

INSTRUCTIONS TO AUTHORS

by the Editor of **GEOPHYSICS**¹

EDITORIAL POLICY

Material published in **GEOPHYSICS** should show relevance to petroleum, mining, geothermal, groundwater, environmental, or engineering geophysics. A more mathematical paper should have an illustration or example of its application. Case histories, tutorials, and interpretation papers are of special interest. Manuscripts on fundamental geophysical principles are also welcome, including papers on exploration of the deep crust and upper mantle. **GEOPHYSICS** should have broad appeal, ranging from practical field studies to the more theoretical treatments.

Authors are strongly encouraged to include at least one example of recorded data in the manuscript to illustrate the technology or concept being proposed.

Technical papers, geophysical studies, short notes, discussions, and review papers are all welcome. Technical papers and geophysical studies require an abstract; short notes [three (3) printed pages or less] do not. Authors should confine their papers to eight (8) journal pages or less, including figures. Papers that exceed eight (8) journal pages may be subject to page charges (see the following section on page charges). The Editor may request that they be shortened or separated into two or more papers. The intent of the length restriction is to improve clarity by encouraging authors to organize and focus their writing. Concise reporting also permits **GEOPHYSICS** to publish a larger number of papers.

All contributions submitted in English are considered regardless of whether the author is a member of the Society; however, nonmembers generally incur mandatory page charges. A technical contribution is accepted for review with the understanding that (1) it has neither been accepted for publication nor published elsewhere and (2) it is neither currently being considered by another journal nor will it be submitted to another journal while under consideration for **GEOPHYSICS**. If prior publication has been to a very limited audience significantly different from the readers of **GEOPHYSICS**, the Editor may choose to waive these restrictions. It is the authors's responsibility to inform the Editor of any variance from the status described in (1) or (2) above.

Translations of non-English papers that are published in or have been submitted to another journal will not be accepted unless specifically solicited by the Editor.

All inquiries about manuscript status must be addressed to Sheral Danker (e-mail: sdanker@seg.org) or Judy Wall (e-mail: jwall@seg.org), in the Publications Department at the SEG Business Office. All communications about exceptions to rules, improper manuscript handling, appeal of reviews, etc., may be addressed to the attention of the Editor at the SEG Business Office: P. O. Box 702740, Tulsa, OK 74170-2740, or for special delivery: 8801 S. Yale Ave., Tulsa, OK 74137.

PAGE CHARGES

To support the high cost of publication, technical papers, geophysical studies, and short notes published in **GEOPHYSICS usually incur page charges. For members in good standing, there are voluntary page charges of \$100 for the first eight pages and mandatory charges of \$150 for the ninth and tenth pages, \$200 for the eleventh and twelfth pages, \$250 for the thirteenth and fourteenth pages, and \$350 for the fifteenth page and each additional page more than 15. For nonmembers, the mandatory charges are \$200 for each of the first eight pages, \$250 for the ninth and tenth pages, \$300 for the eleventh and twelfth pages, \$350 for the thirteenth and fourteenth pages, and \$450 for the fifteenth page and each additional page more than 15.**

Regarding color charges, for members in good standing, there are voluntary charges of \$350 per page for color pages up to two pages. For manuscripts with more than two color pages, there are mandatory charges of \$350 per color page. For nonmembers there is a \$350 mandatory charge for each color page.

There are no mandatory charges to members or nonmembers for case histories and tutorials.

The exact number of pages in an article cannot be confirmed until shortly before printing. However, a reasonable page estimate is the number of words in the text divided by 1000 plus 35% of the number of figures.

If none of the authors of a paper is an SEG member in good standing, payment of nonmember page charges is mandatory. Members are requested, but not required, to pay the charges for the first eight (8) pages; however, they must pay all other charges. Charges to members for pages more than eight (8) will be billed, and must be paid prior to publication of the paper. Billing will take place after the paper is accepted and before it is assigned to a specific issue.

Publication of a paper is independent of voluntary page charge payments, but it is important for each author to honor the page charge request. Our publication costs are very substantial and keep growing. For discussions, page charges are purely voluntary and are at member rates for everyone.

In addition to these page charges, there may be charges for changes requested in the typeset proofs that alter the text in the accepted manuscript. Such charges are determined by the publications staff from the proofs reflecting the changes. Authors wishing to inquire about these charges should contact the Technical Copy Editor or the Publications Manager at the SEG Business Office.

It is SEG policy to suspend publication privileges of any author who has a past-due account with the Society.

¹Revised January 2002. These complete Instructions to Authors are available on SEG's Web site at www.seg.org.
Special Note: Areas of emphasis are shown in bold throughout the instructions.

Writing about geophysics

Write to inform, not to impress the reader. Before beginning to write, organize your material carefully. Include all the data necessary to support your conclusions, but exclude redundant or unnecessary data.

Choose the active voice more often than the passive. The passive usually requires more words and sometimes obscures the meaning. Use the first person, not the third person, and do not use “we” when “I” is appropriate.

Prepare a first draft that includes all the data, arguments, and conclusions that you had planned to cover. Then edit your manuscript carefully. Ask yourself whether the reader will find the text clear and the figures to be thoroughly integrated with the text. Go through this process at least twice, preparing a new draft each time.

When you are satisfied, ask a colleague to read your draft—preferably someone who is not well acquainted with the subject matter. Be prepared for criticism. If one reader does not understand parts of your text, others will have the same problem. Remember, you are thoroughly acquainted with your subject, your reader is not.

Robert A. Day’s book, *How to write and publish a scientific paper* (1983, ISI Press), is a useful guide for preparing and organizing a technical paper.

For details on style and usage, such as capitalization, punctuation, etc., refer to the University of Chicago’s *The Chicago Manual of Style*, 14th Edition.

The Encyclopedic Dictionary of Exploration Geophysics, 3rd Edition, by R. E. Sheriff, is SEG’s standard for terms peculiar to geophysical technology and contains the preferred (SI) units and abbreviations for units.

WRITING FOR GEOPHYSICS

Checklist to avoid common mistakes

- Is the entire paper double spaced?
- Do figures appear on separate pages and are they grouped at the end of the manuscript?
- Are all pages numbered?
- Have I followed the requirements for my abstract?
- Have I followed the style instructions for the reference list?
- Have I followed the instructions for labeling figures?
- Is a separate list of figure captions included?
- Have I properly numbered equations and followed style guidelines for vectors, matrices, and tensors?

Organization

A scientific paper can be divided into six parts: a title, an abstract, an introduction, a methods section, a results section, and a discussion and conclusions section. There is some flexibility in labeling these components, but they should be clear-

ly identifiable and follow in order. The abstract, introduction, and conclusions should be labeled as such.

Length

Authors should attempt to keep papers to **less than eight (8)** journal pages (see “Page charges” for guidance on estimating page length). Longer papers can be accepted, but they will incur excess page charges (see “Page charges”).

Title page

The title is a label, not a sentence. Choose as few words as possible to describe the contents of the paper adequately. Use proper syntax. The first word should be significant and helpful both for classifying and indexing the paper. If the title is longer than 38 characters, please provide a short 38-character version to appear as a running head above alternate pages of the printed paper. Company names should not be included in the title.

List the authors (full name whenever possible) on the title pages as they should appear in print. Include only those who take intellectual responsibility for the work being reported and exclude those only peripherally involved. The author list should not be used in lieu of an acknowledgment section.

Abstract

Every manuscript, other than a short note or discussion, must be accompanied by an informative abstract of no more than 200 to 300 words. References should not be cited in the abstract. The abstract must not simply list the topics covered in the paper, but should (1) state the scope and principal objectives of the research, (2) describe the methods used, (3) summarize the results, and (4) state the principal conclusions. Do not refer to the paper in the abstract. If uninformative phrases such as “is discussed” or “is shown” appear in the abstract, the above criteria are not met and the paper will not be published without substantial changes to the abstract.

Remember that the abstract will be the most widely read portion of the paper. It must be able to stand alone as a very short version of the paper rather than as a description of the contents. Readers (and occasionally even reviewers) may be influenced by the abstract to the point of final judgment before the body of the paper is read. Abstracts of GEOPHYSICS articles are published by various groups throughout the world.

The comments by Landes and by Mahrer, included on the last pages, provide further valuable insights. Please pay particular attention to the preparation of your abstract, and use the material in these two references as a guide.

Introduction

The purpose of the introduction is to tell readers why they should want to read what follows. This section should provide sufficient background information to allow readers to understand and evaluate the paper’s results without referring to previous publications. This does not mean, however, authors should use the introduction to rederive established results or to indulge in other needless repetition. The introduction should (1) present the nature and scope of the problem, (2) review the pertinent literature (within reason), (3) describe the method of investigation, and (4) describe the principal results of the investigation.

For additional guidelines see Claerbout, J. F., 1991, A scrutiny of the introduction, *The Leading Edge*, **10**, 39.

Methods

The methodology employed in the work should be described in sufficient detail so that a competent geophysicist can duplicate the results. More detailed items (e.g., heavy mathematics) are often best placed in appendixes.

For complex mathematical articles, authors are strongly encouraged to include a table of symbols.

Results

The results section contains applications of the methodology described above. The results of experiments (either physical or computational) are data and can be presented as tables or figures, and analyses. Whenever possible, include at least one example of recorded data to illustrate the technology or concept being proposed. Case history results are usually geologic interpretations.

Selective presentation of results is important. Redundancy should be avoided, and results of minor variations on the principal experiment should be summarized rather than included. Details appearing in figure captions and table heads should not be restated in the text. In a well-written paper, the results section is often the shortest.

Discussion and Conclusions

Often scientists hesitate to impose their interpretations and conclusions on the reader, especially those that pertain to the significance of their results. However, without interpretations and conclusions, readers can only wonder why they read the paper. Reviewers, and editors in particular, are unlikely to ascribe any more significance to a paper than the author gives it. The Discussion and Conclusions sections should include (1) the principles, relationships, and generalizations inferred from the results (but not a repetition of the results); (2) any exceptions to, or problems with, these principles, relationships, and generalizations as indicated by the results; (3) agreements or disagreements with previously published work; (4) theoretical implications and possible practical applications of the work; and (5) conclusions drawn (especially regarding significance), with a summary of the evidence for each conclusion.

HOW TO SUBMIT A MANUSCRIPT

Beginning early in 2002, the primary method for submitting manuscripts to GEOPHYSICS will be electronic, over the Internet. Corresponding authors should prepare their manuscripts and accompanying figures in electronic form, as a single electronic document, then visit the GEOPHYSICS page on the SEG Web site (<http://seg.org/publications/geophysics>) and follow the links and instructions for submitting a manuscript online. Online instructions will be more detailed and up to date than those found in this document. GEOPHYSICS will accept manuscripts submitted in hard copy, but hard-copy submission is strongly discouraged except when corresponding authors have no satisfactory Internet facilities available to them. Manuscripts and accompanying figures not submitted electronically will require more handling by SEG staff, and this will slow the review process.

After a paper has been reviewed and accepted, authors may submit an electronic version to the SEG Web Group for publication in the Geophysics Online portion of the SEG Web site in advance of print publication. Papers will appear as they are submitted by authors. Papers submitted for Geophysics Online must be submitted as PDF or PostScript that easily can be converted to PDF. More complete instructions are available on the Geophysics Online site (<http://geonline.org>). Publication in Geophysics Online marks the official publication date of a paper, which is usually much earlier than the subsequent printed publication.

Papers submitted to GEOPHYSICS should meet the requirements detailed in this guide. There are certain requirements, however, which if not met may prevent a paper from even being accepted for review. Papers most likely to be delayed include those not submitted electronically, those with text on both sides of each sheet if submitted in hard copy, those not keyed in double-spaced format, and those written in unacceptable poor English. In such cases, the paper will not be reviewed until the necessary basic requirements are satisfied. To facilitate processing and review, authors are urged to read and carefully follow the procedures described below.

Acceptable forms of the manuscript

Manuscripts reviewed online are circulated as PDF documents. Authors are strongly encouraged to submit their manuscripts and accompanying figures as a single document in PDF, Postscript, or Microsoft Word. The online submission software automatically converts Microsoft Word and PostScript files to PDF. Creating high-quality PostScript and PDF files from L_AT_EX files can be problematic. Some helpful suggestions on how to do this are available on the Geophysics page of the SEG Web site.

Once a paper is accepted, authors are required to send floppy or Zip disks, accompanied by the requested number of hard copies. This electronic version of the manuscript used for peer review is not used for production.

Preferred formats for production are Microsoft Word and L_AT_EX. Although we are able to translate text in most common word processing programs, we must rekey any math that has not been provided in the recommended L_AT_EX using the SEG/T_EX macro. Note: When submitting diskettes, please identify software used and include hard copies of the same manuscript version.

Technical papers, geophysical studies, and short notes submitted in hard copy either for review or final production must include one original and five copies. For discussions, only one original and two copies are required. Original figures should be retained by the author until requested by the publication staff.

Each copy of the manuscript should include copies of illustrations, a list of references, and a list of figure captions. Copies of illustrations in color should be submitted in color for evaluation.

See Checklist to avoid common mistakes on page 2.

Where to send manuscripts

Manuscripts and accompanying figures should be submitted online using SEG's Web-based online submission, peer review, and tracking system. If a manuscript must be submitted in hard copy, it should be addressed to the Editor only at the SEG Business Office. Authors are requested not to address the Editor, Assistant, or Associate Editors directly unless the communication is of a personal nature, or is an appeal. Routine communications are handled more efficiently electronically through the peer review module or by using the SEG Business Office address.

MANUSCRIPT PREPARATION

Paper weight and size

When hard copy submission is necessary, each copy of the manuscript must be submitted on medium-weight 8-1/2 × 11-inch paper. (Lightweight, standard-size paper is acceptable for submissions from outside the USA.)

Spacing and paragraphs

Manuscripts must be double-spaced with print on only one side of each sheet. Double-space all parts of the manuscript including the footnotes, quoted material, references, figure captions, and the abstract. Also, each paragraph must be indented to avoid confusion.

Page numbers

Page numbers must appear on all pages of text, including references, figure captions, and tables.

Page length, line width, and margins

Each page should have no more than 30 lines of type, with no line exceeding 6 inches in length. Ample margins should be left at the top, bottom, and sides.

Meeting citations

If your technical paper was presented orally at an SEG meeting, please so note on the title page. The presentation will be cited on the title page in the journal with the number of the meeting, organization, and date.

Headings

Place principal headings at the center of the page in capital letters. Headings of the next lower rank should be placed on the left margin (without indentation), with only the first word of the heading and proper nouns capitalized. Start the text that follows on the next line and indent it. For headings of lower rank, indent, underline (or italicize), place a period and dash after the heading, and follow with text on the same line. If headings of still lower rank are necessary, introduce them by a lower-case letter, e.g., (a), indent, underline (or italicize) and follow with a period and dash. Follow with text on the same line.

Do not number sections of the text—refer to sections by name or content, e.g., “discussion on deconvolution.”

Examples of style for terms

acknowledgments
 air gun*
 airwave
 antialias
 audio frequency*
 back projection*
 band limited*
 bandwidth
 borehole
 CDP (for common depth point)
 CMP (for common midpoint)
 CRP (for common reflection point)
 Chebychev
 crosscorrelation
 crosshole
 crossline
 cross-section
 crosswell
 database
 data set
 dc (direct current)
 far-field
 finite difference*
f-k filter
 free space*
 groundwater
 half-space
 high resolution*
 inline
 mis-tie
 noncolinear
 plane wave*
 poststack
 prestack
 pseudosection
P-wave
Q filter
 raypath
 rms (for root mean square)
 seismic (adj.)
 seismics (n.)
 semi-infinite
S-wave
 time slice*
 travelttime
 wavefield
 waveform
 wavefront
 waveguide
 wavelength
 wavenumber
 wave stack
 wave test
 wavetrain
 wide band*
 z-plane

* hyphenate as an adjective; e.g., finite-difference method.

Examples of style in text

- Use American spelling; e.g., modeling, color, analyze, behavior, etc.
- All sentences must begin with a capital letter. Lowercase Greek letters, mathematical symbols, or numerals may not be used to begin a sentence.
- Use a semicolon before the adverbial conjunctions *however, thus, hence, therefore*, etc., in compound sentences.
- Use a semicolon between independent clauses not joined by a conjunction.
- A colon should follow a complete sentence that introduces an item or list.
- Do not use a colon when an equation or list comes immediately after a verb or preposition.
- Mathematical symbols serve as verbs.
- Equations are punctuated as sentences and should be numbered.
- The abbreviations et al., i.e., and e.g., are set with periods and commas, except when et al. is used in a text reference. Then the preceding comma is omitted.
- Extensive use of italics in text is discouraged; use only for the most necessary emphasis.
- Do not use italics for foreign and Latin words that have become common in English usage. Examples are *a priori* and *et al.*
- Use quotation marks to refer to a special term only the first time the term appears.
- Hyphens are not generally used in words formed with prefixes; e.g., antisymmetric, multidip, nonlinear, semi-major, subbottom, prestack, poststack, pseudosection, etc. Exceptions include proper nouns and words with quasi-, as in quasi-static.
- Hyphens are not used between -ly ending adverbs and the words they modify, e.g., horizontally layered.
- Do not use newly invented acronyms or trade names to describe your technique. Widely used trade names that appear in the *Encyclopedic Dictionary of Exploration Geophysics* (e.g., microlog) are acceptable.
- Use symbols for percent (%) and degree (°) in the text as well as in mathematical expressions, tables, or figures.
- Spell out points of the compass, e.g., east-west, north-northwest, etc.
- In a series of three or more items, a comma (or a semicolon where appropriate) follows each item, including the one that precedes “and.”

Examples of style for units

Physical quantities should be expressed in SI units. Exceptions to this rule may be permitted, at the discretion of the Editor, when field measurements were obtained or equipment was specified with different units. In such cases, the value of non-SI units should be followed by its equivalent in SI units, enclosed by parentheses, e.g., 7200 ft/s (2200 m/s). Do not carry more significant figures in the unit conversion than were used in the original measurement. For example, note that 7200 ft/s converts to 2200 m/s, not 2195 m/s.

All of the following conform to SI metric standards:

s for second
 Ω .m or ohm-m for ohm-meter
 S/m for siemens/meter
 Hz as unit, hertz as word
 A as unit, ampere as word

F as unit, farad as word
 H as unit, henry as word
 V as unit, volt as word
 J as unit, joule as word
 N as unit, newton as word
 W as unit, watt as word
 Pa as unit, pascal as word
 m/s for meter per second (not ms^{-1})
 1000 or 10 000 for 1,000 or 10,000
 times sign (\times) instead of dot for multiplication
 space between number and unit (10 m, not 10m)
 mGal, not mgal
 ms for millisecond
 GHz for gigahertz
 MHz for megahertz
 kHz for kilohertz
 cm for centimeter
 mm for millimeter
 μm for micrometer
 nm for nanometer
 pm for picometer

The following exceptions to SI units are acceptable:

g/cm^3 as density unit
 bar as pressure unit
 gamma as magnetic field intensity unit
 darcy as permeability unit

If followed by SI equivalent in parentheses, the following units are acceptable:

ft (m)
 ft/s (m/s)
 mi (km)
 $\mu\text{s/ft}$ ($\mu\text{s/m}$)

Mathematical material

One of the most complicated and expensive operations in publishing GEOPHYSICS is typesetting mathematical formulas. If mathematical equations are composed using T_EX, rekeying may not be required and subscripts, superscripts, brackets, and all other mathematical symbols and terms appear in the galley proof just as the author(s) originally created them (see section “Acceptable forms of manuscript” for instructions on submitting manuscripts in T_EX). Otherwise, you can help reduce these costs by writing equations in their simplest forms. Often a complicated expression can be simplified if various terms are assigned symbols that are defined individually. For some good examples, see the paper by Nelson in GEOPHYSICS, **53**, 1088-1095.

In the text, the shilling fraction using the solidus (/) should be used rather than the built-up fraction (two decks) e.g., $3/4$ rather than $\frac{3}{4}$.

Fractional exponents should be used instead of radicals wherever feasible. Radicals are preferred, however, for simple square roots, e.g., $\sqrt{2}$ rather than $2^{1/2}$.

Subscripts and superscripts, where there is any doubt they will be clear to the typesetter, should be indicated by carets and inverted carets, for example,

$$q/\overset{\wedge}{ij}; p\underset{\wedge}{w}^2.$$

To standardize space and time coordinates, use lower-case letters x , y , z for Cartesian space coordinates. Designate corresponding axes by x -axis, y -axis, and z -axis, and designate the time coordinate by t . To represent traveltime and finite changes in traveltime, use t and Δt rather than T and ΔT . All axis coordinates on figures must be indicated and should be consistent with the text.

Typesetters generally are not mathematicians. Following these guidelines will enable the typesetter to work with material that is consistent.

Handwritten Greek letters and other unusual symbols must be identified by name in the margin where they are introduced. For example, a “kappa” will not be set as a “k” if it is properly identified. A list of all symbols used in the manuscript on a separate sheet of paper is very helpful.

Equations are punctuated as sentences, e.g., an equation should be followed by a comma where good English usage requires a comma at that position in the sentence. Equations that cannot be placed on one line must be broken only at the “addition” operator symbols. The sign should be placed at the start of the second line.

Terms in equations are grouped with the following symbols: parentheses (), brackets [], and braces { }. For example, $X = \{2R + [(k + 1)(k + 2)]^2\}^{1/2}$.

The typesetter is instructed to set all mathematical symbols and all isolated letters in the text in italic type, if there are no markings to the contrary. Use italics for all symbols for scalar quantities including those represented by Greek letters. **Please note the following style change that will be evident in the published manuscripts. Vectors are set in lowercase boldface roman (regular) letters, while matrices and tensors are set in boldface capital roman letters.** Here are some ways you can facilitate the processing of your article: (1) Set all letters (including Greek) representing scalar quantities in italics. Do not use italics for such items as sin, cos, max, min, etc. Also, do not use italics for letters representing units of measurement: ms, ft, etc. (2) Set all vector quantities in bold lowercase except in cases otherwise noted, as in the case of electromagnetic fields. (3) Set all matrices and tensors in bold capital letters. In any case, it is imperative that a distinct difference is made between vectors, on the one hand, and matrices and tensors on the other.

All displayed equations should be numbered throughout the manuscript. Also, when referring to an equation in text, please identify it with a phrase that could serve to identify the type of equations throughout the text, as shown in the following example.

without phrase: “inserting equations (5) and (6) into (9) ...”

with phrase: “inserting the form, equation (5), of the electric field E and the Lindhard form, equation (6), of the dielectric function ϵ into the constitutive equation (9) ...”

Equation numbers in the text should be shown in parentheses, e.g., “As shown in equation (10).” The number must also be accompanied by: “equation,” “expression,” or another synonym to identify the number itself. Equations in Appendix A should be numbered with the prefix A-, e.g., equation (A-1).

For complicated and detailed mathematical papers, authors are encouraged to include a table near the beginning of the paper defining their mathematical symbols. Authors are also strongly encouraged to place complicated and detailed mathematics in appendices.

Figures

In the manuscript, figures should not be included within the text copy but should be collected at the end of the manuscript with each figure on a separate page (see “Preparation of Illustrations”).

Tables

Tables should not be included within the text copy but should follow the manuscript, with each table on a separate sheet. Other lists may be run within the text. Lengthy tables or tables with complicated content should be submitted in a form that permits either digital or photographic reproduction to avoid expensive typesetting.

Captions and headings

Each figure must have a caption and each table must have a heading. Captions and headings should be explicit enough that the significance of the illustration or table can be understood by the reader without reference to the text. Figure captions should be listed on a separate sheet at the end of the manuscript.

Each illustration and table should be given an Arabic number (not a plate number) and should be referred to by that number in the text. In the caption, list the figure in the form Fig. 3. When referring to figures in the text, spell out and capitalize the word Figure. The word Table is spelled out and capitalized both in text references and in table headings.

Footnotes

Footnotes should be avoided unless essential and then should be held to a minimum. All footnotes introduced in the text of a paper should be numbered consecutively from the beginning to the end of the manuscript. In the manuscript, each footnote must be inserted at the bottom of the page where the reference appears.

Appendixes

All appendixes should have a substantive title such as “Appendix A—Mathematical considerations.” In each appendix, number equations and figures beginning with 1 in the manner: A-1, B-1, etc.

References

References must appear at the end of the main body of the text, but ahead of appendixes.

Citation of previous work acknowledges the importance of those investigations and makes available to the reader much more background information than is practical to include in a single paper. However, to be of real value, all references must be readily accessible to the reader. Company reports, conference proceedings, private communications, and books or journals published only in a language not readily accessible to most readers should be avoided. If internal reports with wide circulation constitute an important reference, cite them in the text but not in the bibliography; e.g., (Levy, G. M., 1984, Geonics Ltd. Tech. note TN-16). Similarly, citations of personal communications, as well as papers submitted to a journal but not yet accepted, may be placed in the text but not in the bibliography.

In the text, literature citations should show the author’s name followed by the year of publication in parentheses, e.g., Nettleton (1940). If the author’s name is not referred to in the text, it and the year should be inserted in parentheses at the point where the reference applies: (Nettleton, 1940).

If there is more than one reference to the same author at a given point in the text, list the years in chronological order with a comma between. When more than one author is referenced at a given point in the text, separate the references by semicolons. If a specific page is referenced, include the page number within the parentheses following the year (Nettleton, 1940, 142).

PREPARATION OF ILLUSTRATIONS

Where possible, design each illustration to be reduced to GEOPHYSICS column size to conserve space and reduce costs. See Figure 1 for an example of a properly formatted illustration. **The abscissa and ordinate of each graph should be labeled and units should be denoted in parentheses. A title heading for each graph is encouraged, the first letter of graph labels should be capitalized, and the graph's style, font, and format should be consistent with other figures.** The body of illustrations should not contain titles or other textual material that can be placed in the caption. Only where clarity demands will exceptions to this rule be considered. Use standard GEOPHYSICS abbreviations in labeling scales (see "Style of units").

All illustrations submitted for peer review must be submitted in electronic format. Electronic submission of illustrations is preferred for accepted papers ready to enter production. All such illustrations must be submitted in EPS or TIFF format with color and grayscale images at a resolution of at least 300 dpi and lineart of at least 600 dpi. These illustrations should be submitted on floppy or Zip disk or on CD-ROM and must be accompanied by a production-quality hard copy. Submission of production-quality digital files for illustrations is not required. Avoid submitting copier machine reproduction as originals. If the illustrations are prepared by hand, use black drawing ink on white (preferably tracing) paper or mylar.

Hard copy illustrations must be submitted on 8 1/2 × 11-inch sheets—neither larger nor smaller. Larger-size figures are likely to be damaged, while smaller ones could be lost in the printing plant. Each sheet must contain only one figure. An original set (or good-quality photographic prints) of illustrations is required.

The author's last name and the figure number should be in the margin of each original and copy for identification. Indicate the preferred size and correct orientation of the printed figure. Use an upward-pointing arrow to show orientation; the size options are column width, page width, and full page.

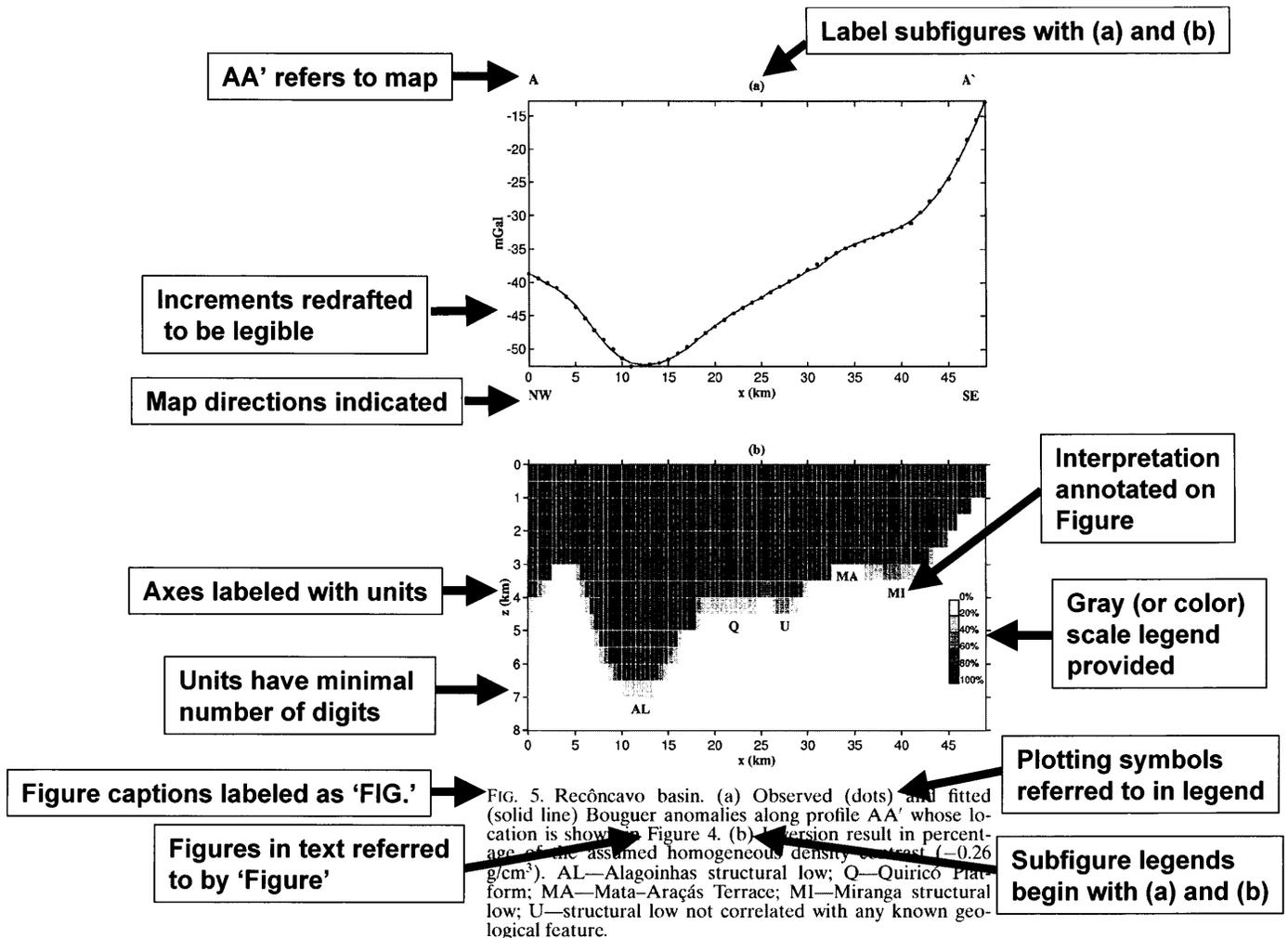


FIG. 1. Figure from Barbosa et al. (1999).

Color illustrations should be submitted as positive prints (not slides). Color figures taken from printed pieces are discouraged. Digitized versions of color figures are welcome.

The author may retain the originals until they are requested by the publication staff. Good quality reproductions are sufficient for the review process. If color is essential to conducting a proper review, submit xerographic copies.

To ensure a high quality reproduction, authors should make a diligent effort to **provide the best possible “original” illustrations available.**

Permission to reprint

Authors are responsible for obtaining permission to use figures and tables previously published in other books or journals. Letters of the copyright holders granting permission should accompany the manuscript. It is also the responsibility of the author to check reproduced materials against the originals for absolute accuracy.

BIBLIOGRAPHY

No section of a manuscript requires more time and effort devoted to corrective editing than does the reference section. Authors are requested to be meticulous in following the instructions for references.

All references should be grouped alphabetically by author at the end of the paper under the heading **REFERENCES**. For a given author referenced more than once for the same year, use the suffix, a, b, etc., to distinguish references. References with identical authorship should be listed in chronological order.

Material not yet accepted and scheduled for publication should not be included in the references. Material accepted for publication may be cited as a reference provided its publication date has been established.

References **not** cited in the text should not be in the bibliography unless the paper is of a survey or tutorial nature. Under such circumstances, these references should be grouped separately under the heading **REFERENCES FOR GENERAL READING**.

Format for REFERENCES

In the list of references, the order and punctuation suggested in the examples that follow will be observed.

For a list of abbreviations to be used throughout references in manuscripts submitted to GEOPHYSICS, see List of Abbreviation for References, in GEOPHYSICS, Vol. 65, 9-15.

Papers from journals:

Kosloff, D. D., and Baysal, E., 1982, Forward modeling by a Fourier method: *Geophysics*, **47**, 1402-1412.

(Note: For each author, show last name first then initial(s). Capitalize only the first word of the title and proper nouns. Do not use quotation marks unless they are actually part of the title. Do not underline or use italics. Show the volume numbers in bold, omit the issue number, and show beginning and ending page numbers. Abbreviate titles of publications.)

Papers from magazines:

Castagna, J. P., 1993, Petrophysical imaging using AVO: *The Leading Edge*, **12**, No. 3, 172-179.

(Follow the instructions for papers from journals. If each issue of the magazine begins with page 1, include the issue number after the volume number.)

Books:

Davis, P. J., and Rabinowitz, P., 1975, *Methods of numerical integration*: Academic Press Inc.

(Follow the instructions for papers from journals. Reference the full name of the publisher in abbreviated form. Do not reference the city of publication or the number of pages in the book.)

Articles in books:

Baker, D. W., and Carter N. L., 1972, Seismic velocity anisotropy calculated for ultramafic minerals and aggregates, *in* Heard, H. C., Borg, I. V., Carter, N. L., and Raleigh, C. B., Eds., *Flow and fracture of rocks*: Am. Geophys. Union, *Geophys. Mono.* **16**, 157-166.

Theses:

Lodha, G. S., 1974, Quantitative interpretation of airborne electromagnetic response for a spherical model: M.Sc. thesis, Univ. of Toronto.

(Reference to a thesis requires neither the name of the department nor the number of pages.)

Discussions:

Zhou, B., 1992, Discussion On: “The use of Hartley transform in geophysical applications,” Saatçilar, R., Ergintav, S., and Canitez, N., authors: *Geophysics*, **57**, 196-197.

Oral presentations that are not published in a Proceedings or Abstract volume:

Hubbard, T. P., 1979, Deconvolution of surface recorded data using vertical seismic profiles: Presented at the 49th Ann. Internat. Mtg., Soc. Expl. Geophys. (Include abbreviated name of sponsoring organization; do not include city.)

Expanded abstracts:

Constable, S. C., 1986, Offshore electromagnetic surveying techniques: 56th Ann. Internat. Mtg., Soc. Expl. Geophys., *Expanded Abstracts*, 81-82.

(Note: References to proceedings of many conferences are appropriate only if these proceedings are generally available to the reader. Authors are requested to avoid such references to material of limited availability. The SEG Expanded Abstracts do qualify as a reference because of their general accessibility.)

Patents:

Antsey, N., 1976, Seismic delineation of oil and gas reservoirs using borehole geophones: *Canadian Patents* 1 106 957 and 1 114 937.

(Following name, indicate year patent was granted.)

REVIEW AND EDITING PROCEDURES

Peer review

If the SEG Editor or an Assistant Editor decides that a submitted manuscript is relevant for *GEOPHYSICS*, it is sent to an appropriate Associate Editor, who selects two or three knowledgeable, unbiased people to review the paper in detail. The reviewers send their comments to the Associate Editor, who forwards them, along with a recommendation, to an Assistant Editor. After considering the reviewer's comments and the Associate Editor's opinion and recommendation, the Editor or an Assistant Editor corresponds with the author. The Editor accepts, rejects, or requests modifications of the paper and sends the reviewers's and Associate Editor's comments to the author. (Reviewers are anonymous unless they choose otherwise.)

Because few papers are accepted for publication without author revisions, a second review is usually necessary. Depending on the extent of the revisions, the Associate Editor may check the changes or seek additional reviews. To keep *GEOPHYSICS* timely, the Editor, Assistant Editors, and Associate Editors strive to make the peer review process brief by asking reviewers to submit their reviews within four weeks. If a reviewer cannot meet this schedule or decides not to review a paper after its receipt, Sheral Danker or Judy Wall in the Publications Department should be notified immediately.

Online peer review

Beginning early in 2002, the transactions described above will be handled through SEG's online peer review system. Manuscripts will be circulated among editors and reviewers in PDF form over the Web. An entry link to this system is provided from the GEOPHYSICS page on the SEG Web site (<http://seg.org/publications/geophysics>).

In the online system, reviewers will find electronic interfaces that closely match paper forms they have processed in the past. The GEOPHYSICS staff anticipates that some hard-copy mailing of manuscripts will continue to be necessary, primarily the mailing of some annotated manuscripts that reviewers may not be able to convert back to PDF for submission to Associate Editors. While seeking to speed the review process through Internet information transfers, the Editors recognize that some nonelectronic means must be allowed so as not to compromise the quality of GEOPHYSICS peer review. The full range of annotation options available to reviewers and Associate Editors is described within the online peer review system.

Reviewer's responsibilities

A reviewer has the following equally important responsibilities:

To evaluate the work's importance and relevance to geophysics—If the work is fundamental research, has the author clearly demonstrated why others in our community should find the results interesting? If the work is applied research or a case study, would readers learn anything from

it? Case history papers do not need to include new technology, but they should emphasize the impact the geophysical work had on a play, area, commodity, or technique. The impact determines the degree of reader interest and should weigh heavily in a reviewer's evaluation.

To critique scientific quality—Are the author's conclusions supported by the evidence presented? Were sound geophysical principles employed? Is previously published information presented as new material? Are there any flaws in the author's reasoning or mathematics? Was the experiment done carefully and with proper controls? Are all assumptions clearly stated?

To ensure that the material is communicated effectively and efficiently—Is the paper free of ambiguity? Are new concepts explained in sufficient detail? Are there redundancies? Does every part of the paper contribute to its theme? Are figures self-explanatory and well labeled? Are there large gaps in reasoning and mathematical developments? Are appendixes needed?

A reviewer is not expected to rewrite a paper that is poorly written and structured; that is the job of the author with help from the editors. The reviewer should try to identify problem areas, especially those that are difficult to understand and where the technical information is not communicated clearly. Comments such as "this paragraph is confusing," "this section seems out of place," and "awkward style" are often appropriate. Whenever possible, reviewers should be specific in identifying what is confusing or questionable.

To provide constructive feedback to authors—Criticism offered objectively can result in effective revisions and, consequently, in a worthwhile paper. Conversely, blunt and brutal statements of the same information may insult and discourage an author and result in the loss of a useful contribution. A paper should not be rejected solely because the reviewer does not agree with an author's conclusions, comments, or interpretation. Instead, the reviewer should list objections and ask the author to address them in the revision. The reviewer should refrain from derogatory comments and make constructive suggestions to improve the paper.

Editing

Accepted manuscripts are edited by an Associate Editor, the reviewers, the Editor, and the copy editor. It is the common goal of these people to improve the effectiveness of communication between the author's work and the reader. It is never the intention to change the technical nature of the author's paper, but to remove ambiguities in wording and, in general, to improve the clarity of meaning.

If extensive editing is required to achieve this goal, the edited manuscript will be returned to the author for review to avoid the possibility of having changed technical meaning. Manuscripts are also returned if they do not adhere to style guidelines, or if editing of mathematics or references is extensive. Final approval by the author of such revisions is required before type is set for publication.

Galley proofs (the paper as it will look in *GEOPHYSICS*) are sent to the author, the Editor, the Special Editors, and the copy editor for review. Authors are advised to read the galley proofs carefully as this is their last opportunity to make changes. However, at this stage, changes by the author should be kept to a minimum. Costs associated with any rewriting of the paper will be billed to the author.

Reprints

An order form for reprints is sent to authors with the galley proofs and is also available on the SEG website. Authors are asked to fill in the information on the form and return it as directed on the form.

Discussions

Discussions of a paper published in *GEOPHYSICS* are screened by an Associate Editor and then sent to the author of

that paper for a reply. To avoid delaying publication, the author is requested not to include any subjects in his reply that are not addressed in the discussion. If no reply is received, the discussion will be printed without one. Both the discussion and the author's reply are proofed and screened by the Associate Editor and Editor before publication. Galley proofs are not sent to the author of the discussion unless changes beyond spelling and punctuation are made by the editorial staff.

A SCRUTINY OF THE ABSTRACT*

BY KENNETH K. LANDES†

ABSTRACT

The behavior of editors is discussed. What should be covered by an abstract is considered. The importance of the abstract is described. Dictionary definitions of "abstract" are quoted. At the conclusion a revised abstract is presented.

Presumably new editors, like new senators and small children, should be seen and not heard. But unfortunately the Association has elected (the electorate had no choice) an editor who is a nonconformist. For many years I have fretted over the inadequate abstract, and now perhaps I can do something about it—but not by keeping quiet.

Many of the abstracts appearing in the publications, including the meeting programs, of the A.A.P.G. can best be described by the use of a homely word that refers to an infestation by a certain minute organism. The abstract appearing at the beginning of this note is in that category. I regret to say that it is not an extreme case. My collection contains several that are worse. Dean Russell of Louisiana State refers to such abstracts as "expanded titles." They could also be looked upon as a table of contents, in paragraph form, with "is discussed" and "is described" added so as to furnish each subject with the verb necessary to complete the sentence. The reader is left completely in the dark not as to what the paper is about but as to what it tells! The information and the interpretation contained therein remain a mystery unless the reader takes the time to read or listen to the entire paper. Such abstracts can be likened to the "teasers" which your local movie manager shows you one week in the hope of bringing you back next week. But the busy geologist is more likely to be vexed than intrigued by the coy abstract.

To many geologists, especially the tyros in exposition, the writing of an abstract is an unwanted chore required at the last minute by a rule-ridden editor or insisted upon even before the paper has been written by a deadline-bedeveled program chairman. However, in terms of the market reached, the abstract is the *most important part of the paper*. For every individual who reads or listens to your entire paper, from ten to five hundred will read the abstract. It is much better to please than to antagonize this great audience. Papers written for oral presentation should be prepared with the deadline the abstract date instead of the delivery date. Later discoveries can be incorporated within the paper—and they would miss the program abstract anyway.

My dictionary describes an abstract as "a summary of a statement, document, speech, etc." and "that which *concentrates in itself the essential qualities of anything more extensive* or more general, or of several things; essence." The definition I like best has been set in italics. May all writers learn the art (it is not easy) of preparing an abstract containing the *essential qualities* of their compositions! With this goal in mind I append an abstract that I believe to be an improvement over the one appearing at the beginning of this discussion.

ABSTRACT

The abstract is of utmost importance for it is read by 10 to 500 times more people than hear or read the entire article. It should not be a mere recital of the subjects covered, replete with such expressions as "is discussed" and "is described." It should be a condensation and concentration of the *essential qualities* of the paper.

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Some considerations when abstracting

Kenneth D. Mahrer*

My dictionary (Urdang, 1973) defines the abstract as “something that concentrates in itself the essential qualities of anything more extensive or more general, or of several things; essence.” As it applies to writing, Houghton (1975) says, “An abstract can be defined as a *summary of the information in a document*.” Although these definitions are clear and direct, they sometimes get muddled or lost during the writing of a manuscript. As a result, the abstract falls short of its function and the manuscript is greatly weakened. The reviewing, editing, and possible publication of the manuscript can be substantially delayed because of its weak and insufficient abstract. To help expedite matters, I offer the following comments concerning abstracts. I offer these for your benefit, for the benefit of your readers, and for the benefit of editors, reviewers, and publication staffs everywhere.

Except for review articles, we usually write an article paralleling what we did. We follow the rules of logic and the scientific method both to perform and to present our work. However, in this exercise, the abstract is unique. Logic, clarity, development, and the scientific method are no longer the sole guidelines. They have to be merged with condensation, compaction, and summarization. It is probably obvious, but writing a good abstract requires repacking your multipage manuscript into a single paragraph.

Good abstracts are not difficult to write, especially if you have written a good manuscript and avoid some pitfalls. Remember, unlike the situation when you began, your manuscript should contain the requisite content for the abstract. What you have to do is reformulate, evaluate, extract, and recast. This leads to a basic recommendation: write the abstract after the manuscript has been completed, edited, and has rested untouched in a desk drawer for a reasonable amount of time. This fermenting period allows closer empathy with a knowledgeable, but one-time reader.

The following is my attempt to give a helpful, albeit incomplete, set of observations and some dos-and-don'ts of abstracting. It is not my intent to provide a manual on how to write an abstract.

Read Gopen and Swan's article.—Gopen and Swan (1990) have written a very unique and enlightening article on scientific writing. It discusses the science of writing science from the perspective of the needs and requirements of the reader. If this is the only advice you take, please read that article!

Read Landes's article.—Abstracts are not new and seem to date back to cave painting. However, in 1951 K. K. Landes, having had enough of poor abstracts, published, and 15 years later, revised and again published a wonderful and

helpful one-page article on his annoyance's with inadequate abstracts. Landes's article is universal, applying to all scientific disciplines. Make it a hard-and-fast rule: before writing, take 10 minutes and refresh yourself with Landes's article. It is time well spent and may greatly improve your abstract.

Considering my high praise of Landes's article, why do I feel the need to say more? Simply stated, I don't feel that Landes touched on enough of the pitfalls of modern abstracting.

Stress content not intent

An abstract should summarize the content of the article not the intent of the writer(s). It should contain only that which you are specifically reporting in the manuscript. Based on Day's (1983) recommendations, the abstract should have at most one or two sentences on each of the four foundation points of your work. These are: (1) principal objectives and scope of the work, (2) methodology, (3) results, and (4) conclusions.

Leave out extra baggage

Too many abstracts are filled with extras. Stick to the four foundation points. Background references, literature surveys, and setting; justification and motivation; global definition of the problems and discipline; needs, benefits, claims, recommendations, opinions, and utility of the work are not part of the abstract. They may qualify as intent, motivation, bulwark, etc. and appear in the main body of the work, but they are not part of, nor are they needed in the abstract.

Assume a knowledgeable reader

In all writing there is always the question of the knowledge level of the reader. In writing the abstract assume a knowledgeable reader. The level of knowledge assumed should be that of a good supervisor, one who understands the type of work, but is not active in that area and may not remember the more esoteric nomenclature. Note, this level of knowledge may not be the same as what you have assumed throughout your manuscript. Again, this points out that writing the abstract is not simply a continuity task strapped to the end of writing the manuscript. Abstracts require rethinking and reformulating.

Write the abstract last

After you write your manuscript and let it ferment, you should be able to write a terse, but exact, description of each of the four foundation points based on the content of the writ-

ten manuscript. If you cannot formulate a four-to-eight-sentence abstract, maybe you should reexamine your manuscript. It may not be doing its job and should be revised.

Avoid passive voice

To avoid a conflict between intent, content, and extra baggage, it is very helpful to write in the active voice. Sentences structured with “is presented,” “was done,” “is given,” “is developed,” etc. are easy to write, terrible to read, and convey essentially nothing to the reader. Despite how they sound, they provide no useful content; they show only intent, while giving no content.

Keep it short

As indicated above, your abstract does not need to be longer than an eight sentence maximum. If it is, it’s either not doing its job and you have excess baggage or you have a very rare exception. I stress rare. You should complete your abstract in one paragraph only. It should not have multiple paragraphs. If it does, again, you probably have excess baggage.

Because of this length restriction, your abstract may not be smooth and flowing. That’s OK. It may be very terse, staccato sounding, and not particularly easy to read. That’s OK, too. Ease of reading is not a requirement; conveying content is. Because of its short length, a reader can easily read through it a second time.

Make quantitative not qualitative statements

It is very annoying to read that A is bigger or smaller, faster or slower, longer or shorter, more or less porous or permeable, etc., than B without knowing how much or to what extent.

Don’t use equations or other mathematical notation

It should be obvious that equations and mathematical notation have no place in an abstract, but some writers refuse to recognize this. Remember, the abstract must be able to stand alone. Give names to parameters not mathematical symbols.

If required, name common equations (e.g., the wave equation, Laplace’s equation, etc.) and summarize your contribution and findings from them.

In the end, empathize with the first-time reader

Your abstract is short and can be edited easily. As an editing tool, read your abstract and imagine that it is being read for the first time and that it is the only portion of the article that is read. Answer honestly, “what have I conveyed to the reader? With what does he/she walk away?” If, for example, it is a compendium of “is presents” and “was done,” this is not an abstract.

In the end, remember that your intent in writing an abstract is to showcase your work in a direct and lean manner. The abstract should give the casual reader a bit of useful information and the interested reader a prod to continue and read the article. It’s a marketing tool, but not a platform for salesmanship or filibustering. Also remember that there are many services that copy and publish abstracts. An abstract must be structured to stand alone. It should not require leaning on the main body of the article.

Finally, my reason for writing this note is not completely altruistic. All past and present editors, associate editors, reviewers, editorial staff members, and readers in general, who, like Landes, are tired of poor abstracts, are eager to read well written abstracts.

Remember, your abstract is your showcase.

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