PNAS rebrand: Improving accessibility in its many forms

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On January 7, 1997, 82 years and 6 days after Volume 1 of the Proceedings of the National Academy of Sciences (PNAS) was published (1), Volume 94, along with the November and December 1996 issues, were published as the first online issues of the journal. With the appearance of Volume 119 online in January 2022, PNAS marks a quarter-century of electronic publishing. This anniversary year was in part a motivation for a rebranding and major makeover, not as a celebration of longevity but rather as an opportunity to take advantage of technological advances in digital publishing and to align with and promote shifts in societal values, particularly those relating to the democratization of science as a global enterprise and the increasing permeability of disciplinary boundaries.

In 1915, the members of the National Academy of Sciences who proposed the creation of a new journal envisioned a multifaceted mission, as articulated by George Ellery Hale (1), to bring “researches in one department of science to the attention of scholars in other departments, who would otherwise fail to see them,” to achieve a “wide foreign circulation,” and to “contribute to the popularization of scientific researches.” As brilliant as they might have been, these founders couldn’t possibly have imagined how scientific publishing would change over the next 100 years. In 1915, for example, “wide foreign circulation” was an elusive goal; at that time, the four leading American journals of biology had “an average paid foreign circulation of 93 copies (maximum 109, minimum 77)” and the plan to expand the international reach of PNAS was to stress “placing the Proceedings in the leading research centers, including university department libraries when these are of sufficient significance” (1). At that time, the world inventory of universities was in the neighborhood of 200 (https://www.infoplease.com/us/education/major-universities-founded-1900). Today, there are more than 24,000 universities in the world (https://www.statista.com/statistics/918403/number-of-universities-worldwide-by-country/), with 1,400 universities across 92 countries considered “of sufficient significance” to be included in the 2020 Times Higher Education World University Rankings 2020 (https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats).

For its first 90 years or so, PNAS succeeded in fulfilling its mission with the tools of the 20th century, but digital publishing has evolved far more rapidly than has print publishing and has been key to expanding the journal’s goals of overcoming barriers to disseminating scientific knowledge presented by time, distance, and economics. In the winter of 1996, the first online manuscript tracking system was installed. In 1999, PNAS was redesigned with a new cover and online features for the millennium (2, 3). In 2003, the online submission and peer review system (https://www.pnascentral.org/cgi-bin/main.plex) was launched. The electronic journal became the version of record, with Editor-in-Chief Nicholas Cozzarelli (4) predicting in 2003 that “PNAS may someday become a paperless journal.” A website redesign in 2004 commensurate with its new status as a digital-first journal followed, as did another web redesign in 2015. That year, formal print subscriptions ceased (5); Cozzarelli’s “someday” arrived in 2019, when the print version of the journal was discontinued and PNAS became an exclusively electronic journal.

Whereas earlier web redesigns helped to overcome time and distance barriers, in 2020 a platform migration inspired a web redesign to move away from lingering historical conventions of paper publishing and capitalize on the special strengths of digital communication, particularly those enabling greater usability of the journal for a larger and much more diverse population of authors and readers than had ever existed before. Digital publishing has enabled PNAS to be personalized in a way that print publication never could be. Key to making PNAS more user-friendly and

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hence more useful has been recognizing the diversity represented within the readership and author communities and accordingly building in technology that allows readers to personalize their interactions with the journal.

**PNAS Is Now More Portable**

An important component of personalizing interactions with the journal was to provide ready access to content on a reader’s mobile devices. Mobile-optimized website design facilitates discovery and use of PNAS content across all kinds of devices, providing unprecedented portability and allowing readers to discover content on the device most appropriate for whenever and wherever they choose to browse. The print version of PNAS before its digital transition definitely presented challenges to portability; before shifting to weekly issues, Cozzarelli et al. (6) noted that certain individual biweekly print issues “tipped the scales at four pounds” (approximately 1.8 kg). Today, a pocket-friendly cell phone weighing less than 200 grams can provide ready access to all 119 volumes of PNAS.

**PNAS Is Now More Readable**

A template redesign makes articles less cluttered and more readable. Content is foremost, with extraneous text minimized by the use of a set of icons, now being rolled out by a number of publishers, in a persistent location within the design. With a click, these icons link to information on issue, date, classification, submission history, permissions, keywords, author affiliations and notes, Altmetrics, and citation information, including articles citing the paper being viewed (via an integration with Crossref) and citation export functions that enable researchers to download article metadata for use in their citation management tools. Links to supplemental materials appear and can be opened within the article on the same page, and references can be displayed next to where they are cited, eliminating the need to scroll to the end of the article to see them, which disrupts the reading experience.

**PNAS Is Now More Searchable**

For readers, navigating a multidisciplinary journal can present challenges; digital innovations now empower users to find content most relevant to them. Navigation to journal articles across the broad disciplinary fields published in PNAS has been made easier with the addition of a topics menu that allows readers to scan the latest articles in the physical, social, and biological sciences by minor classifications. Recent articles are grouped by article type (e.g., research reports, commentaries, perspectives) within each topic. As well, all content published by PNAS—journal articles, Front Matter magazine content, blog posts, and podcasts—is now hosted on the same website, allowing for more connections to be made between related content.

Also new is the use of technology to recommend content likely to be relevant to users. Now available are “suggested searches” (equipped with type-ahead functionality) that lead to discovery of relevant content through current and past issues. “Saved searches” and bookmarking abilities now enable registered site users to return with ease to articles of interest. Yet another innovation has been to provide more options for email alerts, including alerts by section, keyword, author, and citation, along with personalized control over the frequency and format of alerts (HTML or text).
PNAS Is Now More Author-Centric

Author navigation has been made more intuitive; direct links make sections of the Author Center navigable from the top of any webpage within the site. To help authors identify who among the nearly 300 members of the Editorial Board has relevant expertise to oversee review of their manuscript, a link on the Author Center leads to the names of the Editorial Board members most closely associated with the manuscript classification chosen by the authors. For corresponding authors, an author services section has been included within their profile page, giving corresponding authors the ability to see usage and citation trends of their articles as well as generate e-print tokens to share their paper with colleagues.

PNAS Is Now More Accommodating

PNAS has become image-forward, with images emphasized as scientific content throughout the journal, including on the cover, where images now occupy the full page and even the newly redesigned logo can be unobtrusively integrated into the image to emphasize its content. A full-screen figure and table viewer now fits the image to the entire screen, with zoom capabilities so that high-resolution images can convey information more precisely and so that readers can conveniently browse figures within a paper.

A key component of the rebrand has been to follow accessibility best practices to make the website inclusive for all members of our broad audience who want to discover and engage with PNAS. Designing for inclusivity is particularly relevant for large, high-profile multidisciplinary journals with an audience with varying accessibility needs by virtue of its size. A critical part of the rebrand has been to align PNAS.org with the most current industry-standard accessibility requirements (specifically, Web Content Accessibility Guidelines, WCAG 2.1 AA, https://www.w3.org/WAI/standards-guidelines/wcag/). The new website is designed with accessibility in mind, with structured HTML and ARIA (Accessible Rich Internet Applications) labeling for assistive technology, keyboard navigability, and color contrast. Font design and color are known to affect readability across the cognitive landscape (7) and, as part of the rebrand, PNAS conducted a survey of leading journals and solicited reader input to inform font selection.

From its founding to going online in 1997 and during the 25 years since, PNAS has been a destination for the scholarly research community and a home for its scholarly work across the disciplines. With our rebrand, PNAS welcomes its global and diverse audience to explore the new website as we embrace a more accessible and inclusive future of scientific publication. We’d like to think that George Ellery Hale would have been pleased with our progress.

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