

How to Write and Publish a Scientific Paper

Eighth Edition

An essential guide for succeeding in today's competitive environment, this book provides beginning scientists and experienced researchers with practical advice on writing about their work and getting published. This brand new, updated edition also includes a new chapter on editing one's own work, a section on publicizing and archiving one's paper and updates on authorship, including information on new authorship criteria and on the author identification number ORCID. The book guides readers through the processes involved in writing for and publishing in scientific journals: from choosing a suitable journal, to writing each part of the paper, to submitting the paper and responding to peer review, through checking the proofs. It covers ethical issues in scientific publishing; explains rights and permissions; and discusses writing grant proposals, giving presentations and writing for general audiences.

BARBARA GASTEL is Professor of Veterinary Integrative Biosciences, Humanities in Medicine, and Biotechnology at Texas A&M University. She has received awards and recognitions from the American Medical Writers Association, the Board of Editors in the Life Sciences, the Council of Science Editors, and Sigma Xi: The Scientific Research Society.

ROBERT A. DAY is Professor Emeritus of English at the University of Delaware, where he taught graduate and undergraduate courses in scientific writing. He has directed the publishing program of the American Society for Microbiology and served as managing editor of the *Journal of Bacteriology*. He also has been president of the Society for Scholarly Publishing and chairman of the Council of Biology Editors.

How to Write and Publish a Scientific Paper

Eighth Edition

Barbara Gastel

Texas A&M University

Robert A. Day

University of Delaware



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press
978-1-316-64043-2 — How to Write and Publish a Scientific Paper
Barbara Gastel, Robert A. Day
Frontmatter
[More Information](#)

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
4843/24, 2nd Floor, Ansari Road, Daryaganj, Delhi – 110002, India
79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781316640432
DOI: 10.1017/9781108105293

© Barbara Gastel and Robert A. Day 2016

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

Third edition published 1989
Fourth edition published 1995
Fifth edition published 1998
Sixth edition published 2006
Seventh edition paperback published 2012
Eighth edition paperback published 2016

A hardback edition of *How to Write and Publish a Scientific Paper*, 8th edition was published by ABC-CLIO, LLC. in 2016.

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall.

This edition is not for sale in North America including the United States and its possessions, Canada and Mexico together.

A catalogue record for this publication is available from the British Library.

ISBN 978-1-316-64043-2 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party Internet Web sites referred to in this publication and does not guarantee that any content on such Web sites is, or will remain, accurate or appropriate.

Contents

Preface xv

A Word to International Readers xix

Acknowledgments xxi

PART I: SOME PRELIMINARIES

- 1 *What Is Scientific Writing?* 3
 - The Scope of Scientific Writing 3
 - The Need for Clarity 3
 - Receiving the Signals 4
 - Understanding the Signals 4
 - Understanding the Context 4
 - Organization and Language in Scientific Writing 5
- 2 *Historical Perspectives* 6
 - The Early History 6
 - The Electronic Era 7
 - The IMRAD Story 8
- 3 *Approaching a Writing Project* 11
 - Establishing the Mindset 11
 - Preparing to Write 12

vi *Contents*

- Doing the Writing 14
Revising Your Work 16
- 4 ***What Is a Scientific Paper?*** 18
Definition of a Scientific Paper 18
Organization of a Scientific Paper 20
Shape of a Scientific Paper 22
Other Definitions 22
- 5 ***Ethics in Scientific Publishing*** 24
Ethics as a Foundation 24
Authenticity and Accuracy 24
Originality 25
Credit 26
Ethical Treatment of Humans and Animals 27
Disclosure of Conflicts of Interest 28
- 6 ***Where to Submit Your Manuscript*** 29
Why Decide Early, Why Decide Well 29
Prestige and Impact 31
Access 34
Avoiding Predatory Journals 34
Other Factors to Consider 35
Using Instructions to Authors 36

PART II: PREPARING THE TEXT

- 7 ***How to Prepare the Title*** 41
Importance of the Title 41
Length of the Title 42
Need for Specific Titles 42
Importance of Syntax 43
The Title as a Label 44
Abbreviations and Jargon 45
More About Title Format 45
- 8 ***How to List the Authors and Addresses*** 47
The Order of the Names 47
Definition of Authorship 49

- Defining the Order: An Example 50
- Specifying Contributions 51
- Proper and Consistent Form 51
- Listing the Addresses 52
- A Solution: ORCID 53
- Purposes of the Addresses 54

- 9 ***How to Prepare the Abstract*** 55
 - Definition 55
 - Types of Abstracts 57
 - Economy of Words 59
 - Akin to Abstracts 60

- 10 ***How to Write the Introduction*** 61
 - Guidelines 61
 - Reasons for the Guidelines 62
 - Exceptions 63
 - Citations and Abbreviations 65

- 11 ***How to Write the Materials and Methods Section*** 66
 - Purpose of the Section 66
 - Materials 67
 - Methods 68
 - Headings 68
 - Measurements and Analysis 68
 - Need for References 69
 - Tables and Figures 69
 - Correct Form and Grammar 70

- 12 ***How to Write the Results*** 72
 - Content of the Results 72
 - How to Handle Numbers 73
 - Strive for Clarity 73
 - Avoid Redundancy 74
 - A Supplement on Supplementary Material Online 74

- 13 ***How to Write the Discussion*** 75
 - Discussion and Verbiage 75
 - Components of the Discussion 76
 - Factual Relationships 76

viii *Contents*

- Noting Strengths and Limitations 77
- Significance of the Paper 78
- Defining Scientific Truth 78

- 14 ***How to State the Acknowledgments*** 80
 - Ingredients of the Acknowledgments 80
 - Being Courteous 80

- 15 ***How to Cite the References*** 82
 - Rules to Follow 82
 - Electronic Aids to Citation 83
 - Citations in the Text 83
 - Reference Styles 84
 - Name and Year System* 85
 - Alphabet-Number System* 85
 - Citation Order System* 86
 - Titles and Inclusive Pages 87
 - Journal Abbreviations 87
 - Some Trends in Reference Format 88
 - Examples of Different Reference Styles 88
 - Citing Electronic Material 89
 - One More Reason to Cite Carefully 89

PART III: PREPARING THE TABLES AND FIGURES

- 16 ***How to Design Effective Tables*** 93
 - When to Use Tables 93
 - How to Arrange Tabular Material 96
 - Exponents in Table Headings 99
 - Following the Journal's Instructions 99
 - Titles, Footnotes, and Abbreviations 100
 - Additional Tips on Tables 100

- 17 ***How to Prepare Effective Graphs*** 101
 - When Not to Use Graphs 101
 - When to Use Graphs 103
 - How to Prepare Graphs 104
 - Symbols and Legends 106
 - A Few More Tips on Graphs 107

- 18 *How to Prepare Effective Photographs* 108
 Photographs and Micrographs 108
 Submission Formats 108
 Cropping 109
 Necessary Keys and Guides 109
 Color 111
 Line Drawings 113

PART IV: PUBLISHING THE PAPER

- 19 *Rights and Permissions* 117
 What Is Copyright? 117
 Copyright Considerations 118
 Copyright and Electronic Publishing 119
- 20 *How to Submit the Manuscript* 121
 Checking Your Manuscript 121
 Submitting Your Manuscript 122
 The Cover Letter 122
 Sample Cover Letter 124
 Electronic Cover Letters 125
 Confirmation of Receipt 125
- 21 *The Review Process (How to Deal with Editors)* 126
 Functions of Editors, Managing Editors, and
 Manuscript Editors 126
 The Review Process 128
 The Editor's Decision 132
 The Accept Letter 133
 The Modify Letter 133
 The Reject Letter 136
 Editors as Gatekeepers 138
- 22 *The Publishing Process (How to Deal with Proofs)—
 and After Publication* 140
 The Copyediting and Proofing Processes 140
 Why Proofs Are Sent to Authors 141
 Misspelled Words 141
 Marking the Corrections 143

x *Contents*

- Additions to the Proofs 143
- Addition of References 145
- Proofing the Illustrations 145
- When to Complain 146
- Reprints 146
- Publicizing and Archiving Your Paper 147
- Celebrating Publication 149

PART V: DOING OTHER WRITING FOR PUBLICATION

- 23 ***How to Write a Review Paper*** 153
 - Characteristics of a Review Paper 153
 - Preparing an Outline 154
 - Types of Reviews 155
 - Writing for the Audience 156
 - Importance of Introductory Paragraphs 157
 - Importance of Conclusions 157

- 24 ***How to Write Opinion (Letters to the Editor, Editorials, and Book Reviews)*** 158
 - Writing Informed Opinion 158
 - Letters to the Editor 158
 - Editorials 159
 - Book (and Other Media) Reviews 160

- 25 ***How to Write a Book Chapter or a Book*** 162
 - How to Write a Book Chapter 162
 - Why (or Why Not) to Write a Book 163
 - How to Find a Publisher 163
 - How to Prepare a Book Manuscript 165
 - How to Participate in the Publication Process 166
 - How to Help Market Your Book 168

- 26 ***How to Write for the Public*** 170
 - Why Write for General Readerships? 170
 - Finding Publication Venues 170
 - Engaging the Audience 172
 - Conveying Content Clearly 173
 - Emulating the Best 174

PART VI: CONFERENCE COMMUNICATIONS

- 27 *How to Present a Paper Orally* 177
 How to Get to Present a Paper 177
 A Word of Caution 178
 Organization of the Paper 178
 Presentation of the Paper 179
 Slides 180
 The Audience 181
 A Few Answers on Questions 182
- 28 *How to Prepare a Poster* 183
 Popularity of Posters 183
 Organization 184
 Preparing the Poster 185
 Presenting the Poster 187
- 29 *How to Write a Conference Report* 188
 Definition 188
 Format 189
 Presenting the New Ideas 190
 Editing and Publishing 190

PART VII: SCIENTIFIC STYLE

- 30 *Use and Misuse of English* 195
 Keep It Simple 195
 Dangling Modifiers 196
 The Ten Commandments of Good Writing 197
 Metaphorically Speaking 198
 Misuse of Words 198
 Tense in Scientific Writing 200
 Active versus Passive Voice 202
 Euphemisms 202
 Singulars and Plurals 203
 Noun Problems 204
 Numbers 205
 Odds and Ends 205

xii *Contents*

- 31 ***Avoiding Jargon*** 208
Definition of Jargon 208
Mumblespeak and Other Sins 208
Mottoes to Live By 210
Bureaucratese 210
Special Cases 212
- 32 ***How and When to Use Abbreviations*** 214
General Principles 214
Good Practice 215
Units of Measurement 216
Special Problems 216
SI (Système International) Units 217
Other Abbreviations 217
- 33 ***Writing Clearly across Cultures and Media*** 218
Readable Writing 218
Consistency in Wording 220
Serving International Readers 220
A Few Words on Email Style 221
Writing for Online Reading 222
- 34 ***How to Write Science in English as a Foreign Language*** 223
English as the International Language of Science 223
The Essentials: Content, Organization, and Clarity 224
Cultural Differences to Consider 225
Some Common Language Challenges 226
More Strategies for English-Language Writing 227
More Resources 228

PART VIII: OTHER TOPICS IN SCIENTIFIC COMMUNICATION

- 35 ***How to Write a Thesis*** 231
Purpose of the Thesis 231
Tips on Writing 233
When to Write the Thesis 234
Relationship to the Outside World 235
From Thesis to Publication 236

- 36 ***How to Prepare a Curriculum Vitae, Cover Letter, and Personal Statement*** 237
- What's a CV? What's It Good For? 237
 - What to Put In (and What to Leave Out) 239
 - Other Suggestions 239
 - Preparing a Cover Letter 240
 - Writing a Personal Statement 241
- 37 ***How to Prepare Grant Proposals and Progress Reports*** 243
- Preparing a Grant Proposal 243
 - Identifying Potential Sources of Funding* 244
 - Preliminary Letters and Proposals* 244
 - Common Parts of a Proposal* 245
 - Preparing to Write the Proposal* 246
 - Writing the Proposal* 246
 - Common Reasons for Rejection* 249
 - Other Problems to Watch For* 249
 - Resubmitting a Proposal* 250
 - Two Closing Comments* 251
 - Writing a Progress Report 251
 - Basic Structure* 251
 - Some Suggestions* 252
- 38 ***How to Write a Recommendation Letter—and How to Ask for One*** 254
- Deciding Whether to Write the Letter 254
 - Gathering the Information 255
 - Writing the Letter(s) 255
 - A Light Aside 256
 - If You're Seeking Recommendation Letters 257
- 39 ***How to Work with the Media*** 258
- Before the Interview 258
 - During the Interview 260
 - After the Interview 261
- 40 ***How to Provide Peer Review*** 263
- Responding to a Request for Peer Review 263
 - Peer Reviewing a Scientific Paper 264
 - Providing Informal Peer Review 266

xiv *Contents*

41 ***How to Edit Your Own Work*** 269

Preparing to Edit Your Work 269

Items to Notice: 8 Cs 270

A Good Choice: Checklists 271

Finding and Working with an Author's Editor 272

42 ***How to Seek a Scientific-Communication Career*** 276

Career Options in Scientific Communication 276

An Admittedly Unvalidated Quiz 277

Career Preparation 278

Entering the Field and Keeping Up 279

Appendix 1: Selected Journal Title Word Abbreviations 281

Appendix 2: Words and Expressions to Avoid 285

Appendix 3: SI (Système International) Prefixes and Their Abbreviations 293

Appendix 4: Some Helpful Websites 295

Glossary 297

References 303

Index 311

Preface

Criticism and testing are of the essence of our work. This means that science is a fundamentally social activity, which implies that it depends on good communication. In the practice of science we are aware of this, and that is why it is right for our journals to insist on clarity and intelligibility.

—Hermann Bondi

Good scientific writing is not a matter of life and death; it is much more serious than that.

The goal of scientific research is publication. Scientists, starting as graduate students or even earlier, are measured primarily not by their dexterity in laboratory manipulations, not by their innate knowledge of either broad or narrow scientific subjects, and certainly not by their wit or charm; they are measured and become known (or remain unknown) by their publications. On a practical level, a scientist typically needs publications to get a job, obtain funding to keep doing research in that job, and gain promotion. At some institutions, publications are needed to obtain a doctorate.

A scientific experiment, no matter how spectacular the results, is not completed until the results are published. In fact, the cornerstone of the philosophy of science is based on the fundamental assumption that original research *must* be published; only thus can new scientific knowledge be authenticated and then added to the existing database that we call scientific knowledge.

It is not necessary for the plumber to write about pipes, nor is it necessary for the lawyer to write about cases (except *brief* writing), but the research scientist, perhaps uniquely among the trades and professions, must provide a document showing what he or she did, why it was done, how it was done, and what

xvi Preface

was learned from it. The key word is *reproducibility*. That is what makes science and scientific writing unique.

Thus, the scientist must not only “do” science but also “write” science. Bad writing can and often does prevent or delay the publication of good science.

Unfortunately, the education of scientists is often so overwhelmingly committed to the technical aspects of science that the communication arts are neglected or ignored. In short, many good scientists are poor writers. Certainly, many scientists do not like to write. As Charles Darwin said, “A naturalist’s life would be a happy one if he had only to observe and never to write” (quoted by Trelease, 1958).

Most of today’s scientists did not have a chance to take a formal course in scientific writing. As graduate students, they learned to imitate the style and approach of their professors and previous authors. Some scientists became good writers anyway. Many, however, learned only to imitate the writing of the authors before them—with all its defects—thus establishing a system of error in perpetuity.

The main purpose of this book is to help scientists and students of the sciences in all disciplines to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published. Because the requirements of journals vary widely from discipline to discipline, and even within the same discipline, it is not possible to offer recommendations that are universally acceptable. In this book, we present certain basic principles that are accepted in most disciplines.

Let us tell you a bit about the history of this book. The development of *How to Write and Publish a Scientific Paper* began many years ago, when one of us (Robert A. Day) taught a graduate seminar in scientific writing at the Institute of Microbiology at Rutgers University. It quickly became clear that graduate students in the sciences both wanted and needed *practical* information about writing. If a lecture was about the pros and cons of split infinitives, the students became somnolent; if it addressed how to organize data into a table, they were wide awake. Therefore, a straightforward “how to” approach was used for an article (Day 1975) based on the lecture notes. The article turned out to be surprisingly popular, and that led to the first edition of this book.

The first edition led naturally to the second edition and then to succeeding editions. Because this book is now being used in teaching programs in many colleges and universities, it seems especially desirable to keep it up to date. We thank those readers who kindly commented on previous editions, and we invite suggestions that may improve future editions. Please send suggestions and comments to Barbara Gastel at b-gastel@tamu.edu.

This edition, the eighth, is the third for which Barbara Gastel joins Robert A. Day—and the first for which Gastel is first author. Gastel remains grateful to Day for asking her to collaborate. We are delighted that our previous editions

together have been translated into at least five languages, and we hope the current edition will be widely translated too.

In keeping with its title, this book has always focused primarily on writing and publishing scientific papers. It also has long provided broader advice on scientific communication. Beginning with the first edition, it has contained chapters to help readers write review papers, conference reports, and theses. Over time, chapters were added on other topics, such as how to present a paper orally and how to prepare a poster presentation. Recent editions also included chapters on approaching a writing project, preparing a grant proposal, writing about science in English as a foreign language, communicating science to the public, and providing peer review.

The current edition maintains this scope but has been substantially updated and otherwise revised. The electronic world of scientific communication has continued to evolve, and we have revised this book accordingly. Thus, for example, we now discuss using ORCID identifiers, avoiding predatory journals, and giving digital poster presentations. We have added a chapter on editing one's own work before submission, and we now include a section on publicizing and archiving one's paper after publication. The list of electronic resources has been expanded substantially. Cartoons have long been a popular feature of the book; we have retained favorites from previous editions and added several new cartoons by Jorge Cham (of PHD Comics), Sidney Harris, and others.

This book remains a “how-to book” or “cookbook,” focusing mainly on points of practical importance. As in past editions, the book also contains some other items, such as cartoons and examples of humorous errors, intended to lighten the reading. Readers wishing to explore topics further are encouraged to consult works noted in the text or cited as references and to look at websites mentioned in this book.

Good scientific writing is indeed crucial. We hope this book will demystify writing and publishing a scientific paper and help you communicate about your work effectively, efficiently, and even enjoyably. Your success will be our greatest reward.

A Word to International Readers

For researchers throughout the world, communicating in English in standard Western formats has increasingly become the norm for sharing information widely. Thus, over the years *How to Write and Publish a Scientific Paper* has had many readers for whom English is not a native language. We hope the current edition will serve an even wider readership.

Aware of the diversity of our readers, we have tried especially hard in the current edition to present the main content in language easily understood by non-native speakers of English. One issue that we faced, however, was whether to retain the jokes that enlivened the book for many readers but sometimes confused readers from linguistic or cultural backgrounds other than our own. Because these jokes have been a distinctive feature of the book and one of its appeals, we have retained most of them in those chapters updated from early editions. However, because humor often does not translate well cross-culturally, we have limited its use in the more recently added chapters.

If, as an international reader, you occasionally encounter a silly-seeming story or comment in this book, do not worry that something is wrong or that you have missed an important point. Rather, realize that you are seeing some examples of American humor.

We welcome readers from throughout the world and hope they will find our book helpful in communicating science internationally. Suggestions for making the book more useful are appreciated at any time.

Acknowledgments

Over the years and over the editions, many colleagues and others have contributed directly or indirectly to this book. Those we have worked with in scientific publishing and academia have shared information and ideas. So have fellow members of the Council of Science Editors and the Society for Scholarly Publishing. Students and other users of the book have made suggestions. Many colleagues read and commented on manuscripts for early editions. Wura Aribisala, George Hale, Daniel Limonta Velázquez, Arkady Mak, Nancy Day Sakaduski, and Roberto Tuda Rivas read recent editions and offered thoughtful suggestions. Editors and production staff brought the work to publication. We thank all these people.

We also thank our families for their support, encouragement, and counsel. As preparations for this edition were beginning, life was ending for Sophie B. Gastel, mother of Barbara Gastel. It is to her memory that we dedicate this edition.