor** provide brief comments that allow readers to constructively address a difference of opinion with authors of a PNAS article.
| • Letters are limited to 500 words, 2 graphical elements (figures or tables), and 10 references. Legends should only include brief descriptions of the figures. Supporting information is not allowed.
| • Letters may not include references to submitted papers or unpublished results, requests to cite the Letter writer’s work, accusations of misconduct, calls for retraction, or personal comments to an author.
| • Letters must be submitted within 6 months of the first online publication date of the subject article. |

| **Opinions** are succinct essays that appear in the Front Matter section. Authored by researchers, Opinion pieces further the discourse on a timely topic, or offer a call to action, via a clearly articulated argument that includes novel ideas or proposals. The argument should be explicitly stated early on in the piece. All authors are welcome to submit proposals for consideration. Submissions deemed appropriate for the section are reviewed by at least one NAS member, or other expert, who has the relevant expertise. Submissions should be approximately 1,500–2,000 words, not including references. They do not require abstracts. |
Initial Submissions

PNAS is format-neutral at initial submission, which means that manuscripts do not need to be formatted according to specific journal guidelines to be considered for review. We do, however, require the following information in order to evaluate your manuscript:

1. A manuscript file (in any format) including the following:
   - Title page (title, author list, classification, keywords)
   - Abstract
   - Significance statement
   - Main text
   - References
   - Figures or tables with appropriate legends (may be uploaded separately)
   - SI files (may be uploaded separately)
2. Contact and competing interest information for all authors.
3. Data sharing plans (including all data, documentation, and code used in analysis).
4. Funding information and whether open access has been selected.
5. A list of appropriate Editor Board Members, NAS members, and qualified reviewers (minimum of three each) who are experts in the paper’s scientific area. A brief justification for suggested reviewers is welcome, particularly for interdisciplinary papers.
PNAS will consider manuscripts for review as long as all components listed above are included in the submission. More granular details on manuscript formatting, including guidance on information to include in each section of the file, are included in the Manuscript Formatting Guidelines below.

Learn more about the initial submission process for member-contributed submissions.

In addition to items 1–4 above, Contributed submissions must include the names of at least two experts who have agreed to review the manuscript. The names and institutional affiliations of all reviewers of Contributed articles are published in a footnote. These experts must:

- be from different institutions (from the authors and each other),
- not have collaborated with the authors in the past 48 months, and
- be free of any other competing interests.

The final version of the paper must be submitted by the last day of the year to count toward that year’s annual limit.

**Revised Submissions**

Revised papers must be received within 2 months of the revision decision or they will be treated as new submissions. If you require additional time, please notify PNAS. In addition to the information provided at initial submission, revised submissions must also include:

- a point-by-point response to reviewer comments, and
- a tracked-changes version of the revised manuscript.

Revised Submissions are encouraged to follow all Manuscript Formatting Guidelines, including the Publication-Ready Source File Guidelines. Please note that multiple revisions are rarely permitted, and there is no guarantee that the paper will be accepted. Please contact us if you have any questions regarding manuscript formatting or the revision process.

**Manuscript Formatting Guidelines**

See the initial submission guidelines to learn about formatting requirements for submitting to PNAS. Review the revised submission guidelines before preparing your revised submission. Detailed formatting guidelines are provided below.

**Manuscript templates**

Please use the templates below to prepare your manuscript for PNAS.

<table>
<thead>
<tr>
<th>Word</th>
<th>LaTeX (Overleaf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Article</td>
<td>Research Article</td>
</tr>
<tr>
<td>Brief Report</td>
<td>Brief Report</td>
</tr>
<tr>
<td>SI Appendix</td>
<td>SI Appendix</td>
</tr>
</tbody>
</table>

Support for LaTeX templates is provided by Overleaf. Please contact PNAS if you have questions about submitting in LaTeX and include the manuscript file as an attachment if possible.
**Manuscript order**

Submitting manuscript sections in the following order will allow us to locate important information more easily and may speed the review process. Number all manuscript pages starting with the title page.

1. **Title page**
2. **Abstract**
   - Explain to the general reader the major contributions of the article
   - Include no more than 250 words
   - Cite all references in the abstract in full within the abstract itself AND in the text
3. **Significance statement (Direct and Contributed Submissions only)**
   - Explain the significance of the research at a level understandable to an undergraduate-educated scientist outside their field of specialty
   - Include no more than 120 words
4. **Main text**
   - Introduction
   - Results
   - Discussion
   - Materials and methods (describe procedures in sufficient detail so that the work can be repeated)
   - We encourage authors to follow the Text Recycling Research Project’s Best Practices for Researchers.
5. **Acknowledgments and funding sources**
   - Spell out all abbreviations
   - Use FundRef to identify the standard name for any funders
   - Do not include dedications
6. **References**
7. **Figure legends**

**Title Page Element**

Please include the following information on the title page:

<table>
<thead>
<tr>
<th><strong>Title Page Element</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Keep the title brief (&lt; 135 characters), descriptive, and comprehensible to a broad scientific audience. Include the studied organism. Avoid numbers, acronyms, abbreviations, punctuation, and puns.</td>
</tr>
<tr>
<td>Author Line</td>
<td>Include full names of all authors in the order intended for publication. Use asterisks (*) to designate co-corresponding authors and numbered footnotes to indicate equal contributions.</td>
</tr>
<tr>
<td>Author Affiliations</td>
<td>Include, in this order, department/laboratory/section/division, institution, city, state with ZIP code (for US institutions) or country with postal code (for non-US institutions). Use superscripts to match authors with institutions. Multiple affiliations are allowed. Affiliations where the work was done should be listed. If an author’s affiliation has changed since the work was done, the current affiliation should also be listed and noted as such. Supply an ORCID identifier for each author in both the manuscript and author profile(s). If an author does not have an ORCID identifier, PNAS strongly encourages them to obtain one. For proper authentication, authors must provide their ORCID at submission and are not permitted to add ORCIDs on proofs.</td>
</tr>
</tbody>
</table>
Corresponding Author
Include the name, complete address, phone number, and email address of the author(s) to whom correspondence and proofs should be sent. Note that corresponding authors’ email addresses will be published in the article footnotes.

Preprint Servers
If applicable, note if a manuscript was deposited as a preprint, including to which server(s) and the licensing information in regards to the article.

Classification
Select both a major and minor classification category. Dual classifications are permitted between major categories.

Keywords
Include at least three keywords at submission.

Classifications
Select a major (Physical, Social, or Biological Sciences) and a minor category from the following. Dual classifications are permitted between major categories. Dual classifications within a major category are only permitted in exceptional cases and are subject to Editorial Board approval.

PHYSICAL SCIENCES
Applied Mathematics; Applied Physical Sciences; Astronomy; Biophysics and Computational Biology; Chemistry; Computer Sciences; Earth, Atmospheric, and Planetary Sciences; Engineering; Environmental Sciences; Mathematics; Physics; Statistics; and Sustainability Science.

SOCIAL SCIENCES
Anthropology; Demography; Economic Sciences; Environmental Sciences; Political Sciences; Psychological and Cognitive Sciences; Social Sciences; and Sustainability Science.

BIOLOGICAL SCIENCES
Agricultural Sciences; Anthropology; Applied Biological Sciences; Biochemistry; Biophysics and Computational Biology; Cell Biology; Developmental Biology; Ecology; Environmental Sciences; Evolution; Genetics; Immunology and Inflammation; Medical Sciences; Microbiology; Neuroscience; Pharmacology; Physiology; Plant Biology; Population Biology; Psychological and Cognitive Sciences; Sustainability Science; and Systems Biology.

Main text
Please take note of the following when preparing your manuscript for PNAS:
• Do not include statements of novelty or priority.
• Avoid laboratory jargon.
• Use correct chemical names.
• Specify strains of organisms.
• Display trade names with an initial capital letter only.
• Provide names of suppliers of uncommon reagents or instruments.
• Use Système International units and symbols whenever possible.
• Only link to websites that are permanent public repositories, such as self-perpetuating online resources funded by government, academia, and industry. Links to an author’s personal web page are not acceptable.
• Use standardized nomenclature for species-specific gene and protein names (see Genecards, MGI Nomenclature page, HUGO Gene Nomenclature Committee, the Wheat Initiative or equivalent resources).
  • Proposed gene names must be deposited to and approved by the appropriate nomenclature committee before publication of the article.
• Ensure that abbreviations are accessible to a broad scientific audience. Define all abbreviations that are specific to a particular field at first mention in the text.

• If you believe your manuscript would benefit from professional editing, we encourage you to use an editing service (see list here) prior to submission. PNAS does not take responsibility for or endorse these services, and their use has no bearing on acceptance of a manuscript for publication.

Publication-ready Source Files Guidelines

Once your manuscript has been accepted, PNAS will request publication-ready source files. Please use the following guidelines when preparing these files. Do not make extensive edits; PNAS only allows minor edits at proofs.

Manuscript file

Manuscript files must adhere to the following:

• Word, RTF, or LaTeX format
• No embedded figures, tables, or schemes
• Equations must be editable; images are not acceptable
• In-text footnotes should be preceded by a footnote symbol, used in the order *, †, ‡, §, ¶, #, ||,**, ††, ‡‡, §§, ¶¶, ##

LaTeX

The PNAS submission system runs PDFLaTeX (Overleaf’s default). Please use the latest version of LaTeX2e to prepare your files. Using other versions or alternate engines (such as XeLaTeX or LuaLaTeX) may cause compilation issues at submission.

• PNAS LaTeX template
• Equations spanning two columns
• Main class file
• Bibliography style file
• Main style file
• Additional LaTeX Instructions

Basic Rules

• Upload .cls, .sty, .bib, .bst, .bbl, and .ldf files using the “LaTeX Support File” file type. The PNAS submissions system treats each LaTeX submission as a single directory.
• Avoid nesting, cross-referencing, and using input commands, as these will cause compilation errors.
• Do not remove packages that are included in the Overleaf template.
• When adding packages to the template, ensure that their commands do not clash with existing packages.

Figures and Tables

• Use the \includegraphics command within the main manuscript file and upload each figure source file in the submission system separately using the “Figure” file type.
• Include tables within the main manuscript .tex file only.

References

• Use pnas-new.bst for the current PNAS bibliography style.
• Use the Automatic Journal Title Abbreviation package provided in Overleaf to prevent references from appearing longer than they would in publication.

Resolving Compilation Problems in Submission

• To recompile the manuscript file, delete the original file from the submission and upload it again.
• Upload an alternate PDF as a “Related Manuscript File” if the system compiled PDF is incomplete or inaccurate.

Figures
Supply figures and schemes as high-resolution files whenever possible. Please review the PNAS Digital Art Guidelines before uploading images.

Authors must adhere to United Nations naming conventions for maps (see https://www.un.org/geospatial/mapsgeo). Authors should avoid the drawing of contested borders or use of contested topographical names. If disputed territories are relevant for a map, please ensure neutral figure captions, legends, and labelling within the map.

PNAS strives to ensure articles are accessible for readers throughout the world by offering article PDFs that are easily suitable for downloading in any environment. To accommodate size and content, article PDFs are processed to display images at 200 ppi, which will guarantee quality at print size. The HTML display of an article offers 300 ppi for all images. In addition, the option to enlarge each figure and table in the HTML display is available to closely review comprehensive details, as necessary.

• Provide all images at final size. While figures may be sized conservatively to save page space, PNAS reserves the right to make the final decision on figure size in published articles and authors may be asked to shorten manuscripts that exceed the stated length requirement.
  o Small: approximately 9 cm x 6 cm
  o Medium: approximately 11 cm x 11 cm
  o Large: approximately 18 cm x 22 cm
• Ensure that all numbers, letters, and symbols are no smaller than 6 points (2 mm) and no larger than 12 points (6 mm) after reduction. Keep text sizing consistent within each graphic.
• Preassemble all composite figures.
• Submit images in these file formats: TIFF, EPS, PDF, or PPT.
• Submit 3D images as either PRC or U3D. For each 3D image, include a 2D representation in TIFF, EPS, or PDF format.

Figure legends
Include figure legends immediately after referencing the figure in the manuscript. Ensure that figure legends adhere to the following guidelines:

• For figures with multiple panels, the first sentence of the legend should be a brief overview of the entire figure. Explicitly reference and describe each panel at least once in the figure legend.
• Include clearly labeled error bars in all graphs and describe them in the figure legend.
• State whether a number that follows the ± sign is a standard error (SEM) or a standard deviation (SD).
• When applicable, provide the P value, magnification, or scale bar information.
• Indicate the number of independent data points (N) represented in a graph in the legend.
• Ensure that numerical axes on all graphs go to 0, except for log axes.

Tables
• Ensure that the table is in an editable Word, RTF, or LaTeX format.
• Include a brief title (above) and footnotes (below) the table.
• Avoid multipart tables (Table 1A, Table 1B).
### Raster vs. Vector

<table>
<thead>
<tr>
<th>Definition</th>
<th>Images composed of pixels (also called “bit-mapped” or “pixelmapped” images). Use for non–line art images, e.g., scanned artwork, digital photographs, complex imagery, and color effects such as blended colors, shading, shadows, and gradients.</th>
<th>Images composed of paths (points, lines, and curves) that are created with mathematical formulas. Use for line art images, e.g., graphs, polygons, logos, illustrations, circles, and ellipses, all predominantly composed of solid colors with sharp lines and contrasts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td><img src="Image" alt="Raster Sample" /></td>
<td><img src="Image" alt="Vector Sample" /></td>
</tr>
<tr>
<td>- Notice pixelation and blurriness of numbers, and jagged edges of lines. For details, magnify image by using zoom function.</td>
<td>- Notice continuous smooth paths of numbers and lines. For details, magnify image by using zoom function.</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>- Graphics are resolution dependent; scaling to different sizes results in quality loss. - Images with large dimensions will maintain large file sizes.</td>
<td>- Graphics are <strong>not</strong> resolution dependent; they can be scaled to any size without quality loss. - Images with large dimensions will maintain smaller file sizes.</td>
</tr>
<tr>
<td>File types</td>
<td>- JPGs, GIFs, TIFs, and EPSs/PDFs originating from raster programs. - Common programs: Adobe Photoshop, Corel Painter, SketchBook Pro, and GIMP.</td>
<td>- AIs and PPTs/EPSS/PDFS originating from vector programs. - Common programs: Adobe Illustrator, Corel DRAW, Sketch, PowerPoint, and Canva.</td>
</tr>
<tr>
<td>Requirements &amp; Tips</td>
<td>- 300 <strong>ppi</strong> for grayscale or color images with no type or lettering, 600–900 ppi for grayscale or color images with type, and 1000–1200 ppi for line art, e.g., bar graphs. - Color mode should be RGB. - Avoid creating text in graphics. - Raster-based files can have low resolution in the published article, as they cannot be altered in size without losing quality.</td>
<td>- 300 <strong>dpi</strong> for grayscale or color images with no type or lettering, 600–900 dpi for grayscale or color images with type, and 1000–1200 dpi for line art, e.g., bar graphs. - Color mode should be RGB. - Best for creating text in graphics. - Vector-based files provide maximum flexibility for sizing your figures, as they can be altered in size while maintaining high-quality resolution.</td>
</tr>
</tbody>
</table>

### References

References must be in PNAS style and numbered in the order they appear in the text. Unpublished abstracts presented at meetings or references to “data not shown” are not permitted. If necessary to reference a retracted article, include an explanation for doing so and cite the retraction notice rather than the original publication.

Cite references in numerical order as they appear in text, and include all references cited in the main text in the main manuscript file. Include a separate citation list for references cited in the SI. Tables and figures will be inserted in the text where first cited; number references in these sections accordingly.

- Include the full title for each cited article. Use MEDLINE/PubMed abbreviations of journal titles or use the full journal title for any journals not indexed in MEDLINE.
- If there are more than five authors, list the first author’s name followed by et al.
- Provide volume numbers for journal articles as applicable; provide DOI numbers if volume numbers are not available.
- Provide page ranges for journal articles and book chapters.
- Provide date of access for online sources.
- If an article has been accepted for publication but is not yet published, note in-press status and include a DOI number when possible.

<table>
<thead>
<tr>
<th>Source</th>
<th>Example</th>
</tr>
</thead>
</table>

**Supporting information**

SI will be published as provided by the authors; it will not be edited or composed.

SI file formats:

- **SI Appendix**: Supply a single PDF file, combining all text, figures, tables, movie legends, and SI references. See the PNAS SI template.
- **Datasets**: Supply XLSX, RTF, PDF, CSV, GZ, or TXT files.
- **Movies**: Supply AVI, MOV, WMV, GIF, or MPEG files at the desired reproduction size and length. Movies are limited to 10 MB in size. Include a brief legend for each movie in the SI Appendix.
- **Software**: Supply source code or scripts in native file types.

When preparing SI files, please note the following:

- The main text of the paper must stand on its own without the SI.
- SI is referred to in the text and cannot be altered by authors after acceptance.
- Refer to the SI Appendix in the manuscript at an appropriate point in the text. Number supporting figures and tables starting with S1, S2, etc. References should be cited in numerical order as they appear in the SI; do not cite main-text references in the SI and vice versa.

If you choose to place detailed materials and methods in an SI Appendix, you must provide sufficient detail in the main-text methods to enable a reader to follow the logic of the procedures and results. The main article text also must reference the SI methods. If a paper is fundamentally a study of a new method or technique, then the methods must be described completely in the main text.
Journal Cover Images
Authors are invited to submit scientifically interesting and visually arresting images to be considered for our cover (see our archive). Illustrations need not appear in the article but should be representative of the work. Images should be original, and authors must grant PNAS a License to Publish.

To submit an image for consideration for the PNAS cover:

- Submit the image with your manuscript through the PNAS manuscript submissions system, or email the image to PNASCovers@nas.edu. Contact PNAS for instructions on submitting large files.
- Include a brief lay-language caption (50–60 words) and credit information (e.g., Image credit:...).
- Submit an image that is 21.59 cm wide by 27.94 cm high.
- Submit the file in EPS or TIFF format and use RGB color mode.

The deadline for cover submissions is when your proof corrections are returned. If you choose to submit an image outside the online submission system, make sure you include the manuscript number, author name, phone, and email in your submission.

Submissions Contributed by NAS members
NAS members may contribute up to two research manuscripts annually, which must be within the member’s area of expertise and in which the member had a direct, significant role in the design and execution of the work. The initial version of the manuscript must be submitted by the last day of the year to count toward that year’s annual limit.

The submissions and peer review process for Contributed manuscripts are described below. All authors, including NAS member authors submitting their work through the Contributed track, must adhere to PNAS editorial policies and guidelines.

Peer Review Process
Tier 1: Initial screening by the Editorial Board
All research reports, including those contributed by an NAS member, must be peer reviewed by at least two independent experts in a process overseen by a member of the Editorial Board. The contributing member submits the manuscript to PNAS along with the names of at least two experts in the field of the paper who have agreed to review the work and brief comments about why each of those reviewers was chosen. A member of the Editorial Board evaluates the appropriateness of the submission for PNAS, determines whether the work is in the member’s direct area of expertise, and considers whether the reviewers selected by the authors have the necessary expertise to evaluate the manuscript. Submissions may be declined or alternative reviewers may be suggested at the discretion of the Editorial Board member.

Tier 2: Independent peer review
The Editorial Office sends the manuscript to the assigned reviewers and to others who may be selected by the Editorial Board member, manages the review process, and collects the reviewer reports. When the reviews are completed, the contributing member works with their coauthors to revise the manuscript in response to the reviewers’ comments. The revised manuscript and a point-by-point response are returned to the reviewers to ensure that their concerns have been adequately addressed.

Tier 3: Final evaluation by the Editorial Board
The responsible member of the Editorial Board reviews the final version of the member’s manuscript, along with all rounds of reviewers’ comments and the authors’ point-by-point responses. Only when the assigned Board member is satisfied that the work has been appropriately reviewed...
and is suitable for PNAS will the manuscript be accepted. The name of the NAS member responsible for contributing the article, along with the names of the reviewers, will appear below the author affiliation line on the title page of the published paper.

**Authorship**

For Contributed submissions, the NAS member acts as the corresponding author during the review process and must be listed as a corresponding author on the published article. After completion of the review process, a coauthor may be designated to serve as a co-corresponding author.

**Competing Interests**

Academy members who have a competing interest, financial or otherwise, that could be seen as significantly impairing their objectivity or as creating an unfair competitive advantage for any person or organization tied to the research should submit their work as a Direct Submission. See Editorial and Journal Policies for further information.

**Initial Submissions**

As with Direct Submissions, Contributed submissions must include the following four items:

1. A manuscript file (in any format) including the following:
   - Title page (title, author list, classification, keywords)
   - Abstract
   - Significance statement
   - Main text
   - References
   - Figures or tables with appropriate legends (may be uploaded separately)
   - SI files (may be uploaded separately)
2. Contact and competing interest information for all authors
3. Data sharing plans (for all data, documentation, and code used in analysis)
4. Funding information and whether immediate open access has been selected

In addition to these four items, as noted above, Contributed submissions must include the names of at least two experts in relevant subject areas (particularly for multidisciplinary studies) who have agreed to review the manuscript. The names and institutional affiliations of all reviewers of Contributed articles are published in a footnote. These experts must:

- be from different institutions (from the authors and each other),
- not have collaborated with the authors in the past 48 months, and
- be free of any other competing interests.

Visit Submitting your Manuscript for full instructions on submissions and manuscript formatting.

**Editorial and Journal Policies**

The standard mode of submitting manuscripts to PNAS is Direct Submission; manuscripts may be submitted directly to PNAS—authors do not need to first obtain an NAS member’s agreement to serve as an editor. In submitting to PNAS, all authors must agree to abide by PNAS editorial and journal policies. Manuscripts are reviewed with the explicit understanding that all authors have seen and approved of each submitted version.

**Peer Review Process**

**Tier 1: Editorial Board assessment**

The PNAS Editorial Board is made up of NAS members who are active scientists and experts in their fields. On submission, your paper is assigned to an Editorial Board member in one of the 31
NAS disciplines. If the Board member determines that the paper should proceed further, she or he assigns it to a member editor or, if the NAS membership lacks sufficient expertise, to a nonmember guest editor to oversee the peer review process. The Board may reject manuscripts without further review, or review and reject manuscripts that do not meet PNAS standards. More than 50% of submissions are declined at initial evaluation.

**Tier 2: Member editor or Guest editor assessment**

A member editor is an NAS member who is an active scientist in the field most relevant to your research. The member editor manages the peer review process for papers in their field and determines suitability of your work for PNAS.

A guest editor is an active scientist who is not an NAS member but is recognized by the Board as an expert in their field. Guest editors manage the peer review process in emerging and interdisciplinary fields where the NAS membership lacks sufficient expertise. With oversight from the Editorial Board, guest editors determine suitability of your work for PNAS.

**Tier 3: Independent peer review**

Research papers across all submission routes are peer reviewed by at least two independent experts. If your paper is sent out for review, your member editor or guest editor selects recognized subject experts to review your work. The editors evaluate the reviewers’ comments and make a recommendation to the Editorial Board member, who makes the final decision to accept or reject your paper. The acceptance rate is currently 14%.

A member or guest editor will typically secure two independent peer reviews. However, a single negative review, with which the editor agrees, may be sufficient to recommend rejection. The names of the reviewers of Direct Submissions are confidential and not shared, unless express permission is granted by the reviewers. Contributed submissions have open peer review (named reviewers).

For all articles, the peer review track is identified below the author affiliation line on the title page of the article, along with the name of the NAS member responsible for editing or contributing the paper.

The above peer review process is used to evaluate Brief Reports, Direct Submissions, Letters to the Editor, and Perspectives. Learn more about the peer review process for member-contributed submissions.

**Editorial Policies**

- Authorship and Contributions
- Competing Interest
- Design and Analysis Transparency
- Dual Use Research of Concern
- Embargo Policy
- Errata
- Human and Animal Research
- Image Integrity
- License to Publish
- Materials and Data Availability
- Name Changes
- Open Access
- Preprint Servers
- Previous Publication
- Recombinant DNA
- Research Misconduct
- Statistical Analysis
- Survey Research
- Transfers, Resubmissions, and Appeals

**Authorship and Contributions**

**Authorship** must be limited to those who have contributed substantially to the work. The corresponding author must have obtained permission from all authors for the submission of each version of the paper and for any change in authorship. Use of artificial intelligence (AI) software, such as ChatGPT, must be noted in the Materials and Methods section (or Acknowledgments, if no Materi-
als and Methods section is available) of the manuscript and may not be listed as an author. Authors are solely accountable for, and must thoroughly fact-check, outputs created with the help of generative AI software.

All collaborators share some degree of responsibility for any paper they coauthor. Some coauthors have responsibility for the entire paper as an accurate, verifiable report of the research. These include coauthors who are accountable for the integrity of the data reported in the paper, carry out the analysis, write the manuscript, present major findings at conferences, or provide scientific leadership to junior colleagues.

Coauthors who make specific, limited contributions to a paper are responsible for their contributions but may have only limited responsibility for other results. While not all coauthors may be familiar with all aspects of the research presented in their paper, all collaborators should have in place an appropriate process for reviewing the accuracy of the reported results.

Authors must indicate their specific contributions to the published work, which will be published as a footnote to the paper. Published contributions are taken from the submission system, not from the manuscript file. Examples of designations include:

- Designed research
- Performed research
- Contributed new reagents or analytic tools
- Analyzed data
- Wrote the paper

An author may list more than one contribution, and more than one author may have contributed to the same aspect of the work.

**ORCID**

PNAS strongly encourages all authors to use their ORCID identifier when submitting papers. ORCID provides a persistent digital identifier that distinguishes you from every other researcher. When provided, published articles display the ORCID logo and link to an author’s ORCID record. Learn more or register for ORCID.

**Corresponding Authors**

Throughout submission and peer review, a single corresponding author is responsible for providing all necessary manuscript information and interactions with the editorial office. After acceptance, multiple corresponding authors, who are responsible for checking the accuracy of the proof contents and who will act as points of contact for queries about the published article, are permissible; these authors should be indicated on the title page (see Submitting Your Manuscript).

**Group Authors**

A group author is an organization or conglomerate of researchers that is collectively credited with authorship. An individual can appear as both an author and a member of a group author on the same paper. Group authors usually share contributions collectively, such as “performed research” or “contributed new reagents or analytic tools.” The group author is listed on the author byline instead of listing all individual members. Individual members of the group are displayed within the Supporting Information of the published article and are included within the article metadata to ensure that the article is correctly indexed and linked to individual members in searches. Before submitting a manuscript with a large author list, please contact PNAS@nas.edu.

**Competing Interest**

Failure to disclose a competing interest at submission may result in author sanctions. Authors must disclose, at submission, any association that poses or could be reasonably perceived as posing a
financial or personal competing interest in connection with the manuscript, and acknowledge all funding sources supporting the work. Disclosures must be entered directly into the submission system; providing a link to full disclosures hosted on a website is not permissible. When asked to evaluate a manuscript, members, reviewers, and editors must disclose any association that poses a competing interest in connection with the manuscript.

PNAS Competing Interest Policy

PNAS recognizes the multiplicity of financial and other competing interests confronting authors, referees, and editors. The PNAS policy is designed to manage, not eliminate, competing interests. The most important element of our policy is that all authors, members, referees, and editors must disclose any association that poses or could be reasonably perceived as posing a financial or intellectual competing interest in connection with the manuscript. Divulging a potential competing interest usually does not invalidate the research or the comments of a referee or editor; it simply provides the reader information necessary to independently assess the work.

When a competing interest is disclosed either by the author or the editor, a descriptive footnote will be included with the published article.

PNAS reserves the right to publish an erratum disclosing competing interests related to a previously published paper. Authors, referees, or editors who have deliberately or recklessly failed to disclose a competing interest may receive sanctions, including being banned from publishing in PNAS.

This policy applies to all material published in PNAS, including research articles, Perspectives, Editorials, Reviews, Colloquium papers, and Commentaries. For further details, please contact PNAS.

Guidance

Financial Competing Interest

A financial interest in an organization whose products or services are related to the article’s subject matter and could be reasonably perceived as capable of influencing the objectivity, integrity, or interpretation of a publication should be disclosed as a competing interest.

In determining whether the financial interest meets the “reasonably be perceived as…” criterion, use your best judgment to arrive at a good-faith determination. A helpful criterion is whether a nondisclosed competing interest would embarrass you if it were to become public after publication of your work.

These financial interests may include employment, substantive ownership of stock or mutual funds*, membership on a standing advisory council or committee, service on the board of directors, public association with the company or its products, consulting fees, patent filings, compensation as a spokesperson, honoraria received in exchange for services, or financial support.

These considerations apply to financial interests held by you, your spouse or domestic partner, or your dependent children within the last 48 months.

*For example, many US universities require faculty members to disclose interests exceeding $10,000 or 5% equity in a company.

Personal Association Competing Interest

A competing interest due to a personal association arises if you are asked to serve as editor or reviewer of a manuscript whose authors include a person with whom you had an association, such as a thesis advisor (or advisee), postdoctoral mentor (or mentee), or coauthor of a paper, within the last 48 months. When such a competing interest arises, you may not serve as editor or reviewer.

A competing interest due to personal association also arises if you are asked to serve as editor or reviewer of a manuscript whose authors include a person with whom you have a family relationship,
such as a spouse, domestic partner, or parent–child relationship. When such a competing interest arises, you may not serve as editor or reviewer.

A personal association competing interest may exist for Academy members who submit a Contributed manuscript if a suggested reviewer was, for example, the member’s thesis advisee (or advisor), postdoctoral mentee (or mentor), or coauthor of a paper, within the last 48 months. When such a competing interest arises, an alternative reviewer must be suggested.

Author Responsibilities
During manuscript submission, authors are required to complete the online form, disclose any competing interests, and acknowledge all funding sources supporting the work. The corresponding author must ensure that all authors have disclosed any competing interests.

Editor and Reviewer Responsibilities
When asked to evaluate a manuscript, reviewers and editors must disclose any association that poses a competing interest in connection with the manuscript. Referees and editors are asked to recuse themselves from handling a paper if the competing interest makes them unable to make an impartial scientific judgment or evaluation. A referee or editor who has a competing interest but believes that it does not preclude his or her making a proper judgment must disclose to the journal the nature of the interest.

Design and Analysis Transparency
Authors should follow field standards for disclosing key aspects of research design and data analysis, and should report the standards used in their study. See the Equator Network for information about standards across disciplines. PNAS encourages authors to preregister their studies and analysis plans and to provide links to the preregistration in their submission.

Dual Use Research of Concern
Authors and reviewers must notify PNAS if a manuscript reports potential dual use research of concern. PNAS will evaluate such papers and, if necessary, will consult additional reviewers.

Embargo Policy
PNAS may distribute embargoed copies of an accepted article to the press prior to publication. Embargoes expire at 3:00 PM Eastern time, Monday of the publication week. Authors may talk freely with the press about their work but should coordinate with the PNAS News Office so that reporters are aware of PNAS policy.

If a version of your PNAS manuscript has ever been posted, in whole or in part, in any publicly accessible form, including on preprint servers, or if you plan on presenting your embargoed paper at a conference prior to publication, please note that different embargo policies may apply and you must contact the PNAS News Office immediately at 202-334-1310 or PNASNews@nas.edu.

Errata
PNAS is committed to correcting published research as necessary to maintain the accuracy of the scientific record. Authors should notify PNAS when a correction to a published article is needed by completing the Correction Request form. At the discretion of PNAS, errors discovered after the publication of the article that do not substantively affect the scientific results, such as minor typographical mistakes that could affect meaning, may be corrected online without a formal correction. A note regarding the postpublication update will be appended to the updated article.

For errors of a scientific nature that do not alter the overall results or conclusions of a published article, PNAS will publish independent, citable corrections. Requests for these corrections will be sent to an editor for review to determine whether the errors warrant a correction.

The standards for assembling scientific figures have evolved over time and are taken into consideration when addressing concerns about published figures. If concerns are raised regarding figures
that were assembled in accordance with the guidelines at the time of their publication but do not meet current standards, they will be evaluated on a case-by-case basis to determine their impact on the reported results. In instances where figure errors do not affect the overall results or conclusions of a published article, PNAS may choose to publish independent and citable corrections while keeping the figures unchanged. Instances of suspected improper figure assembly, such as unauthorized duplication, may be reported to the corresponding author’s affiliated institution or funding agency, as recommended by COPE.

PNAS articles may be retracted by their authors or by the editors because of pervasive error or unsubstantiated or irreproducible data. Articles may be retracted, for example, because of honest error, scientific misconduct, or plagiarism.

Name changes do not require a formal correction, unless specifically requested. See Name Changes for more information.

**Human and Animal Participants and Clinical Trials**

Studies must have been approved by the author’s institutional review board. Authors must include in the methods section a brief statement identifying the institutional and/or licensing committee approving the experiments, including reference/permit numbers (where available), or provide a statement why this was not necessary. For all experiments involving human participants, authors must also include a statement confirming that informed consent was obtained from all participants, or provide a statement why this was not necessary. All experiments must have been conducted according to the principles expressed in the Declaration of Helsinki. Authors must follow the International Committee of Medical Journal Editors’ policy and deposit trial information and design into an accepted clinical trial registry before the onset of patient enrollment. Manuscripts should include registration numbers and the name of the register. For animal studies, authors must report the species, strain, sex, and age of the animals. Where animals are used in research we expect them to have been treated in a humane manner and in line with the ARRIVE guidelines.

**Image Integrity**

No specific feature within an image may be enhanced, obscured, moved, removed, or introduced. The grouping or consolidation of images from multiple sources must be made explicit by the arrangement of the figure and in the figure legend. Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and if they do not obscure, eliminate, or misrepresent any information present in the original, including backgrounds.

Questions about images raised during image screening will be referred to the editors, who may request the original data from the authors for comparison with the prepared figures. If the original data cannot be produced, the manuscript may be rejected. Cases of deliberate misrepresentation of data will result in rejection of the paper and may be reported to the corresponding author’s home institution or funding agency, as recommended by COPE. Authors must obtain consent for publication of figures with recognizable human faces.

**Materials and Data Availability**

To allow others to replicate and build on work published in PNAS, authors must make materials, data, and associated protocols, including code and scripts, available to readers in a public repository upon publication. Exceptions for legal, ethical, and logistical (e.g., size) must be noted. Authors should follow the FAIR (findable, accessible, interoperable, and reusable) data principles and deposit data in community-approved public repositories (see the DataCite Repository Finder to search for appropriate repositories) prior to publication. At submission, authors must describe how readers will be able to access the data, associated protocols, code, and materials mentioned in the paper. If requested, these materials must be made available to editors and reviewers during submission for the purposes of evaluating the manuscript. A statement detailing data-sharing plans (including all data, unique materials, documentation, and code used in analysis) will be included in the published article. Any restrictions on access to the data, or any parts of it, must be disclosed in
detail at submission. Authors are encouraged to deposit laboratory protocols and include their DOI or URL in the methods section of their paper. Data not shown and personal communications cannot be used to support claims in the work.

Authors should deposit as much of their data as possible in community-endorsed publicly accessible databases, and when possible follow the guidelines of the Joint Declaration of Data Citation Principles. If deposition of data is not possible, authors may use SI to show all necessary data. Research datasets, whether original or previously published, must be cited in the references as a condition for publication. In rare cases where subject-specific repositories are not available, authors may use a general repository such as figshare, Dryad, or Open Science Framework. For further information about accessibility of data and materials, see:

- Reproducibility and Replicability in Science (2019)
- Joint Declaration of Data Citation Principles

<table>
<thead>
<tr>
<th>Material</th>
<th>Policy</th>
</tr>
</thead>
</table>
| Algorithms and Computer Codes                      | • Authors must make algorithms and computer codes available to readers, e.g., through GitHub or Zenodo.  
• The version of code associated with the paper must be maintained by the authors. |
| Characterization of Chemical Compounds             | • Authors must provide sufficient information to establish the identity of a new compound and its purity.  
• Authors must include sufficient experimental details to allow other researchers to reproduce the synthesis.  
• Authors must include characterization data and experimental details either in the text or in the SI. |
| Datasets                                           | • Before publication, authors must deposit large datasets (including microarray data, protein or nucleic acid sequences, and atomic coordinates for macromolecular structures) in an approved database and provide an accession number for inclusion in the published article. Citation to the dataset should be included in the references.  
• When no public repository exists, authors must provide the data as SI or, if this is not possible, on the author’s institutional website.  
• Authors should contact PNAS regarding privacy concerns, legal constraints to sharing, or to provide instructions for accessing large datasets. |
| Earth and Space Sciences Data                      | • Authors should follow the FAIR data principles.  
• See DataCite Repository Finder. |
| Enzymology Data                                    | • When reporting kinetic and equilibrium binding data, authors should follow the Standards for Reporting Enzymology Data (STRENDa) commission guidelines. |
| Fossil and Rare Specimens                          | • Fossils, other geological samples, archeological materials, or other rare specimens must be deposited in a museum or repository and be made available to qualified researchers under conditions stipulated by the institution and/or relevant entities that permitted the work and/or house the collections.  
• Authors must ensure that specimens were collected in concordance with international norms, and with all national and local laws of the territory in which they were discovered. |
<p>| Functional Magnetic Resonance Imaging (fMRI) Studies | • Authors should deposit data to XNAT Central or equivalent publicly accessible repository. |</p>
<table>
<thead>
<tr>
<th>Material</th>
<th>Policy</th>
</tr>
</thead>
</table>
| Genomic and Proteomic Studies                    | • Authors must submit genomic, proteomic, or other high-throughput data to the NCBI gene expression and hybridization array data repository (GEO) or equivalent publicly accessible database.  
• Authors should deposit data in dbGaP.  
• Accession numbers must be provided and access to deposited data must be available at the time of publication.  
• Submitted data should follow the MIAME checklist.                                                                                                                                 |
| Plasmids                                         | • Authors are encouraged to deposit plasmid constructs in a public repository such as Addgene.                                                                                                                                                                    |
| Protein and Nucleic Acid Sequences               | • Authors must deposit data in a publicly available database such as GenBank, EMBL, DNA Data Bank of Japan, UniProtKB/Swiss-Prot, or PRIDE.  
• Including raw data in the public repositories is recommended.  
• Authors must provide a link to the data and associated accession numbers prior to publication.  
• Showing examples within the manuscript (body or supplementary information) of individual replicates prior to averaging in order to provide a sense of variability of the data is recommended. Detailed information should be available in associated datasets. |
| Structural Studies: Small-angle Scattering Experiments | • Authors are encouraged to follow the guidelines by the International Union of Crystallography (IUCr).  
• Prior to submission, authors are encouraged to use the IUCr checkCIF service to validate their crystallographic information files (CIFs) and structure factors.  
• Validation reports may be submitted as SI for editors and reviewers.                                                                                                                                 |
| Structural Studies: Structures of Biological Macromolecules from Electron Microscopy Experiments that Involve any Averaging Method (including subtomogram averaging) | • Authors should deposit the 3D map at either the EMBL-EBI (UK) or RCSB USA) EMDB deposition site.  
• Any atomic structure models fitted to EM maps must be deposited in PDB.  
• For electron tomographic studies with no averaging, deposition of one or more representative tomograms in EMDB is strongly recommended.  
• PDB and/or EMDB accession codes must be included in the manuscript, together with a brief descriptive title for each accession.  
• Where PDB models have been fitted into EMDB maps, the correspondences between them should be clearly stated.                                                                                                                                 |
| Unique Materials (e.g., cloned DNAs; antibodies; bacterial, animal, or plant cells; viruses) | • Authors must make unique materials promptly available on request by qualified researchers for their own use. Failure to comply will preclude future publication in the journal.  
• Authors may charge a modest amount to cover the cost of preparing and shipping the requested material.                                                                                                                                 |

Failure to comply with the PNAS materials and data availability policies may preclude future publication in the journal. Contact PNAS@nas.edu if you have difficulty obtaining materials or data. PNAS encourages the use of Research Resource Identifiers (RRIDs), unique searchable identifiers, for critical reagents and tools (antibodies, organisms, cell lines, and software projects). RRIDs link readers to external resources and enable search engines to return all papers in which a particular antibody, organism, or tool was used. Once you have located an RRID, please insert “RRID:” plus the identifier in the appropriate location in the manuscript.

**Name Changes**

PNAS recognizes that people change their names for a variety of reasons (e.g., gender identity or change in marital status). An author, editor, or reviewer who wishes to change how their name appears on a published PNAS article should complete the Name Change Request form. PNAS will work on each request to ensure that the change is made quickly, accurately, and confidentially, if requested. Given/family names and initials will be updated in all versions of the article.
(HTML and PDF), as well as metadata records of the paper. No indication or notification of the change will be published unless a formal correction is requested. Once the change is made, only the new name will be associated with the paper. PNAS will send the updated information to PubMed, PubMed Central, and CrossRef, but cannot control changes in other downstream repositories or indexing services. PNAS cannot update references (in text or reference list), only listed names of authors, reviewers, or editors in the byline.

For additional questions or information, please contact PNAS_namechange@nas.edu.

Open Access

All PNAS articles are free within 6 months of publication. Authors who choose the immediate open access option can have their articles made available without cost to the reader immediately upon publication. Open access articles are published under a nonexclusive License to Publish and distributed under a Creative Commons Attribution-NonCommercial-NoDerivatives (CC BY-NC-ND) license or a Creative Commons Attribution (CC BY) license for authors whose funders or institutions require it.

Preprint Servers

Posting on preprint servers, such as arXiv or bioRxiv, is permitted and will not affect editorial consideration. However, authors must disclose preprint deposition. The license selected for a preprint will affect the sharing, adaptation, and reuse of material (see Licenses for PNAS Articles and the PNAS statements on prior publication, preprints, and the media embargo policy for details). Please contact the PNAS News Office (PNASNews@nas.edu) before posting an accepted manuscript as a preprint.

Previous Publication

Submitted manuscripts must not have been published previously or concurrently submitted for publication elsewhere. What constitutes prior publication must take into account many criteria, including the extent of review, and will be determined on a case-by-case basis. Related manuscripts that are in press or submitted elsewhere must be included with a PNAS submission.

Figures, tables, or videos that have been published elsewhere must be identified, and permission from the copyright holder for both the online and print editions of the journal must be provided.

Recombinant DNA

Physical and biological containment must conform to National Institutes of Health guidelines or those of a corresponding agency.

Research Misconduct

All work should be free of fabrication, falsification, and plagiarism as defined by the US Office of Research Integrity. In cases of suspected or alleged misconduct, PNAS follows the recommended procedures from COPE.

PNAS uses software to screen manuscripts for potential text duplication. PNAS will also evaluate issues with text, data, or figures that are brought to our direct attention and may request from the authors source data, descriptions of how experiments were performed, or explanations of how figures were prepared. PNAS may discuss concerns with a member of the Editorial Board, the editor, or the authors.

Authors should place direct quotes or excerpts from others’ publications in quotation marks and must identify the original source reference(s). For text passages that overlap with another, published work, but that are not verbatim, authors must include the original source reference(s).

Statistical Analysis

Statistical analyses should be done on all available data and not just on data from a “representative experiment.” Statistical analyses should include:
• the source and version of all software used, and
• full information on the statistical methods and measures used for each table and figure, such as a statistical test, estimates of parameters, exact sample sizes, and measures of evidence strength (frequentist or Bayesian).

Statistics and error bars should only be shown for independent experiments and not for replicates within a single experiment (see Figure Legends for error bar details). Editors may send manuscripts for statistical review.

Survey Research

PNAS supports the recommendations for Protecting the Integrity of Survey Research. All survey questions and their order must be included in the supplemental material upon initial submission. When reporting survey data, the following information must be disclosed in the methods section as applicable:

• sampling design, modeling, and weighting assumptions;
• respondent recruitment and question-related panel conditioning factors;
• attrition rates and potential implications of attrition.

When survey data are weighted, the phrase “representative sample” should not be used without explicit acknowledgment of the underlying assumptions, including disclosure of weighting and modeling used.

Transfers, Resubmissions, and Appeals

_PNAS Nexus_ was established as a transfer journal of quality papers from PNAS. Submissions that have been reviewed and declined by PNAS, along with the associated reviewer and editor comments, may be transferred PNAS Nexus to save time for authors and reviewers. Questions about the suitability of your manuscript for PNAS Nexus should be directed to pnasnexusheditorialoffice@oup.com. Once a manuscript is transferred from PNAS, authors may edit their files and manuscript details before completing the submission process at PNAS Nexus. Authors may always submit directly to _PNAS Nexus_ without mentioning their PNAS submission.

Resubmissions to PNAS may be allowed upon request from the Editorial Board. Appeals must be made in writing and sent to PNAS@nas.edu. PNAS may consider author appeals of decisions on rejected papers; however, appeals on the basis of novelty or general interest are unlikely to be granted. Due to the high volume of submissions that PNAS receives, a quick decision on appeals cannot be guaranteed. If an appeal is rejected, further appeals of the decision will not be considered and the paper may not be resubmitted. Repeated appeals or resubmissions of a rejected manuscript without invitation by the Editorial Board will not be considered and may result in the authors being banned from submitting to PNAS.

Fees and Licenses

Publication Charges

PNAS depends, in part, on the payment of article processing charges (APCs) to finance its operations. Papers are accepted or rejected for publication and published solely on the basis of merit. Introducing Beginning with articles in volume 119, PNAS has implemented a simplified APC and license structure that removes dependency on article length. PNAS will grant waivers for authors who do not have funding to cover APCs (for example, in mathematics and astronomy, or from lower-income countries).
Regular research articles:

<table>
<thead>
<tr>
<th>Options</th>
<th>APC</th>
<th>Available Licenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed Open Access</td>
<td>$2,595</td>
<td>CC BY-NC-ND</td>
</tr>
<tr>
<td>Immediate Open Access</td>
<td>$4,995 for corresponding authors from institutions with current-year site licenses (compared to our $5,495 regular fee)</td>
<td>CC BY-NC-ND or CC BY</td>
</tr>
</tbody>
</table>

Brief Report articles: $2,285 per article with either a CC BY or CC BY-NC-ND license. All Brief Report articles are published open access.

All PNAS articles, regardless of their license, are free within 6 months of publication.

Publication charges may be paid by credit card, check, or wire transfer. On receipt of the publication estimate, authors may log into the author billing system to review their charges. Email questions regarding billing and payment of APCs to PNASsupport@copyright.com. Submit requests for waivers of charges to PNASWaiverRequests@nas.edu.

Licenses for PNAS Articles

Users are advised to check each article for its publication license and corresponding distribution policies.

PNAS offers two Creative Commons licenses: CC BY-NC-ND and CC BY. Please visit the respective websites for information on license terms.

The standard PNAS license has been discontinued beginning with articles published in volume 119 (2022). Information on the terms that apply to articles that published with this license can be found here: standard PNAS License terms.

Open Access Policy

All PNAS articles are free to read within 6 months of publication, without a subscription, and PNAS automatically deposits the version of record in PubMed Central for the authors. Authors who choose the immediate open access option can have their articles made freely available immediately upon publication. The following content is freely available upon publication:

- Front Matter
- Special Features
- Classics
- Editorials
- In This Issue
- Corrections
- Retractions
- Retrospectives
- Editorial Expression of Concern
- At the National Academies
- Nobel papers

Open access articles are published under a nonexclusive License to Publish and distributed under a Creative Commons Attribution-NonCommercial-NoDerivatives (CC BY-NC-ND) license or a Creative Commons Attribution (CC BY). Some funders and institutions have explicit open access and license requirements. Authors are advised to confirm these requirements with their funding or institutional representatives to ensure compliance or to request policy waivers. Changes to license selections, or open access status, after publication may not be possible.
Since 2004, PNAS has offered green open access to everyone: authors may deposit their accepted manuscript in their funding body’s archive or designated noncommercial institutional repository, under the same license as the published article, provided that a link to the published article in PNAS is included. Authors may make their deposited manuscripts publicly available 6 months after publication, or immediately on publication if the article was published in PNAS under the immediate open access option.

PNAS offers an immediate open access option. Note that Plan S-funded authors may not be able to use Plan S funds to pay for open access fees. If Plan S-funded scientists do not have funds available, PNAS will grant waivers for the CC BY fee on a case-by-case basis. In light of the ongoing COVID-19 pandemic, PNAS continues to make relevant content free to access. Any data or preprints shared ahead of submission of research articles relevant to the outbreak will not preempt publication in PNAS. Please read the full statement here.

PNAS also participates in the following open access initiatives:

- All content, regardless of license, is automatically deposited by PNAS in PubMed Central. Articles that publish with the delayed open access option are free within 6 months of publication on PubMed Central. Articles that publish under the immediate open access option are free to read immediately.
- Articles published in PNAS are compliant with the NIH Public Access Policy.
- PNAS participates in CHORUS.
- Articles published in PNAS are sent to the Open Access Switchboard so that funders and institutional administrators are notified of publication milestones.
- All PNAS articles are freely available in 124 developing countries.

Authors Rights and Permissions

Rights and Permissions
For volumes 1–89 (1915–1992), the author(s) retains copyright to individual articles, and the NAS holds copyright to the collective work. For volumes 90–105 (1993–2008), the articles are copyright NAS. For volumes 106–119 (2009–2022), except for open access articles submitted beginning September 2017, the author(s) retains copyright to individual articles, and NAS retains an exclusive License to Publish these articles and holds copyright to the collective work. For articles published under either a CC BY-NC-ND or CC BY license beginning September 2017, the NAS retains a nonexclusive License to Publish.

Visit the Permissions FAQ for detailed information about PNAS copyright and self-archiving. See the PNAS listing on Sherpa RoMEO.

PNAS authors do not need permission for the following cases:
1. to use their original figures or tables in their future works;
2. to make copies of their articles for their own personal use, including classroom use, or for the personal use of colleagues, provided those copies are not for sale and are not distributed in a systematic way;
3. to include their articles as part of their dissertations; or
4. to use all or part of their articles in printed compilations of their own works.


Requesting Permission
For permission to reuse material in volumes 90–118 (1993–2021) that published under the exclusive PNAS License to Publish, requests should be sent to PNASpermissions@nas.edu and must include the following information about the requestor and the material:
1. Your full name, affiliation, and title
2. Your complete mailing address, phone number, and email
3. PNAS volume number, issue number, and issue date
4. PNAS article title
5. PNAS authors’ names
6. Figure/table number or portion of text to be reprinted

Requests must also include the following information about the intended use of the material:

1. Title of work in which PNAS material will appear
2. Authors/editors of work
3. Publisher of work
4. Retail price of work
5. Number of copies of work to be produced
6. Intended audience
7. Whether work is for nonprofit or commercial use

Permission is not required to use original figures or tables for noncommercial and educational use (i.e., in a review article, in a book that is not for sale) if the article published under the exclusive PNAS License to Publish. Please include a full journal reference and, for articles published in volumes 90–105 (1993–2008), include “Copyright (copyright year) National Academy of Sciences” as a copyright note. Commercial reuse of figures and tables (i.e., in promotional materials, in a textbook for sale) requires permission from PNAS.

Reproducing full articles (whether physically or electronically) published under the exclusive PNAS License to Publish requires permission from PNAS and will also incur an article reprint fee. Sharing the URL of a PNAS article does not require permission and will not incur any fees. In September 2017 (partway through volume 114), PNAS started offering CC BY-NC-ND and CC BY licenses for open access articles. PNAS is not authorized to grant permission for material published under either license, as the authors hold copyright. However, depending on the intended use, permission may not be required at all. Users are advised to check each article for its publication license and corresponding reuse and distribution policies.

As a courtesy, please notify PNAS authors when reusing their work, regardless of the License to Publish. Use of PNAS material must not imply any endorsement by PNAS or NAS.

Text and data mining are permitted for noncommercial institutions with an active institutional site license to PNAS for internal noncommercial research purposes. Other requests should be sent to PNASpermissions@nas.edu.

PNAS cannot supply original artwork. Such requests should be directed to the article’s corresponding author (contact information is available in the article’s footnotes).

**Additional Permissions Requests**

Copyright Clearance Center offers the following pay-per-use options for PNAS material:

- Use in electronic or print course materials (i.e., coursepacks, classroom handouts, posting on an academic institution intranet)
- Delivery via Interlibrary Loan (ILL) or other document delivery
- Photocopying for general business or academic use
- Sharing content electronically (i.e., sending in an email, posting on an intranet or extranet)

Pay-per-use orders can be submitted directly through the Copyright Clearance Center website. Authorization to photocopy items for the internal or personal use of specific clients is granted by
the NAS provided that the proper fee is paid directly to the Copyright Clearance Center.

For questions regarding any of the above, including permission to photocopy beyond that permitted by Section 107 or 108 of the US Copyright Law, contact:
Copyright Clearance Center, 222 Rosewood Drive Danvers, MA 01923 Phone: 978-750-8400 Fax: 978-750-4770 Email: info@copyright.com.

License to Publish
Signing the License to Publish grants NAS nonexclusive rights to publish the work in PNAS.

PNAS Pilot Transformative Agreements

The NAS is pursuing select pilot transformative agreements with institutions and consortia to provide immediate public access to PNAS, the flagship journal of the NAS. These agreements offer a sustainable open access framework and provide the following benefits to researchers at participating institutions:

- Researchers have unlimited access to all content published in PNAS, including subscription-only content, immediately after publication.
- Research articles by corresponding authors based at participating institutions are published immediate open access under a CC BY license, directly deposited to PubMed Central (PMC) and to Europe PMC, and archived in LOCKSS/CLOCKSS and Portico.
- Depending on the agreement, authors within the institution qualify for reduced or no research article publication fees, with no limit to the number of articles that may be published immediate open access.

Jisc Publish-and-Read Transformative Agreement

Jisc has signed a Publish-and-Read agreement with the NAS. The agreement, which benefits all corresponding authors from participating UK institutions, runs from July 1, 2021, to December 31, 2023.
Under the agreement, corresponding authors from an institution that has signed up with Jisc may publish open access in PNAS without incurring article page charges. A CC BY license is applied to the article by default. Authors who opt out of publishing their articles with an open access license will be responsible for paying the full PNAS charges for their articles, as outlined in the PNAS Publication Fees page.

How to take advantage of this agreement:

- The corresponding author must be affiliated with an institution participating in this pilot agreement, and the author must publish under this affiliation.
- The author should use their institutional email address when submitting their paper, if possible. The author will be asked to validate their institution if a validated institution is not already linked to the author's user profile.
- If invited to submit a final revision, the author will receive a request to sign the License to Publish once the revision is received. The corresponding author should choose a CC BY license to qualify for this agreement.
- The article must be accepted for publication in PNAS between July 1, 2021, and December 31, 2023.
- Authors who publish in PNAS always retain copyright ownership or have the ability to set the copyright owner as their institutions when required.
For a complete list of institutions participating in this pilot program with Jisc, please visit https://www.pnas.org/jisc-publish-and-read.

University of California Publish-and-Read Transformative Agreement

California Digital Library has signed a Publish-and-Read Transformative Agreement with the NAS on behalf of the University of California. The agreement, which benefits researchers at all University of California campuses and the Lawrence Berkeley and Lawrence Livermore National Laboratories, runs from August 1, 2021, to December 31, 2023.

Under the agreement, corresponding authors from any University of California institution, including the Lawrence Berkeley and Lawrence Livermore National Laboratories, may publish open access in PNAS for a discounted total rate of $3,000 per article, with no separate article page charges. A CC BY license is applied to the article by default; authors may opt to change to CC BY-NC-ND.

Authors may also opt out of using an open access license to publish their article and choose subscription-only access instead. These authors will pay PNAS article charges as outlined in the PNAS Publication Fees.

How to take advantage of this agreement:

- The corresponding author must be affiliated with a University of California campus, the Lawrence Berkeley National Laboratory, or the Lawrence Livermore National Laboratory, and the author must publish under this affiliation.
- The author should use their institutional email address when submitting their paper, if possible. The author will be asked to validate their institution if a validated institution is not already linked to the author’s user profile. A University of California institution or either the Lawrence Berkeley or the Lawrence Livermore National Laboratories must be indicated.
- If invited to submit a final revision, the author will receive a request to sign the License to Publish once the revision is received. The corresponding author must choose either a CC BY or CC BY-NC-ND license to qualify for this agreement.
- The article must be accepted for publication in PNAS between August 1, 2021, and December 31, 2023.
- Authors who publish in PNAS always retain copyright ownership and have the ability to set the copyright owner as their institutions when required.

Max Planck Society Publish-and-Read Transformative Agreement

Max Planck Digital Library (MPDL) has signed a Publish-and-Read Transformative Agreement with the NAS on behalf of the Max Planck Society. The agreement, which benefits corresponding authors affiliated with the Max Planck Society, runs from May 1, 2023, to April 30, 2026.

Under the agreement, corresponding authors from any Max Planck Society institute may publish open access in PNAS without incurring individual article processing charges (APCs). A CC BY license must be selected. Authors who opt out of publishing their articles with an open access license should contact PNASaubilling@nas.edu for guidance on covering the PNAS charges for their articles.

How to take advantage of this agreement:

- The corresponding author must be affiliated with an institution participating in this pilot agreement, and the author must publish under this affiliation.
- The author should use their institutional email address when submitting their paper, if possible. The author will be asked to validate their institution if a validated institution is not already linked to the author’s user profile.
- If invited to submit a final revision, the author will receive a request to sign the License to
Publish once the revision is received. The corresponding author should choose a CC BY license to qualify for this agreement.

- The article must be accepted for publication in PNAS between May 1, 2023, and April 30, 2026.
- Authors who publish in PNAS always retain copyright ownership or have the ability to set the copyright owner as their institutions when required.

**PNAS and Funder Mandates**

All authors who publish in PNAS under a CC BY license retain copyright ownership for their work, along with the right to post their accepted manuscript under the same CC BY license. PNAS makes all published articles available through PMC and Europe PMC at the close of each weekly issue.

**Bill & Melinda Gates Foundation**

Authors whose research was funded in part or in whole by the Gates Foundation may comply with the Gates Foundation open access policy as follows:

- Include the following acknowledgment in your manuscripts submitted for publication to PNAS: “This work was supported, in whole or in part, by the Bill & Melinda Gates Foundation [grant number]. Under the grant conditions of the Foundation, a Creative Commons Attribution 4.0 Generic License has already been assigned to the Author Accepted Manuscript version that might arise from this submission.”
- Choose a CC BY license for your article. Note that the Gates Foundation does not permit you to use their funds to pay the article processing charges (APCs) associated with publishing open access in PNAS.
- Include a data availability statement with your article that describes where any primary data, associated metadata, original software, and any additional relevant materials necessary to understand, assess, and replicate the reported study findings in totality can be found. Make this data freely available on publication. PNAS requires a data availability statement for all published articles. Learn more about data availability statements at PNAS. Learn more about Gates Foundation data availability requirements.

**HHMI**

Authors whose publication results from research conducted in HHMI laboratories may continue to pay their PNAS APC from their HHMI budget through December 31, 2022.

**The Wellcome Trust**

Authors may comply with the Wellcome open access policy by including the following statement in their submission, which will be included in the published article: “This research was funded in whole or in part by the Wellcome Trust. For the purpose of Open Access, the author has applied a CC BY public copyright license to any Author Accepted Manuscript (AAM) version arising from this submission.”

Wellcome Trust authors should also select a CC BY license for their PNAS article, which ensures that their article will be made freely available upon publication. Note that Wellcome does not permit authors to use their funds to pay the APC associated with publishing open access in PNAS.

**After Acceptance**

Once your article has been accepted, it will be sent to our production team for copyediting and composition. You will receive an email notification when your proof is ready for review. When this
Article Production and Publication

Copyediting and Composition. Copyeditors make minor stylistic changes to the manuscript to ensure it adheres to PNAS style. PNAS may convert and size figure files to fit the journal template. We note significant changes or concerns as author queries on the page proofs that we send to the corresponding authors for review and approval.

Page Proofs. Corresponding authors receive an email link to download page proofs for review about 2 weeks after the article has been transferred to our production vendor. Please check page proofs carefully against the manuscript, and return all corrections within 48 hours. Limit alterations to errors and changes that impact scientific content. Adding ORCID IDs is not allowed at proof stage; please visit Editorial and Journal Policies for more information on proper authentication of ORICD IDs. Extensive corrections, additions, deletions, and rephrasing of sentences are not permitted at the page proof stage. If submitted, substantive changes may be subject to deletion or editorial review and may incur a surcharge of $50 per page.

Publication. PNAS publishes articles online daily. Articles are published directly into their respective issues. Most articles are published in an issue 2 to 3 weeks after proof corrections are returned. Corresponding authors will receive an email once the article is scheduled for publication. The article publication date is the official date of record. After an article has published on PNAS.org, it will be distributed to a broad audience throughout the scholarly research community, including archiving repositories and discovery services. View the full list here.

All authors of PNAS articles will receive an email notification when their article has been published. Corresponding authors will receive an invitation to visit the Author Services section of the PNAS Profile to claim eprint tokens, a service that provides access to articles that are published behind the paywall. Other functionality available within the Author Services profile section includes the ability to view usage statistics, view AltMetric scores, and sign up for citation email alerts.

Corresponding authors may share eprint token links with colleagues or co-authors to bypass any access controls on Delayed Open Access articles. We ask that the corresponding author share the terms and conditions of the PNAS copyright along with the links.

Errata and Corrections
If you discover any errors in your published article, you may request a correction by completing the Correction Request form. Please see Errata for more information.

PNAS Embargo Policy
PNAS may distribute embargoed copies of an accepted article to the press prior to publication. Work posted on preprints can be discussed with reporters but you should coordinate with the PNAS News Office and indicate to reporters that the preprint has not been peer reviewed. We ask that you refrain from posting accepted manuscripts on publicly accessible preprint servers until after the PNAS embargo has expired. Learn more about the PNAS embargo policy here, or contact the News Office directly at PNASNews@nas.edu.

Promoting Your Article
PNAS has a variety of programs to support our authors and highlight newsworthy articles. However, as the author, you are best positioned to ensure that your research reaches the right audience. Here, we discuss what we do to promote articles, as well as tools you can use to ensure
effective dissemination of your work.

**PNAS Article Promotion Programs**

- We make particularly newsworthy articles available to the broader science journalism community through press tips on EurekAlert!, a nonprofit news-release distribution platform operated by the American Association for the Advancement of Science (AAAS).
- We feature selected articles on our accounts on major social media platforms, including Twitter and Facebook.
- We interview authors of noteworthy research on our podcast, Science Sessions.
- We publicize selected articles in PNAS Special Features and our annual Top Ten collection.
- We recognize six outstanding articles published in PNAS each year with the prestigious Cozzarelli Prize.
- We promote news mentions on the PNAS website.
- We promote newly published articles in weekly email alerts.
- We showcase newsworthy and interesting papers in our bi-weekly newsletters.
- We display the number of downloads and citations each article receives, along with Altmetric data such as number of tweets and blog entries, on the article’s info tab.

**Author Article Promotion Tools**

**Ensure your article is discoverable through search.** Give your article a clear and descriptive title and include as many relevant keywords or phrases as possible. Include at least three or four of your keywords or phrases in your abstract. Tools like Keywords Everywhere and Google Scholar can help you develop and test keywords before including them in your manuscript.

**Personally contact peers and colleagues.** Personally contact fellow researchers in your institution and field, as well as researchers whose work made an impact on your research. Let them know that you have published an article they may be interested in. Send them a link. Ask for feedback.

**Create or update researcher profiles.** Update your institutional or departmental home page and research group website with a link to your paper. If possible, include a short description with keywords so that search engines can find you. In addition:

- Register for an ORCID ID. ORCID provides a unique digital identifier that distinguishes you from every other researcher, so that your work can be correctly attributed to you.
- Create a Google Scholar Profile. This will help Google aggregate all of your articles and citations so that researchers can find them in one place. Your profile will appear high in the page rankings if people are searching for your work.

**Sign up for Kudos.** Kudos is a platform designed to help you make your research available to a broad audience and track the impact of your outreach efforts. Once you register with Kudos, you can claim articles from PNAS and other journals and track them all in one place. You can also access tools to help you grow your readership and citations. Learn more or sign up here.

**Share a link to your article on research-sharing networks.** Many disciplines use academic research-sharing and networking sites extensively. These sites include ResearchGate, Mendeley, Academia.edu, Loop, and others.

**Promote your article on social media.** Promoting your articles on social media platforms can significantly enhance their visibility and reach. As more scientific researchers are turning to social media to discover and share research in various fields, it has become valuable to showcase your work to a wider audience. Using social media professionally not only helps in promoting your
articles but also offers opportunities to engage with other researchers, participate in discussions, and build meaningful professional connections. When utilizing social media to present your article, it’s essential to include a link to the published work. This strategy ensures that engagement measurement tools like Altmetrics accurately count the interactions and impact generated within the social media network. To see the latest tracked sources in Altmetrics, visit https://www.altmetric.com/about-us/our-data/our-sources/.

Create shareable, plain-language summaries. If your intended audience includes members of the general science-interested public or researchers outside your specialization, a plain-language summary will make your research more accessible. Many PNAS authors start with their significance statement or abstract and create plain-language summaries that are designed for a specific audience or medium.

Plain-language summary examples and tutorials:
- How to write a media release for your university press office or research office
- How to make a YouTube video abstract for busy clinicians and the general public

Blog about your article. If you already maintain or contribute to a blog in your field, write a post about your article. If not, contact blogs in your field and ask about opportunities to guest post. You might also consider posting on a long-form digital publishing site like Medium.com.

Blogging tutorials and resources:
- Why science blogging still matters
- How to write a blogpost from your journal article
- How to turn your research paper or article into a blog

Make use of your institution’s communications channels/press office. If your institution has a press office, contact them with a media release and ask for assistance in promoting your work. The press office will have access to channels such as email lists and social media, as well as contacts at news outlets or government agencies who may be able to help your research get noticed. Remember to coordinate any press releases with the PNAS News Office.

Article and Issue Reprints

Author Reprints. PNAS reprints are produced in full color and include self-covers. Covers for reprints display the volume, issue, page numbers, and PNAS masthead with the reprint article title and authors imprinted in the center of the page. Covers for all reprints are printed in color on the same paper stock as the article.

You are invited to place reprint orders at the page proof stage. More information is available here. For questions, please email the Copyright Clearance Center at publicationservices@copyright.com.

Author reprints must be used solely for personal use. For other uses, see Commercial Reprints, below.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>25</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$523</td>
<td>$583</td>
<td>$706</td>
<td>$935</td>
<td>$1,173</td>
<td>$1,411</td>
<td>$1,645</td>
</tr>
</tbody>
</table>

The minimum order for author reprints is 25 copies; shipping is not included. The rate shown only represent average costs for an eight-page article and do not include shipping. Actual pricing is contingent on the final page count.
Eprints. An eprint is a high-quality, full-color PDF with a cover that is suitable for electronic distribution and printing. Eprints for PNAS articles are available for $250.

Single Copies of Articles. Single copies (PDF format) of articles may be downloaded from the PNAS website. Subscribers may download single copies of current articles free of charge. Nonsubscribers may download single copies of articles for free after 6 months or may pay the pay-per-view fee ($10 per article) for current articles. For details, simply go to the article you wish to download. If you are not a subscriber, ordering information will appear.

Single Copies of Issues. Individual, print-on-demand issues may be purchased here.

Commercial Reprints. PNAS accepts requests for commercial reprint orders of specific articles.

For information, please contact:

Chris Jones
Reprint Account Manager
Sheridan Reprints
450 Fame Avenue
Hanover, PA 17331
Email: chris.jones@sheridan.com
Phone: 717-632-8448 x8128
Fax: 717-633-8929

Reprints are saddle-stitched and self-covered upon request, unless journal covers are ordered. Self-covers may be black and white or color and are printed on the same paper stock as the article. Journal covers are color only and are printed on the standard PNAS cover stock.

Any alteration to the standard pages, including the addition of company logos, is subject to additional charges. Payment must accompany reprint orders.