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SPIE. Proceedings

Introduction

Conference proceedings and journals serve complementary functions in scientific and technical communications. A proceedings is a record of the research that was presented at a conference. Researchers use individual papers to report in-progress research and to document results. Journal papers usually present a more mature and peer-reviewed archive of the research (1).

Proceedings and journals are both valuable for scientific purposes, depending on the specific discipline (2) and goals of the author and organization. This white paper lays out key aspects of both and discusses the value of proceedings as a means to disseminate progress in science and technology.

Conference proceedings can measure the ability to innovate and propose new ideas, whereas journal publication can more strongly contribute to building a knowledge basis (3).

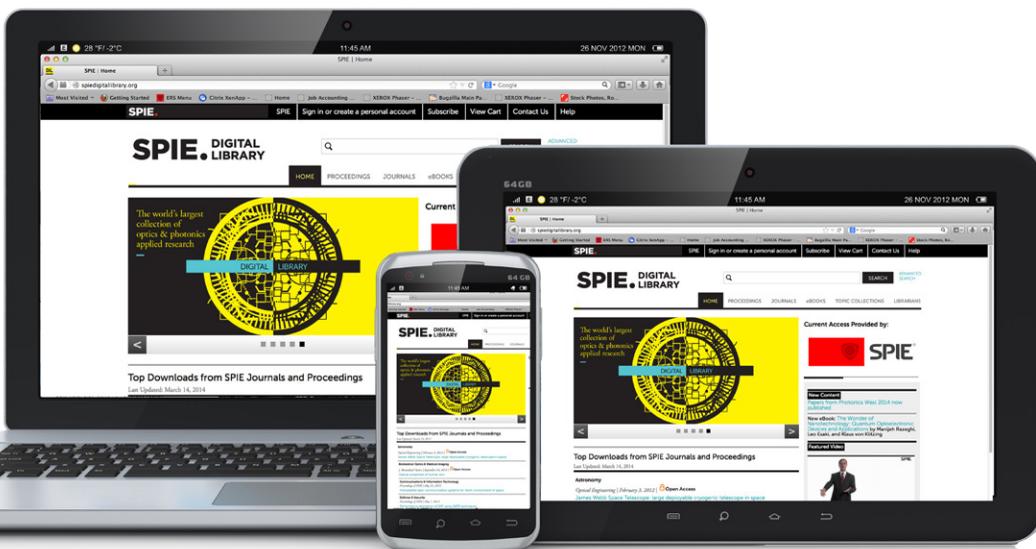
Background

Researchers in science and engineering fields are expected to contribute to knowledge and to create intellectual property that can be commercialized and financially benefit their organizations (4). Being the first to publish a finding is a way to show that a person or a team was the first to develop it, to make this research available to others for advancement of the body of knowledge, and to promote a career or organization.

An organization with product development and market competitiveness as primary concerns can position its innovations in the marketplace and mitigate the threat of substitution by presenting at a conference and publishing its research. Understanding and serving the needs of new and expanding markets requires active collaboration between technology developers, manufacturers, vendors, and customers, which can be established by interaction at conferences and through research papers.

Many organizations encourage their researchers to present at conferences and to publish proceedings papers because such activity improves their research and development productivity by helping them establish and maintain links with the scientific community, attract talent, and access external knowledge on which they can innovate (5). For a researcher, publishing shows one's research ability and performance and can enhance one's professional status and potential career advancement (6, 7).

Organizations can use proceedings and journal papers to document their findings and to prevent others from obtaining patents, as such publications can help prove that any subsequent filing is not a "novel" invention (8).



Publishing in Conference Proceedings or Journals?

Researchers choose publications for their research that bring high visibility with the audiences they want to reach (9), along with serving any other goals of their funding/employing institution. Timeliness, cost of publication, ease, expediency, attendance at a conference, patenting, or need for open access are other factors considered in making the publication decision.

Publishing norms vary across research communities. Academics generally need to publish in peer-reviewed publications in order to earn promotions and tenure (10), while industry researchers need to publish quickly for market reasons. Journal articles usually represent finished research; proceedings have a significant role in new and fast growing disciplines (11).

In summary, key differences between journals and proceedings include:

JOURNAL ATTRIBUTES

- Report on completed research projects with conclusive findings
- Tend to cover concepts or theory
- De-emphasize mis-steps or negative results
- Articles chosen by an editorial team, which may eliminate “noise” but also introduces a subjectivity regarding worthiness
- The preferred publication vehicle for academic and government researchers because of full peer review and impact factor
- Selective and rigorous

PROCEEDINGS ATTRIBUTES

- Collectively, a record of a conference that reflects state of the art at that time and over time for a continuing series
- Individually, a snapshot of a researcher’s project
- The preferred publication for researchers in industry
- A place to publish preliminary findings
- Inconclusive or negative results may be shown, to help others learn
- A means for learning how to write research papers for students
- Reviewed by the conference chairs and program committee; the final paper may reflect this “peer review”
- Inclusive and diverse

Why publish in *Proceedings of SPIE*?

Presenting ongoing or completed research at SPIE conferences and publishing that work in *Proceedings of SPIE* benefits researchers in optics and photonics and the science and engineering community generally.

1. This package of presenting and publishing enables research groups to promote their work and create and maintain linkages across the wider research community. Authors connect with their audience, create networks, share findings, and foster research and innovation, thus creating a valuable community.

The connection between presenting at the conference and publishing in the proceedings was examined in a study of the SPIE Advanced Lithography conference (12). The author found that when research findings were more open during the development phase, via conference presentations and proceedings publication, it was easier for scientists and engineers to deeply understand the corresponding hardware and software and thereby make their interactions with others in the community easier.

Organizations that support such open networking and dissemination can attract staff talent, potential collaborators, funders, partners, and purchasers and can access external knowledge on which they can build to create innovations (13, 5).

2. Proceedings cover new, evolving, interdisciplinary fields of research.

Many of the most exciting and emerging research fields bring together knowledge from different disciplines. The standard journal peer-review system has difficulty assessing such interdisciplinary research (14). Potential reviewers may not be expert in all aspects of the paper's research problem, data, and methods, or a topically focused journal may consider such interdisciplinary research out of scope (15, 16). Many high-ranking journals favor narrowly focused research and avoid interdisciplinary topics (17). However, proceedings are an appropriate venue for this material.

Proceedings serve to provide access to new, more recent literature at the forefront of scientific research (18).

3. Proceedings are the preferred research publication in some SPIE communities.

Between 2004 and 2009, 54% of engineering papers were published in proceedings, 36% in journals, and 10% unknown (11). In 2009, about 42% of optics and 20% of physics publications were proceedings. Overall, worldwide, growth of papers published since 2000, measured for the year 2009, was 141% for conference proceedings and 43% for journals (19).

4. Citation of proceedings papers, while low compared to citation of journal papers, grew from 2000 to 2010 in some countries and disciplines related to SPIE. In general, proceedings are being cited more in both journal and proceedings papers (19). In engineering fields, proceedings may have grown to 10% or more of all cited material (18).¹

¹Results of bibliometric studies of these publication types vary due to how databases identify various publication types, which databases were studied, and more factors (11, 18, 19).

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5. Researchers may publish findings relevant to emerging products in proceedings, thus informing research communities and potential collaborators and buyers.

To succeed in their R&D, researchers must demonstrate the merits of their innovations to outside parties such as regulatory agencies and professional communities, whose assessments influence the commercialization of new products (20, pp. 262-272; 21).

Proceedings may influence these external assessments by helping evaluators to develop a shared framework for comparing innovations, to establish the relevant yardsticks for evaluating them, and to articulate their potential applications (22, 23).

Conference proceedings are especially important in scientific fields with high growth rates (15).

This is particularly important when working in areas of innovation that build on relatively unexplored technologies. Researchers may confront a greater need to highlight those innovations in scientific articles to facilitate external assessments, especially when competing with potential substitutes (24, 25). Proceedings provide a means to do this in a relatively unencumbered manner, while ensuring a standard of scrutiny required to present results to peers in a conference setting.

6. Publishing a description of a discovery or invention in a proceedings allows a researcher to stake a claim in a patent application in the U.S. Waiting to publish in a journal may allow a competitor to assert ownership (12).

In the U.S., the America Invents Act (AIA) gives researchers one year after publishing a paper to file patent applications covering any possible inventions disclosed in that paper. Publishing can also prevent another person from obtaining a patent for an invention, even if that person had developed the same idea first but failed to publish or patent it (8).

7. Proceedings papers can include types of information that might be deemed unsuitable for publication by journal reviewers and editors, such as works in progress, unproven ideas, negative results, theories, and conjecture.

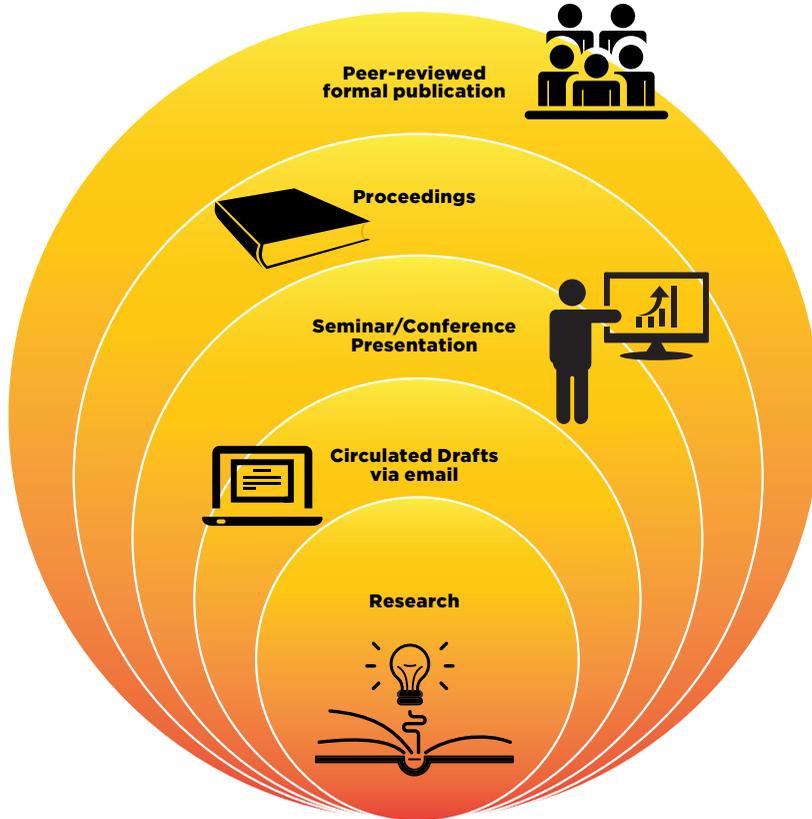
Presenting these and then including them in a proceedings paper provides opportunities for discussions and new solutions. These are also valued by other researchers as they do their work.

“As an optics researcher and educator, I have long relied on the SPIE Proceedings as an incredibly rich and reliable resource.”

- John Greivenkamp
Professor of Optical Sciences,
The University of Arizona

Industry researchers have little patience for what they view as the bias and politics of the first-tier journals, nor do they have time to go through a lengthy review process. Proceedings are favored because they require a great deal less time to prepare than a paper for a refereed journal (26).

8. SPIE provides paths from publishing a paper in *Proceedings of SPIE* to submitting the completed research to the appropriate journal, whether published by SPIE or another organization. The extension of conference papers into journal articles is a common practice in many disciplines (2).



9. Presenting at an SPIE conference results in feedback (peer review) enabling improvements to the related proceedings paper.

SPIE conferences are known for extensive discussion in sessions, hallways, and after hours. Presenters value this feedback and SPIE permits modification of proceedings papers after the conference. This feedback can improve the research effort as well as the proceedings paper, speeding it toward completion and to a journal article for those seeking journal publication (27).

“Many research groups present their current work at conferences, and often material is covered in a conference proceedings that is never published in a journal article . . . it’s of immediate use, which makes it a valuable resource.”

–**Researcher**
National University of Ireland



10. SPIE conferences and proceedings allow researchers to share their research while it is fresh.

SPIE events are ongoing, with one or more conferences per year for many subjects.

11. Authoring proceedings papers is valuable experience for new researchers, and may help them find future collaborators and employers, as well as prepare them to write papers for publication in journals.
12. Submitting research to proceedings simplifies the publishing process, as review typically does not call for additional research and substantial rewriting. Industry researchers whose employers do not want them to take the time to write papers for journals value proceedings for this reason. Researchers in optics and photonics industries find the *Proceedings of SPIE* to be an especially suitable venue (27).
13. Proceedings are inclusive.

Proceedings of SPIE is a vast collection of knowledge across the multidisciplinary, enabling technologies of optics and photonics. A paper addressing a specific problem that may be rejected by a journal as out of scope can be published in the *Proceedings of SPIE*. Authors who might not submit their work to a journal might well present and publish as part of a conference as a way to showcase their work.

A proceedings paper can also be a valuable first publication for new researchers and may help find future collaborators and employers.

14. Users of *Proceedings of SPIE* value the collection; each paper enhances that value.

The collection documents where optics- and photonics-related industries are going, giving direction to basic research that supports applications. Over time, proceedings are an archive of developments in a field and a way to trace a development back to its roots.

Proceedings papers are published promptly upon submission and approval in the SPIE Digital Library, providing researchers with access to new research quickly, even if they did not attend the presentation or the conference.

The inclusive nature of *Proceedings of SPIE* results in a vast collection, offering readers more granular information and solutions to apply to their specific research problems.

Proceedings can help inform buyers in the purchase of a product and about the strength of the research behind the product.

What is unique about *Proceedings of SPIE*?

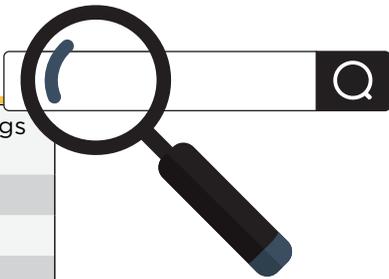
The SPIE Digital Library, including *Proceedings of SPIE*, is the largest collection of optics and photonics basic and applied research. As of mid-2015, the collection includes over 400,000 proceedings papers. It is indispensable for keeping abreast of cutting-edge research in optics and photonics, especially in emerging interdisciplinary fields. The collection is a particularly appropriate venue for research in new and rapidly evolving disciplines. A researcher is likely to read about a new concept first in *Proceedings of SPIE*.

“SPIE’s strength is staking the ground in a particular area, getting there, and publishing fast.”

–Columbia University
Researcher

Proceedings of SPIE ranked among the 50 most-used serials out of 50,000 analyzed by Ex Libris in the bX *Journal Popularity Report* for Q3 2014, the most recent report as of July 2015.² This report is based on the usage of tens of thousands of researchers at institutions worldwide who subscribe to the Ex Libris library catalog system.

INDICES AND SEARCH ENGINES COVERING SPIE PROCEEDINGS



| |
|---------------------------------------|
| Web of Science Conference Proceedings |
| Citation Index-Science |
| Scopus |
| Ei Compendex |
| SAO/NASA Astrophysics Data System |
| Google Scholar |
| ReadCube Discover Services |
| CrossRef |
| Inspec |
| Google |
| Bing |
| DeepDyve |
| EBSCO Discovery Service |
| Proquest Summon Service |
| OCLC WorldCat |
| ExLibris Primo |
| SIPX |

²<http://www.exlibrisgroup.com/category/JournalPopularityReport>

Major scientific indices and search services, including Ei Compendex, Web of Science Conference Proceedings Citation Index-Science, Inspec, Scopus, Astrophysical Data Service (ADS), CrossRef, and Google Scholar, cover *Proceedings of SPIE*. This aids in their discovery, enhances their visibility, and benefits researchers whose work is published in them.

Industry researchers see the SPIE proceedings as little different from journal articles for use in their work. As authors, proceedings are seen as a much better way of getting published, and for marketing and finding sponsorship for their work (27).

Proceedings of SPIE are frequently cited in patents. Currently, SPIE proceedings are cited in more than 50,000 patents. The growth rate of the number of U.S. patents citing SPIE publications is about four times that of all U.S. patents. Companies such as Apple, IBM, GE, Hewlett Packard, Intel, Microsoft, Canon, Toyota, Xerox, and many others cite SPIE proceedings papers as prior art in their patents.

SPIE conferences attract thought leaders and innovators across a broad range of disciplines whose work is then published and widely available in the *Proceedings of SPIE*. Many Nobel Laureates have published in *Proceedings of SPIE*. Their papers are found through the entire history of SPIE proceedings – from the early 1960s until 2015.

Researchers from top companies, universities, and research organizations worldwide publish in *Proceedings of SPIE*, and their organizations subscribe to the SPIE Digital Library.

Leading-edge start-ups, consultants, and other independent change agents use *Proceedings of SPIE* to maintain contact with the research community and to track developments and opportunities in their business areas.

The international community contributes to and reads *Proceedings of SPIE*. Researchers from more than 200 nations access the collection, and SPIE makes the SPIE Digital Library available at little or no cost to developing nations. This increases the likelihood that researchers and students in these countries will read these papers and contribute to future SPIE conferences and proceedings and ultimately to advancements in science and technology.

“SPIE proceedings have information that you don’t get otherwise; it’s not published anywhere else so it’s a unique resource.”

**–Professor
University of Aarhus, Denmark**

SPIE is a not-for-profit organization with major programs supporting underserved scientific communities, students, and education. To ensure wide access to SPIE proceedings and journals, the price of SPIE Digital Library subscriptions has either been reduced or frozen each year from 2010 to 2016.

Reporting on one’s work in conferences and publications is a key function of research life. Choosing the publication venues is an important element of disseminating one’s research. *Proceedings of SPIE* is an effective venue for sharing research and discoveries with peers in optics and photonics, supporting a career, ensuring patent protection, and being part of the record of evolving fields in science and engineering.

28/40 TOP PATENTING COMPANIES IN 2013 CITE SPIE PUBLICATIONS SIGNIFICANTLY³



| COMPANY |
|---------------------------------------|
| Apple Inc |
| Bosch GmbH |
| Brother Industries Ltd |
| Canon Inc |
| Fuji Film Holdings Corp |
| Fujitsu |
| General Electric Company |
| Hewlett-Packard Co |
| Hitachi Ltd |
| Honeywell International Inc. |
| Intel Corporation |
| International Business Machines Corp. |
| Koninklijke Philips NV |
| Micron Technology Inc |
| Microsoft Corporation |
| NEC Corporation |
| Panasonic Corporation |
| Qualcomm Inc |
| Renesas Electronic Corporation |
| Ricoh Co Ltd |
| Samsung Electronics Co Ltd |
| Seiko Epson Corporation |
| Sharp Corp |
| Siemens Aktiengesellschaft |
| Sony Corp |
| Toshiba Corp |
| Toyota Motor Corp |
| Xerox Corp |

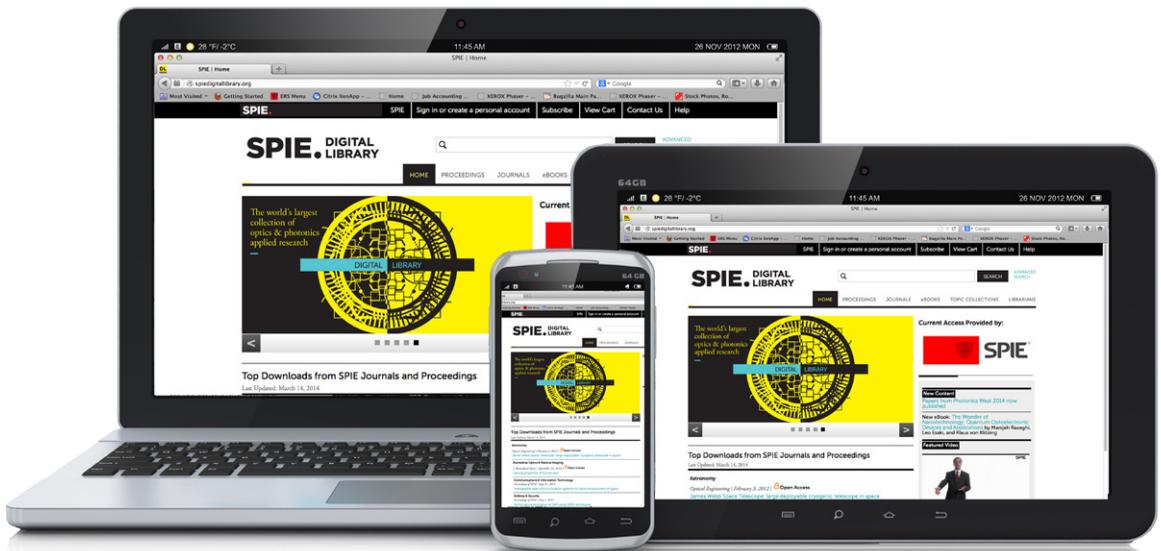
Note: This analysis looked at the top 40 companies in 2013 US patent activity and determined which publishers, conference organizers, and standards organizations were among the top 20 such organizations in the patent references of each in 1997 to 2013. SPIE was one of these organizations for these 28 of the 40 top-patenting companies.

³ Breitzman, Anthony, Ph.D., "Analysis of Patent Referencing to IEEE Papers, Conferences, and standards 1997-2013." Report prepared for Institute of Electrical and Electronic Engineers (May 2014).

Key Topic Areas Covered in *Proceedings of SPIE*

- **Astronomy**
- **Biomedical Optics & Medical Imaging**
- **Communication & Information Technologies**
- **Defense & Security**
- **Electronic Imaging & Signal Processing**
- **Energy**
- **Lasers**
- **Light Sources & Illumination**
- **Lithography & Microelectronics**
- **Metrology**
- **Nanotechnology**
- **Optics**
- **Remote Sensing**
- **Sensors**

Proceedings of SPIE are widely recognized for their cutting-edge research information and technical breadth.



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ABOUT SPIE

SPIE was founded in 1955 to advance light-based technologies. Serving more than 264,000 constituents from 166 countries, the Society advances emerging technologies through interdisciplinary information exchange, continuing education, publications, patent precedent, and career and professional growth. SPIE annually organizes and sponsors approximately 25 major technical forums, exhibitions, and education programs in North America, Europe, Asia, and the South Pacific. In 2015, the Society provided over \$5.2 million in support of scholarships, grants, and other education programs around the world.

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