

# THE SHORT GUIDE SERIES FROM PEARSON LONGMAN

---

*Series Editors*

SYLVAN BARNET AND MARCIA STUBBS

*A Short Guide to Writing about Art*

SYLVAN BARNET

*A Short Guide to Writing about Biology*

JAN A. PECHENIK

*A Short Guide to Writing about Chemistry*

HERBERT BEALL AND JOHN TRIMBUR

*A Short Guide to Writing about Film*

TIMOTHY CORRIGAN

*A Short Guide to Writing about History*

RICHARD MARIUS AND MELVIN PAGE

*A Short Guide to Writing about Literature*

SYLVAN BARNET AND WILLIAM E. CAIN

*A Short Guide to Writing about Music*

JONATHAN BELLMAN

*A Short Guide to Writing about Psychology*

DANA S. DUNN

*A Short Guide to Writing about Social Science*

LEE J. CUBA

*A Short Guide to Writing about Theatre*

MARCIA L. FERGUSON



# Why Do You Need this New Edition?

If you're wondering why you should buy this new edition of *A Short Guide to Writing about Biology*, here are five good reasons.

- ❶ Updated information on citing and referencing sources from the **World Wide Web** reflects the new reality—most students now conduct most of their research online.
- ❷ Additional instruction on **evaluating Web sites** offers guidance for one of the most problematic challenges that students face—deciding which on-line sources are credible.
- ❸ An updated section (Ch. 9) on **submitting manuscripts for publication** reflects the fact that this process is now almost exclusively electronic.
- ❹ Guidelines for developing **poster presentation and oral presentations**—two of the most common ways of conveying information in the sciences—have been combined into a single chapter, eliminating redundancies and highlighting the similarities involved in preparing for these two venues.
- ❺ And finally, the **essay question on burger characteristics** (Ch. 11) has been updated—at considerable digestive cost!

# A Short Guide to Writing about Biology

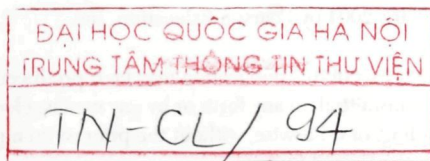
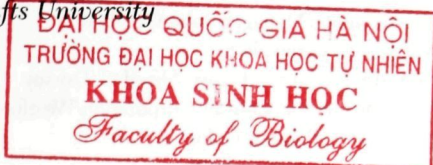
---

SEVENTH EDITION

JAN A. PECHENIK

Biology Department

Tufts University



Longman

New York San Francisco Boston  
London Toronto Sydney Tokyo Singapore Madrid  
Mexico City Munich Paris Cape Town Hong Kong Montreal

Senior Sponsoring Editor: Virginia L. Blanford  
Marketing Coordinator: Bonnie Gill  
Production Manager: Jacqueline A. Martin  
Electronic Page Makeup: GGS Higher Education Resources, A division  
of PreMedia Global, Inc.  
Cover Designer/Manager: John Callahan  
Cover Image: iStockphoto  
Senior Manufacturing Buyer: Alfred C. Dorsey  
Printer and Binder: Courier Corporation/Westford  
Cover Printer: Phoenix Color

### Library of Congress Cataloging-in-Publication Data

Pechenik, Jan A.

A short guide to writing about biology / Jan A. Pechenik.—7th ed.

p. cm.

Includes index.

ISBN-13: 978-0-205-66727-7

ISBN-10: 0-205-66727-9

1. Biology—Authorship. 2. Report writing. I. Title.

QH304.P43 2010

808'.06657—dc22

2009015281

Copyright © 2010, 2007, 2004 by Pearson Education, Inc.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. Printed in the United States.

Please visit us at [www.pearsonhighered.com](http://www.pearsonhighered.com)

**Longman**  
is an imprint of

2 3 4 5 6 7 8 9 10—CRW—12 11 10



ISBN-13: 978-0-205-66727-7

ISBN-10: 0-205-66727-9

To Oliver

If all art aspires to the condition of music,  
all the sciences aspire to the condition of mathematics.

*George Santayana*

# Contents

---

## PREFACE xiii

## PART I

### *General Advice about Writing and Reading Biology 1*

---

#### 1—INTRODUCTION AND GENERAL RULES 2

**What Do Biologists Write about, and Why? 2**

**The Keys to Success 4**

*Eleven Major Rules for Preparing a First Draft 5*

*Seven Major Rules for Developing Your Final Draft 10*

*Nine Finer Points: The Easy Stuff 13*

*The Annoying but Essential Last Pass 14*

**On Using Computers in Writing 15**

**On Using Computers for Data Storage, Analysis, and  
Presentation 18**

**Summary 19**



**TECHNOLOGY TIP 1. GETTING THE MOST FROM YOUR  
WORD-PROCESSING PROGRAM 16**

#### 2—LOCATING USEFUL SOURCES 21

**Using Indexes 22**

**Using *Science Citation Index* 23**

**Using *Current Contents Search* 24**

**Using *Medline* and Other Databases 24**

**Prowling the Internet 25**

**Conducting Web Searches: Developing Productive Search  
Strategies 27**

**Final Thoughts about Efficient Searching: Technology Isn't  
Everything 31**

**Closing Thoughts 32**

**Summary 32**



**TECHNOLOGY TIP 2. USING SEARCH ENGINES  
EFFECTIVELY 29**

### **3—GENERAL ADVICE ON READING AND NOTE-TAKING 33**

Why Read and What to Read 33

Effective Reading 34

Reading Data: Plumbing the Depths of Figures and Tables 36

Reading Text: Summarize as You Go 41

Plagiarism and Note-Taking 42

Plagiarism 42

Take Notes in Your Own Words 44

Split-Page Note-Taking: A Can't-Fail System 48

Final Thoughts on Note-Taking: Document Your Sources 50

Summary 50

### **4—READING AND WRITING ABOUT STATISTICAL ANALYSES 51**

Statistical Essentials 51

Variability and Its Representation 51

When Is a Difference a Meaningful Difference? What You  
Need to Know about Tomatoes, Peas, and Random Events 54

Establishing a Null Hypothesis 56

Conducting the Analysis, and Interpreting the Results 58

Degrees of Freedom 62

Summary: Using Statistics to Test Hypotheses 63

Moving Beyond  $p$ -Values 63

Statistical Power 64

Effect Magnitudes and Alternative Analyses 65

Reading about Statistics 66

Writing about Statistics 66

Summary 70

### **5—CITING SOURCES AND LISTING REFERENCES 71**

Citing Sources 71

Summary of Citation Format Rules 75

Preparing the Literature Cited Section 76

Listing the References—General Rules 76

Listing the References—Using the Correct Format 77

A Sample Literature Cited Section 80



**TECHNOLOGY TIP 3. BIBLIOGRAPHIC MANAGEMENT**

**SOFTWARE 79**

**TECHNOLOGY TIP 4. PRODUCING HANGING INDENTS 79**

### **6—REVISING 82**

Preparing the Draft for Surgery: Plotting Idea Maps 84

Revising for Content 88

**Revising for Clarity 91***Taming Disobedient Sentences—Sentences That Don't Say What the Author Means* 91*The Dangers of It* 94*Problems with And* 96*Headache by Acronym* 96**Revising for Completeness 97****Revising for Conciseness 98***First Commandment: Eliminate Unnecessary Prepositions* 100*Second Commandment: Avoid Weak Verbs* 101*Third Commandment: Do Not Overuse the Passive Voice* 102*Fourth Commandment: Make the Organism the Agent of the Action* 104*Fifth Commandment: Incorporate Definitions into Your Sentences* 104**Revising for Flow 105***A Short Exercise in Establishing Coherence* 107*Improving Flow Using Punctuation* 108**Revising for Teleology and Anthropomorphism 109****Revising for Spelling Errors 109****Revising for Grammar and Proper Word Usage 110***A Grammatical Aside: Rules-That-Are-Not-Rules* 116*A Strategy for Revising: Pass by Pass by Pass* 116**Becoming a Good Reviewer 117***Receiving Criticism* 119*Fine-Tuning* 121*Sentences in Need of Revision* 123**Checklist 124****TECHNOLOGY TIP 5. TRACKING CHANGES MADE TO DOCUMENTS 120**

## PART II

### *Guidelines for Specific Tasks* 127

---

**7—WRITING SUMMARIES AND CRITIQUES 128****Writing the First Draft** 129**Writing the Summary** 130**Sample Student Summary** 131*Analysis of Student Summary* 132**Writing the Critique** 133*The Critique* 133*Analysis of Student Critique* 135**Concluding Thoughts** 136

## **8—WRITING ESSAYS AND REVIEW PAPERS 137**

**Why Bother? 137**

**Getting Started 138**

**Researching Your Topic 139**

**Developing a Thesis Statement 140**

**Writing the Paper 141**

*Getting Underway: Taking and Organizing Your Notes 141*

*The Crucial First Paragraph 142*

*Supporting Your Argument 144*

*The Closing Paragraph 145*

**Citing Sources 146**

**Creating a Title 146**

**Revising 147**

**Checklist 147**

## **9—WRITING LABORATORY AND OTHER RESEARCH REPORTS 148**

**Why Are You Doing This? 148**

**The Purpose of Laboratory and Field Notebooks 149**

*Taking Notes 150*

*Making Drawings 154*

**Components of the Research Report 154**

**Where to Start 156**

**When to Start 156**

**Writing the Materials and Methods Section 157**

*Determining the Correct Level of Detail 157*

*Giving Rationales 159*

*Describing Data Analysis 160*

*Use of Subheadings 160*

*A Model Materials and Methods Section 161*

**Writing the Results Section 162**

*Summarizing Data Using Tables and Graphs 163*

*Constructing a Summary Table 164*

*To Graph or Not to Graph 166*

*Preparing Graphs 171*

*(Not) Falsifying Data 173*

*The Question: To Connect or Not to Connect the Dots? 174*

*Making Bar Graphs and Histograms 177*

*Learning to Love Logarithms 179*

*Preparing Tables 182*

*Making Your Graphs and Tables Self-Sufficient 183*

*Putting Your Graphs and Tables in Order 186*

<i>Incorporating Figures and Tables into Your Report (or Not)</i>	186
<i>Verbalizing Results: General Principles</i>	186
<i>Verbalizing Results: Turning Principles into Action</i>	189
<i>What Is a "Figure"?</i>	190
<i>Writing about Negative Results</i>	190
<i>Writing about Numbers</i>	190
<i>In Anticipation—Preparing in Advance for Data Collection</i>	192
<b>Citing Sources</b>	193
<b>What to Do Next?</b>	194
<b>Writing the Discussion Section</b>	194
<i>Expectations</i>	195
<i>Explaining Unexpected Results</i>	195
<i>Analysis of Specific Examples</i>	197
<b>Writing the Introduction Section</b>	201
<i>Stating the Question</i>	202
<i>An Aside: Studies Versus Experiments</i>	203
<i>Providing the Background</i>	204
<i>A Sample Introduction</i>	206
<b>Talking about Your Study Organism or Field Site</b>	207
<b>Deciding on a Title</b>	207
<b>Writing an Abstract</b>	209
<b>Preparing an Acknowledgments Section</b>	210
<b>Preparing the Literature Cited Section</b>	210
<b>Preparing a Paper for Formal Publication</b>	210
<b>Checklist for the Final Draft</b>	212



#### **TECHNOLOGY TIP 6. USING COMPUTER SPREADSHEETS FOR DATA COLLECTION 193**

#### **TECHNOLOGY TIP 7. GRAPHING WITH EXCEL 215**

### **10—WRITING RESEARCH PROPOSALS 219**

<b>What Are Reviewers Looking For?</b>	220
<b>Researching Your Topic</b>	221
<b>What Makes a Good Research Question?</b>	222
<b>Writing the Proposal</b>	223
<i>Introduction</i>	223
<i>Background</i>	224
<i>Proposed Research</i>	226
<i>Citing References and Preparing the Literature Cited     Section</i>	228
<b>Tightening the Logic</b>	228
<b>The Life of a Real Research Proposal</b>	228
<b>Checklist</b>	229

**11—ANSWERING ESSAY QUESTIONS 230**

Basic Principles 230

Applying the Principles 234

Summary 236

**12—PRESENTING RESEARCH FINDINGS: WRITING TALKS  
AND POSTER PRESENTATIONS 237**

Oral Presentations 237

*Talking about Published Research Papers* 238

*Talking about Original Research* 242

*Talking about Proposed Research* 242

*The Listener's Responsibility* 242

*Preparing Effective Visuals* 243

*Using PowerPoint* 244

Checklist for Being Judged 247

Poster Presentations 248

*Layout of the Poster* 250

*Making the Poster* 252

Checklist for Making Posters 253

**13—WRITING LETTERS OF APPLICATION 254**

Before You Start 255

Preparing the Résumé 255

Preparing the Cover Letter 258

Recruiting Effective Letters of Recommendation 268

**APPENDIX A REVISED SAMPLE SENTENCES 270**

**APPENDIX B REVISED SAMPLE SENTENCES  
IN FINAL FORM 272**

**APPENDIX C COMMONLY USED ABBREVIATIONS 274**

**APPENDIX D SUGGESTED REFERENCES FOR FURTHER  
READING 276**

**APPENDIX E SAMPLE FORM FOR PEER REVIEW 278**

**APPENDIX F SOME USEFUL WEB SITES 279**

**INDEX 281**