

A guide to manuscript writing for scholars in the biomedical sciences.

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Chapter 1

Preface

Teaching a manuscript-writing course for many years has taught us that although few students possess or will ever attain the writing skills of a Hemingway, Cather or Flaubert, most of them actually do know something about grammar, paragraphs and punctuation. However, when it comes to writing a scientific manuscript, most students and young investigators just entering the academic stream do need some guidance. But why shouldn't they, for few of them have probably ever written a data-based scientific paper intended for publication in a peer-reviewed scholarly journal. Where students do need guidance is in regard to the structure, content and organization of the manuscript. Most of them need to be educated about the essential components of a scientific manuscript and what belongs in each of the half-dozen or so subsections of a scholarly paper.

This book should be of great help to investigators in the biomedical sciences who want to write up their research findings and disseminate through respected, peer-reviewed journals, the fruits of their scholarly labors to the international community. It should be especially useful to younger, junior faculty at medical schools and teaching hospitals, who are just beginning their careers and striving to establish their independence and identity in their discipline. Experience has taught the authors of this book that in many instances, young investigators have not been adequately mentored or trained with regard to how to write a scientific manuscript. Though they may have sound and interesting data in hand and a significant story to tell, they are frustrated, bewildered and intimidated when they sit down to write up their findings. The aim of this book is to provide concrete and specific guidelines for writing a manuscript and to hopefully make the process an enjoyable exercise.

The book is the product of more than a decade of teaching a course entitled "*How to write a Manuscript in the Biomedical Sciences*" to several hundreds of physicians and basic scientists at several teaching hospitals in Nigeria and medical schools in the United States, representing most, if not all, of the disciplines and subspecialties of medicine, from Obstetrics and Gynaecology to Anaesthesiology, and from Chemical Pathology to Medical Microbiology and Parasitology. We thought the course was useful in a practical way and so did our students. In fact, they were the ones who encouraged us to write this book.

Wherever the writing course has been taught, nearly every student ended up publishing the paper they produced soon after completing the course. Furthermore, the publication rate of many of them increased markedly after going through "*How to write a Manuscript in the Biomedical Sciences*." We are confident that those who read this book and follow its prescriptions will find their writing groove and see the papers stream out.

The reader will find few references to English grammar on these pages; rather, it is all about the content, structure, organization and balance. We break down the main narrative subsections of the manuscript – title page, abstract, introduction, materials and methods, results and discussion – into their component parts and advise the writer about what the content of each of those sections

should be and how they should be sequenced. For example, with regard to the introduction, we recommend how and where the study's main focus and significance should be situated, where its central hypothesis or question should be placed, what the balance should be in the background section between citing the work of the authors of the manuscript themselves versus that of other investigators, what methods were used to accomplish the study's aims, and what were the rationale and approach to the study.

This book also addresses ancillary but pertinent issues such as: the criteria for authorship; the ethical obligations and responsibilities of the senior author and the corresponding author (assuming they are different); how to avoid or overcome writer's block; how to present data in graphical and tabular form; and standards for presenting statistical information. The reader can expect to encounter quotations of famous writers whose advice will prove interesting, illuminating and inspirational.

Chapter 2

The art of scientific writing

Scientific writing is a category of prose. The word prose is derived from the Latin word *prosus*, which means forward or straight on. However, while the science writer is obliged to get to the point, he/she doesn't necessarily have to abandon the rhythm, color, texture, or structure that confer upon the manuscript the author's own personality and individuality.

I. What is the purpose of a scientific paper and how do you approach the task?

A. We write a research paper that we intend to submit for publication for one or more of the following reasons:

1. Clarify one's thinking and organize your thoughts about the significance, rationale and directionality of your research.
2. Savor the feeling you have contributed something significant to the literature (a sense of self-fulfillment).
3. Provide a creative outlet for unique expression (satisfying the existential need).
4. Get promoted, receive tenure, and get research grants. Should the rewards of promotion and pay raises rather than a passion for writing up one's findings or ideas be the motive for publishing?
5. Become recognized outside your institution (i.e., to have your work cited by others you admire and respect). Publishing your work frequently in respected, peer-reviewed journals is one way to maintain your marketability and mobility.
6. Inform others of our findings (you want to tell the world; it is as if you had a secret you wanted to broadcast to the world). Francis Bacon believed a scientist must read, write and "*engage in conference*" (i.e., debate, contest ideas). A student who used this book said she wanted to publish her work as a means of disseminating information that would benefit mankind.
7. Contribute to and expand the world's fund of knowledge.
8. To create a permanent record (Francis Bacon, the Father of the Scientific Method, insisted that the scholar must write).
9. Have the pleasure of writing.

10. Acquire a personal bibliography (Is this a valid reason? Is there anything wrong with nurturing one's ego?). Too much ego can inhibit collaboration as one may be preoccupied with the question of who's going to get credit for the work.
11. Exhibit and exercise rigor, discipline and accuracy. Most scientists are good at conceiving research projects and specific experiments, but few are effective at manuscript closure. The impulse to write a paper should be praised. But it is not enough. There must be the discipline to finish it and mail it off. The job isn't complete until the manuscript has been sent off to the editor. Self-discipline is the catalyst and the key to productivity with regard to manuscript writing. It means foregoing comforts. The goal should be to produce a free-standing and interesting piece of work. Scientists ultimately get praised for success, not effort, and the way you demonstrate success is with publications of the results of your efforts.

*“(W)eavers in particular, together with scholars and writers with whom they (have) much in common, (tend) to suffer from melancholy and all the evils associated with it. It is understandable given the nature of their work, which (forces) them to sit bent over, day after day, straining to keep their eye on the complex patterns they created.” (W.G. Sebald, **The Rings of Saturn**, p. 283).*

12. The desire to be first (the competitive drive). On the other hand, wanting to find the answer to a question is a more legitimate motivation.
13. In the case of human studies, don't we owe it to the subjects we have studied to publish the data we gathered from them?
14. Make money

B. When should one **NOT** attempt to write a paper or submit a manuscript for publication?

1. When you have no message, nothing significant or new to report. On the other hand, many reasonable and productive scientists find it useful to draft a manuscript even though they realize the data they have in hand is of insufficient quality or quantity to warrant writing a paper they intend to submit for publication. Such individuals find that writing a manuscript before their data is complete or of sufficient quality helps them assess their progress on a particular project and inform them of what additional work needs to be done.
2. When you have no confidence in the data. If you don't have confidence in your data, either its quantity or quality, then don't begin to write. Stop and wait until you have better and more material. No matter how sound your outline, if you attempt to proceed with unreliable data that you yourself don't trust, it is like setting out to build a house with marvelous blueprints using poor quality wood, bricks and mortar. It is like

splendid actors and actresses doing their best under the direction of an able director, but who are shackled with an unworthy script.

3. When your data is redundant with what is in the literature.

C. Some questions you should ask yourself before setting out to write:

1. What is the information I want to communicate? Is my message worthy of valuable journal space? Can I state it in one sentence?
2. Does the information represent new knowledge? How significant or useful is it? Does it simply confirm previous published work? Do my findings significantly extend earlier work?
3. Is the new paper redundant with my earlier work? The New England Journal of Medicine sees redundant or duplicate publication as such a serious matter that they devoted the very first paragraphs of their 1997 'Instructions to Authors' to a discussion of this problem. In fact, most journals require that your covering letter state explicitly that your work has not been published elsewhere.
4. What is the most appropriate format for my manuscript: full-length paper, communication, case report, review article or brief report?
5. Who is my audience? Is there a readership out there interested in what I have to say?
6. Which journal is most appropriate for my message?

D. The four stages of writing a piece:

1. Pre-writing. Gather and organize your material (data, methods, literature).

Draft an outline.

Compose tables and figures.

Make a 'clustering' diagram.

DON'T do any narrative writing.

2. Writing. Set aside several hours of uninterrupted time for writing (early morning or whenever you are rested, most creative, patient and least stressed).

Find a quiet place, a place in which, when you are occupying it, you know your sole task is to write. Here is what Oliver Wendell Holmes said about it ("The Profession of

Law”, in **The Collected Works of Justice Holmes**, vol. 3, pp.472-473, cited in **The Metaphysical Club** by Louis Menand, p. 60):

“ To think great thoughts you must be a hero as well as an idealist. Only when you have worked alone – when you have felt around you a black gulf of solitude more isolating than that which surrounds the dying man, and in hope and in despair have trusted to your own unshaken will – then only will you have achieved. (Only then) can you know the secret isolated joy of the thinker.”

“ So that the prosperity of the body does not waste that of the wit, the painter or draftsman should be solitary, and especially when intent on speculations... I remove myself so far off that their words cannot reach me, and will not obstruct me; in this I say that you'll probably be taken as mad but you'll see that by so doing you will be left alone.” (A review of the book, **The Eye of Leonardo**, by Ingrid Rowland, cited in Leonardo da Vinci (MS Urb. Lat. 1270, 31v) (**The New York Review of Books**, April 10, 2003, p.37).

3. Tackle just one section (e.g., the Introduction) of your paper at a single sitting.
4. Sharing your work (either in part or whole). Let a fellow student, mentor or another faculty member read your work.
5. Revising and finalizing the manuscript.

II. The outline of the manuscript

Make an outline of your paper. It must address the following questions:

1. What is the problem? What is the question? This is the Introduction.
2. How did you study it? This is the Methods section.
3. What did you find? This is the Results section
4. What do your findings mean? This is the Discussion section

It is essential to work from a clear design, and that design is embodied in your outline. Generating the outline to your manuscript is an exercise and test of discipline. The outline reveals the structure of your paper. It is your road map. Would you think of setting out for Accra, Ghana, from Addis Ababa, Ethiopia, in your car without the guidance and benefit of a road-map? While you may know your destination is somewhere in West Africa, you don't know how to get there. The outline serves as the manuscript writer's road map. The outline delineates the steps in the process of writing a paper. However, while the outline indicates the organization and order of a paper, it does not necessarily dictate the sequence in which each section is

written. In fact, in order to build up momentum in your writing it is wise to begin with what you regard as the easier components of the manuscript; for most people, these are the Methods section or the Introduction. By starting with one of the less intimidating sections of your paper you also minimize the risk of experiencing writer's block.

The following sequence is the one most people follow when writing a manuscript: (1) Title Page, (2) Materials and Methods, (3) Introduction, (4) Results, (5) Discussion, (6) References, and (7) Abstract. Of course this is not the final sequence of subsections one finds in the final manuscript.

Following are the elements of the outline:

Title Page

Abstract (narrative versus structured)

* Introduction

Materials and Methods (including human population descriptions)

Tables and Figures

* Results (graphs and tables)

* Discussion

References

Acknowledgments

* These are the most important components of the manuscript.

Why is the outline helpful?

1. Organizes the writer's thoughts.
2. Helps the writer appreciate the logical progression of the paper and the overall process of story telling.
3. Assists the writer introduce a lot of specificity.
4. Enables the writer easily identify missing elements in the paper.
5. Informs the writer of what did not belong in a particular section
6. Gives a sense of control and command of the writing challenge, and gives the writer more confidence in his writing abilities.

7. Enables the writer break down the paper into 'bite sized pieces' without which there is a real risk of severe intimidation.

III. Some thoughts to consider;

*"The task of being a (writer) is not completed at a fixed schedule. No one is a (writer) from eight to twelve or from two to six. Whoever is a (writer) is always one, and constantly assaulted by (writing)." (In: Jorge Luis Borges: **Selected Non-Fictions, essay on Blindness**, pp.473-483.)*

"The outline is to the manuscript as the terra cotta clay model is to sculpture in marble or bronze, or as what the sketch book is to oil painting" (RH Glew).

*"Serious misconduct, such as faking data, is rare. When it does occur, it is almost always in the biomedical sciences. One study ...of some 26 cases of alleged misconduct that surfaced between 1980 and 1986 revealed that 21 came from the biomedical sciences. Furthermore, many of the cases that have arisen have involved M.D.'s rather than Ph.D.'s." (David Goodstein, In: **Academe**, January-February 2002, pp. 28-31).*

IV. Additional comments about the structure and organization of the manuscript

- A. The five steps of article writing according to Family Medicine. **Family Medicine** 1985; 21:379-383.
 1. Conceptualization:
 - a. The inspiration to write the paper comes from the author's experience, (both personal and professional), reading, thinking (contemplation), research, clinical activity, etc.
 - b. Focus, and define boundaries.
 - c. Conduct a thorough, comprehensive and critical literature search.
 2. Organization: The "IMRAD" (Introduction, Methods, Results, and Discussion) approach, preceded by the Abstract. Make an outline, specifying topics and using short phrases. The outline compels and forces decision making about such aspects as inclusion, emphasis, balance and firmness. Allot a specified number of pages for each section of the manuscript so as to guard against overwriting or shortchanging any particular component of the paper.
 3. Composition: Follow your outline and just let the writing flow.
 4. Revision:

- a. Test for structure, logic and transition sentences. Look for gaps in reasoning.
 - b. Clarity. Is each sentence clear, concise and informative?
 - c. Style, rhythm, and appropriateness, accuracy and strength of verbs.
 - d. Accuracy of numbers (data) and reference citations. Labor to be accurate.
5. Final preparation and submission. Have you adhered scrupulously to 'guidelines for authors' ?

Chapter 3

The Title Page

The title page is the “face” of your manuscript and as such can make a strong impression on the reader even before you “speak.”

- I. The elements of the Title page.
 - A. A. Title. Some of the best written, most informative and novel scientific papers have the worst titles. Provide a short running title less than 40 characters, including spaces. The text should be centered.
 - B. Authors. Start with author’s surname followed by initials, followed by most advanced degree (PhD or MD not Ph.D or M.D.) and superscript numeral indicating institutional affiliation (department name, university, state). The text should be centered.
 - C. Corresponding author/correspondence: give full name, title, mailing address, telephone, FAX number and e-mail address. The text should be aligned left.
 - D. Keywords (usually 5-7). Capitalize only the first one and set them off by commas or semicolon. You can get help with finding the right keywords for your paper by doing a keyword search in PubMed after entering your title.
 - E. Disclosures (if any). The aim here is to reveal any possible conflicts of interest. A conflict of interest statement should be provided whether or not one exists.
 - F. Acknowledge sources of support: Grants, sponsors, equipment, gift of chemicals and supplies. Usually provide this information on a separate page.

II. Some useful comments about how to construct the title:

- A. Avoid long, boring titles. Strive to make it interesting. Use the fewest possible number of words (usually less than twelve words). Most journals will specify the upper limit of character count for the title with or without spaces (usually limited to 58 characters with spaces). You should include in your manuscript, the character count of the title with or without spaces. Most journals would specify their preferences in the “Instruction to authors” section. The British Medical Journal for example, specifies the inclusion of the study design in the title. The Journal of the National Medical Association of the US advises against including the name of a

country in the title.

- B. Specify the species of organism (e.g., *E. coli*, lactating women, *T. brucei*, rats). If you studied humans, specify age (e.g., mature, neonate, adult), condition (e.g., pregnant).
- C. The simpler the better.
- D. How do you decide on the key words in the title? Throw down on paper nouns and verbs. The words you choose should be strong, specific, accurate and appropriate.
- E. Use informative, high-density nouns and accurate verbs.
- F. Remember, verbs communicate action.
- G. Be concise and descriptive.
- H. Put strong, specific and informative nouns in the stress, forward position and weaker nouns towards the end of the title.

III. The different styles of titles:

A. Declarative titles.

Declarative titles have verbs e.g., increases, inhibits, correlates with, and induces. Here is an example of a declarative title: *"The erythrocyte sedimentation rate correlates positively with severity of heart failure in blacks."* Some journals say yes, others say no. Declarative titles are most common.

B. Non-declarative titles

Non-declarative titles contain no verb, and can be effective: e.g., *"Menopause and Hormone Replacement Therapy: Facts and Misconceptions."*

C. Interrogative titles.

Interrogative titles express the title as a question, e.g., *"How common is impaired glucose tolerance in first degree relatives of type 2 diabetics?"*

IV. Criteria for authorship.

This is a thorny issue even in developed countries. The authorship criteria of the

“Uniform requirements for submission of manuscripts to biomedical journals”, issued by the International Committee of Medical Journal Editors should apply. Journals like the British Medical Journal apply stricter authorship requirements. Faking of data and ‘gratis’ authorship are unacceptable and will lead to blacklisting of author(s) by the journal in question. Discuss the issue of authorship at the earliest possible moment when the idea has moved to the “lets do it” phase, and the team has been mobilized to do the study.

A. Questions that need to be addressed:

1. Who should be listed as the first author?

The one who did the most work overall

2. In what order should the remaining authors be listed?

It has to be decided by all the authors together. The head of department or supervisor or guarantor is usually listed as the last author.

3. Who is the corresponding author, and what are the responsibilities?

Any of the authors may be listed. The author most conversant with the paper should be listed generally. The most experienced author can also be listed. The corresponding author is responsible for manuscript submission including all correspondence with the journal. However, the journal may contact any of the authors to clarify an aspect of the paper.

B. Issues to consider when deciding on the sequence for listing of authors names:

1. The extent to which each author contributed to the conception, design, execution and interpretation of the study, intimate involvement in data analysis, who had the raw data, who had the seminal idea, and seniority.
2. The extent to which an author is capable of assuming intellectual responsibility for the content of the manuscript.
3. The relative contributions of each author to the drafting of the final manuscript.

V. Some ideas to think about.

“If you are going to be productive in research, you must write a lot. You may write in erratic bursts (though I do not recommend it), but they had better be frequent bursts.” RH Glew

How do you decide on your target audience? How do you select the journal in which you wish to publish your paper? Here are some considerations:

- A. Clinical versus basic science
- B. Diagnostic versus therapeutic versus pathobiologic/mechanistic
- C. At what level of biological organization is your research? (e.g., molecular, behavioral, cellular, perfused liver, epidemiological/population)
- D. Is your experimental system (biological context) human, animal, microbial, etc.?
- E. Is your work of global or local (regional) interest? Should you consider an international journal?
- F. Do your findings apply to E. coli, aardvarks, neonates, infants, children or adults?
- G. Does your work address a particular gender (e.g., postmenopausal women and osteoporosis, the male reproductive system, pregnancy)?
- H. Is your work appropriate for a specific discipline-based journal (e.g., endocrinology, protein structure, nutrition, regulation of gene expression)?

Chapter 4

The Abstract

I. Preliminary draft.

It is useful to write the Abstract first since doing so serves to focus and circumscribe the rest of the paper. As one student expressed it: "It puts a boundary around your project." Second, many people read the Abstract, few read the whole paper; therefore, it needs to be the most polished, carefully constructed part of your paper. Third, it should be self-contained and capable of standing alone.

II. Some general guidelines for the Abstract:

- A. The ideal length is approximately 200 words; average range, 150-250 words (150 for unstructured, 250 for structured abstracts). One and one-half page (double-spaced) is about right for the Abstract. Some journals allow up to a maximum of 300 words. However, published abstracts are usually truncated at 250 words.
- B. In the first sentence or two of the Abstract, you should state the problem or question or hypothesis, define the system you have studied, and provide the rationale for your study: for a basic science paper, go straight to the system you are studying and define it, whereas for a clinically-oriented paper start off with the significance of the study. Make it informative and interesting. The first sentence is especially important; make it strong and informative.
- C. Don't mix tenses (e.g., past and present) when stating findings. Use the past tense.
- D. Cite specific details, include key data (numbers), and keep in mind that when libraries discontinue journals, one criterion used in decision-making is whether the articles in a particular journal are pregnant with numerical information. Also, the search engines (e.g., PubMed, SciSearch) value abstracts that are rich in data.
- C. Avoid extraneous, unnecessary detail, but make it dense with information. Ask yourself if every sentence is informative and necessary.
- D. Omit p-values. This is optional, since you will find some reputable journals that do like to see p-values in the Abstract. Generally, include only p-values for results that support your conclusions.
- E. Follow the "IMRAD" sequence.
I = Background, statement of the problem, hypothesis.

- M = Instruments, techniques.
- R = Findings
- A = And
- D = Conclusion

- G. Avoid abbreviations/acronyms/jargon.
- H. Don't cite references in the Abstract.

III. Components of the Abstract:

- A. Define your system, organism, approach, rationale, methods and strategy. What level of organization is your study: whole animal, cell extract, human beings, naked DNA, pure enzyme?
- B. General significance of the study (This answers the "So what?" question). Are you providing a new piece of knowledge? Are you advancing knowledge that will affect mortality? Morbidity? Is your finding of practical/clinical or fundamental/basic science value?
- C. Question or hypothesis or statement of the problem (e.g. "This study addresses the problem of...")
- D. What did you find? (i.e. results). Begin with the primary outcome of your study (most important results) followed by secondary outcome(s). The results should form the bulk of your abstract. Don't report all results, don't interpret and don't embellish.
- E. What is the significance of your work? (i.e. the implications of your findings).
- F. What are your conclusions? Think about the force of the verb you use: do your results demonstrate, prove, establish, show, suggest or indicate something? Here are some verbs to consider when you are concluding about what your data show: indicate, suggest, demonstrate, confirm, establish, prove, imply, mean, or show? Do you want to be hot or cold or lukewarm about the strength of your assertions?
- G. Don't conclude with the hollow, non-informative statement: "The implications of these results are discussed". Use simple, clear conclusion statement. Don't use self-promoting statements such as "Our findings unambiguously confirm that..." Here are some examples of ways to conclude your Abstract:
 1. The assertive, direct statement approach: "*Rats fed a weaning diet may use the energy from intermediate chain-length fatty acids to maintain a body weight*"

comparable to that of rats fed soybeans at a low intermediate chain-length fatty acid level."

2. We conclude that...
3. These data suggest that...
4. The finding of...suggests that...
5. The discovery of ... is helpful for understanding the...
6. These results suggest that...
7. This study indicates...
8. These data support the hypothesis that...
9. These results further support...
10. These observations show that...
11. These results emphasize the central role of ... in...
12. Our data indicate
13. It is concluded that...
14. These findings suggest...
15. These results demonstrate...

Following are some synonyms for these verbs (taken from Roget's II: The New Thesaurus).

indicate: hint, imply, propose, mean that

demonstrate: argue, attest, point to, show, signify, denote, manifest, disclose, signify

confirm (the idea, concept, hypothesis that): corroborate, substantiate, validate, verify, testify to, ratify, strengthen

establish: settle the question that

prove: authenticate

imply: mean (that), insinuate (that), infer

show: illuminate, reveal, disclose

- H. Key words. Each one you use should be listed in Index Medicus. You can search for appropriate keywords to use in PubMed.

IV. Avoid syntax pitfalls

Scrutinize your syntax (word sequence) for embarrassing lapses. An example: “*From the first day of school in September the third graders had to wait until recess to go to the toilet.*” (You will imagine there must have been a few ‘accidents’!). Modify the sentence and see what happens: “*For the third graders, beginning from the first day of school in September, the new rule is to wait until recess before going to the toilet.*”

Avoid using a string of nouns masquerading as adjectives.

Shun adjectives.

Avoid sensationalism.

Avoid jargon.

Avoid the general.

Don't use abbreviations.

Place seminal, key words at the beginning.

Don't use ‘weasel’ words (e.g., probable, seems to, appears to).

Repetition of ‘heavy’ words (especially nouns and verbs) causes them to lose their force and value.

Edit for embarrassing errors of syntax. Here are some examples.

“*Dr. Kelley is Professor of European Studies at Princeton University and has been writing a history of Berlin since the First World War.*” Doesn't that seem like a very long time to be working on one book!

“A morbidly obese 37-year-old man has had mental slowness and difficulty staying awake for over a year.” No wonder the poor fellow was tired!

“There is overwhelming evidence against the accused, including a 911 recording in which he says he shot his family and a confession.” (**The Lansing State Journal**, July 16, 2003, entitled “Hearing set for teenage murder suspect”). I wonder whether the accused is sadder for shooting his mother or his confession.

Some advice about writing a scientific paper:

Now that you're well into the book, here are some things to keep in mind and which might work for you:

1. Work on several projects at once; that way, you can't rationalize your disinclination to write on the grounds that you're not in the mood to work on a particular paper or writing task. If you don't feel like working on a certain manuscript, perhaps you will be inclined to work on a different one.
2. Do some writing every day. Good and productive writers are in the habit of writing.
3. Find a quiet place, go there when you have writing to do, and CONCENTRATE.
4. Write according to a schedule, not according to your mood. For example, set aside the hours between 5 and 7 o'clock in the morning for writing.
5. Compartmentalize your work. Work on one section of your manuscript at a time (e.g., the Introduction), but set a deadline for when it will be completed. In other words, take bite-size pieces and keep in mind the French proverb: *“Little strokes fell great oaks.”* The first draft of any one section of any paper can be written in two hours or less and in a single sitting.

“Writing is a bit like shoveling coal. You scoop it up and toss it into the furnace. Each lump is a word, and each shovelful is another sentence, and if your back is strong enough and you have the stamina to keep at it for eight or ten hours at a stretch, you can keep the fire hot.” (Paul Auster, **The Book of Illusions**, p.70)

6. Conform to the “Instructions for Authors”.
7. Work from your outline. If you begin to write without having first structured your outline you are apt to be as successful as the artist who ferociously throws paint onto a canvas in frantic hope that a masterpiece will emerge.

8. Stay away from the liquor cabinet if you plan to write. Contrary to myth, not much writing that is worth anything is done after two glasses of wine or a double martini!

“Alcohol is a very bad drug for writers. It is more or less impossible to write when drunk, which is just as well, given how much and how many writers drink; imagine the amount of booze they would put away if it actually helped.” (John Lanchester, “High Style”, in **The New Yorker**, January 6, 2002, p. 82 of pp.82-84.)

9. Set writing high on your priority list of daily scholarly activities; the only acceptable activity that should compete for writing time is reading.
10. Seek criticism from friends and colleagues. Let them read your (double-spaced, with 1” or 2.5cm margins) piece.
11. Set deadlines/ targets for yourself as to when you will complete sections and submit the final manuscript to a journal editor. So many academic types retire leaving behind a frustrating trail of unfinished manuscripts!

“Writers ought to train themselves, like athletes, to do a good day’s work on a bad day.” (Norman Mailer, in **The Spooky Art: Some Thoughts on Writing**, p.330, Random House, cited in *The New Yorker*, March 13, 2003, pp.10-12, in an article by John Leonard entitled “Don Quixote at eighty”.

12. Be reasonable in your estimation of the significance of your paper. Don’t set out to write a great paper; just strive to write the best paper that your data will support. The energy of your language should be commensurate with the importance of your findings. Relax your grasp on importance and you are more likely to turn out a quality piece of work. Don’t anticipate the number of reprint requests or citations in Sci Search or Medline you will receive for your paper after it is published.

Primo Levi saw the following to be the duties of the writer:

“You will write concisely and clearly.

You will avoid embellishments and convolutions.

You will say of each word you have used why you have used that one and not another.

You will love and imitate those who have followed the same path.”

(In: **Primo Levi. Tragedy of an Optimist**, by Myriam Anissimov, p.252, The Overlook Press, Woodstock, 1996).

13. You cannot write when you don’t know what you want to say.

Can one be a scholar if they do not produce a palpable, tangible product that can be shared?

Chapter 5

The Introduction

- I. When writing the Introduction to the paper, keep in mind the fact that you are telling a story. You will want to draw the reader in.

A. Some questions to ask yourself before you start writing:

1. What is the problem/question/hypothesis being addressed? Overall goal, specific aims? Surprisingly, many authors have difficulty articulating an answer to this question.
2. Why was the study done? That is, its purpose and importance. Treatment? Diagnosis? Prognosis? Pathobiology?
3. Have I specified the organism, tissue, cell, system, etc? Have I specified the level of organization of my system (e.g., cell extract, pure enzyme, live human being, single cell, adult, fetus, and pregnant women?)
4. What is the scope of the study? What is the range of my inquiry, what did I do? How many subjects were there? (e.g. was it a pilot study? A full-scale study?)
5. What is its significance? Why is it important? Articulate only your most important 'significance' statement (e.g. mortality, morbidity, cost, prevention, sensitivity, specificity etc). Can you combine the problem, system and significance in one statement?
6. Have I adequately reviewed the literature? What constitutes a thorough review of the literature? Cite no more than three references per assertion. Don't repeat what is standard knowledge in textbooks or widely known (e.g., the second law of thermodynamics, DNA as the informational molecule of life). For historical purposes, cite only the seminal paper in the area. Cite a key review article. Cite only the most deserving authors. Cite the most recent papers that bear directly on your study.
7. What were the methods, rationale and approach? What was your strategy? Why are you studying the problem in the way described in the Methods section? Were there constraints of time or resources? Was it the only feasible method?
8. Should I summarize the results/findings/conclusions of the study? NO!

9. How do I judge the proper length? Make it "short and arresting" (George Matal, 1994). It should be one and a half to three pages long (double-spaced).
10. What does my work add to the world fund of knowledge? What does the world learn from my paper? More subjects, new approach, different methods?
11. Should I include criticism in the Introduction? That is, should I judge or assess the work of others? NO!
12. Have I used inflammatory, hostile language? Avoid insensitive, pejorative (e.g., "tribe", "street-people", "crippled", "mentally-retarded"), emotion-laden, loaded words. If you studied sex-workers in Zambia, don't refer to your subjects as 'prostitutes.'

B. The specific components/functions of the Introduction.

1. Inform the reader of the system you are writing about. What is your system? What question are you pursuing? What is your hypothesis? State your hypothesis or articulate the question you are addressing. It is critical that you clearly spell out the intent of the study. For example: "The present study was designed to test the hypothesis (or evaluate the reliability and validity of ..., or answer the question ...). This was accomplished by..."
2. State the significance of your study. If yours is a clinically related study, it is useful to refer to mortality, morbidity data or state the dollar cost to the nation of the problem you are addressing. That is, what is the human disease burden of the subject you are studying?
3. Provide the background (work done by you and others). Cite 3-5 studies.
4. Outline your approach to the problem (e.g., longitudinal, cross-sectional) and state your rationale. That is, explain and justify why you chose the approach you took. Most readers appreciate being informed of your reasoning.

C. Some advice about writing the introduction:

1. The first sentence should briefly and concisely state the question or hypothesis; that is, describe the problem you are addressing and state the purpose of the study. It's great if you can accomplish both in one sentence, even if it is a long and compound sentence.

2. Define the biological context of the problem: What is the organism, what is the level of organization (e.g., pure enzyme, COS cells, perfused liver, rats)?
3. Literature review. Go way back; make a historical sweep up to the present. How do you balance citations between "them" and "us"? How do you deal with adversaries, critics, competitors? For objectivity, be guided by the Science Citation Services (e.g., number of times a paper or author is cited, the citation power of the journal). Don't use "I" or "we"; instead, use "It has been shown that..."
4. Define obscure terms (e.g., the Fulani; they are nomadic pastoralists of the western Sahel).
5. Significance. Articulate the importance of your work: to the basic sciences, to the biomedical community (e.g., clarifies a pathophysiologic or biological mechanism, improved diagnosis, prognostics, therapy).
 - a. The answer is not known.
 - b. Addresses the health of populations (epidemiology, geographical considerations, global versus local interest).
 - c. Adds an important missing piece to some larger question or problem.
6. Don't use "et al." in the Introduction. Use the terms "colleagues" or "coworkers". Also, try not to use the following descriptors of coworkers: side-kicks, fellow travellers, bed-fellows, cronies, comrades, helpmates, servants, paranympths, buddies, etc.). Don't refer to "Smith's group"; always cite the name of the senior author first.
7. Short sentences work best.
8. The Introduction should answer the following question in the reader's mind: "Why should I care about this study?"
9. Do not include findings of the present study in the Introduction. Also, do not include a detailed discussion of methods or results (these belong in the discussion section).
10. Ask yourself: "Is the introduction focused and relevant?"

Imitation is one way to learn how to write a scientific paper. But to do so requires that you recognize quality. Imitate what is good.

Chapter 6

The Materials and Methods Section

- I. **Purposes of the Materials and Methods section.** The standards you should strive to achieve are the following: (1) Could someone else reading your paper and who has access to the literature replicate your experiments? Or, have you left out some important details? (2) Is there enough information provided to enable a reader to assess the observations you report? (3) Can the reader determine whether your conclusions are warranted?

The four components of the Materials and Methods section:

- A. Description of human populations (gender, age, ethnicity, etc.), or cells (human animal or microbial). In the case of studies involving humans, describe the study protocol in detail. Indicate inclusion criteria (e.g., blood pressure <135/80, body mass index <25), exclusion criteria (e.g., renal disease, malaria infection within the last two years, taking beta-blockers or other medications?). Was it a "convenience" sample? Since it may matter when your study was performed, inform the reader of the time of year the study was conducted (e.g., rainy season versus cold/dry season). Were the subjects smokers?
- B. State whether institutional approval was obtained for human or animal studies. Was informed consent obtained?
- C. Description of specific methods. It is advisable to use subheadings. Report in detail any new method. If you're following someone else's method or procedure precisely, don't repeat verbatim what is already described in the literature. If in doubt, spell it out. Specify the specialized equipment you used to collect your data; include the manufacturer's name and location (city, initials of the state), model number, operating conditions, etc. If you modified a previously published method, describe how you did so. Don't simply state that "Enzyme activity was determined using a modification of the method of Framitz and Smith (1997)". Without repeating a description of the entire procedure, indicate the changes, additions, etc. you made to their procedure. Describe how you processed specimens (e.g., preparation and storage of serum, blood cells) and how you separated and purified cells, enzymes or proteins. On occasion, it's helpful to anticipate a reader's interest in why you selected a particular method. Inform the reader of how many observations you made for each type of value you report. Indicate the coefficient of variance of your quantitative methods of analysis.
- D. Reagents and equipment: Where were they purchased? Who gave them to you (name, institutional affiliation)? What was the quality of the reagent (i.e., purity)? Indicate the supplier of kits (e.g., RIA kit). For equipment you used in your study, specify the model number, name of the manufacturer, and city and state where the manufacturer/supplier is located. Specify the sources of reagents, enzymes, DNA probes, etc. Describe culture

conditions (O₂/CO₂, temperature, media composition), dark-light cycles in the case of animals, the method used to harvest cells, etc.

- E. Statistical methods. Report the software program you used for data analysis (e.g. Data were analyzed with Epi Info 3.4, Centers for Disease Control and Prevention, Atlanta, Georgia, U.S.A.). List what tests will be used on what data.

Indicate the data distribution (e.g. normal, skewed, kurtosis). Report the mean and standard deviation for normally distributed numeric data, median for skewed data, and mode if there is a kurtosis. Don't use 'standard error of the mean' in place of 'standard deviation'.

Where feasible, use odds ratios and confidence intervals to reflect the precision of estimates. All p values should be two-sided except required by study design (e.g. non-inferiority trials). Report exact p-values to reflect the strength of association, not $p < 0.05$. A p value less than 0.05 only reflects a probability and does not prove causation. If a p value is > 0.01 , report it to 2 decimal places, if a p value falls within the range 0.01 and 0.001, report it to 3 decimal places, and if a p value is < 0.001 , report it as $p < 0.001$.

If you have a p-value of 0.056, it's acceptable to refer to the difference as indicating a "trend". However, it is unacceptable to characterize the difference as being "marginally significant". Once you've set your cut-off for significance at $p < 0.05$, then your result either is or is not statistically significant.

When performing multiple comparisons, the probability of a chance finding increases with increasing number of comparisons, therefore, use $p < 0.01$ or $p < 0.005$ or use special statistical methods for multiple comparisons like the *Bonferroni correction*, *Scheffe's test* or *Neuman-Keuls method*.

A guide to choosing the right statistic

A good knowledge of statistics is a prerequisite to good data interpretation and reporting. The strength of your verbs or assertions often depends largely on statistical significance and proper application of statistical methods to the data. Demonstration of appropriate statistical techniques and unbiased interpretation of your findings will make your paper an interesting read, and earn you respect from your peers.

Before applying a particular statistical test, strive to answer the following questions:

1. What scale of measurement did I use to collect the data? (e.g. nominal scale, ordinal scale, or interval scale)
2. Am I comparing mean values or proportions?
3. How many groups do I want to compare? ($n=2$, $n \geq 3$)
4. Are the observations *Independent*? (A single measurement on each subject)

Paired or correlated? (Two measurements on each subject, one before and one after an intervention)

5. Is the number of observations sufficient to use a particular statistic?
6. Do the frequencies follow a normal distribution?
7. What is the variable of interest (outcome variable) and what is its scale of measurement?

Some ways to determine if your data is normally distributed:

1. Group your data and plot as a histogram. If the histogram reveals a symmetrical or near-symmetrical curve, then the variable of interest is normally distributed.
2. If the mean is almost the same with the median
3. If the 25th and 75th percentiles are nearly equidistant from the median.
4. If the median is the same as the 50th percentile.
5. Use a statistical test e.g., *Kolmogorov-Smirnov test for normal distribution*.

Which descriptive statistic is most appropriate?

For descriptive statistics, use the variable's *scale of measurement* and the *shape of the distribution* to determine the appropriate measure of central tendency, dispersion, and correlation as a shown in Table 1 below.

Table 1. Choosing the right descriptive statistic

Scale of measurement	Recommended average to report	Recommended measure of variability	Appropriate correlation
Nominal	proportion	Range or confidence limits	Phi
Ordinal	median	range or IQR*	Rho
Continuous (normal)	Mean	standard deviation	Pearson's r
Continuous (skewed)	median	range or IQR*	Nil
Continuous (kurtosis)	Mode	range	Nil

IQR =* Inter Quartile Range.

Types of statistical tests

1. Parametric tests:

Require random selection of subjects, a normal distribution and equal variances between groups (homoscedasticity). Examples include: t-test, paired t-test, Analysis of variance (ANOVA) and Analysis of co-variance (ANCOVA). Parametric tests are suitable for hypothesis testing and are more conservative.

2. Non-parametric tests:

Do not require random selection of subjects, a normal distribution or homoscedasticity, and are therefore less conservative. Examples include: Chi-square, Mann-Whitney U test and the Kruskal-Wallis H.

Which statistical test is most appropriate?

When aiming to test a hypothesis (inferential statistics), Table 2 below can serve as a useful guide. Use the variable's *scale of measurement* and the *shape of the distribution*. Equally, pay attention to *independent* or *paired* observations in deciding the appropriate statistical test to apply.

Table 2. Choosing the right statistical test

Scale of measurement	Two groups (n=2)		Three or more groups (n≥3)	
	Independent	Correlated (paired)	Independent	Correlated (paired)
Dichotomous nominal	χ^2 Fisher's exact test	McNemar	χ^2	Cochran's Q
Ordinal	Mann-Whitney U	sign test or Wilcoxon	Kruskall-Wallis H	Friedman
Continuous normal	t-test	Paired t-test	ANOVA	Repeated measures ANOVA
Continuous skewed	Mann-Whitney U or Transform to normal	Wilcoxon or rank sum	Kruskall-Wallis H	Friedman

It is often desirable to transform skewed continuous data to a normal distribution in order to apply a parametric statistical test. One way of doing this is taking the logarithm or square root of the individual values, as doing so reduces larger or extreme values by bringing them closer to lower values thereby transforming the data to a normal or near-normal distribution.

When assessing disease scores before and after treatment, Analysis of co-variance (ANCOVA) is the most appropriate statistical test to use.

For multivariate analyses, use logistic regression to model a dichotomous (binary or yes/no) outcome and multiple linear regression when the outcome of interest is a continuous variable.

When analyzing survival (censored) data, use the Kaplan-Meier method to construct survival plots. Use Cox proportional hazards regression to test for significant differences in survival between treatment arms, and report hazard ratios and confidence intervals.

E. Some words of advice for writing the 'M & M' section:

1. Use standard abbreviations and be consistent in their use; don't alternate between min, min., and minutes, or h, h. hrs, hrs. and hours in your manuscript. Don't use undefined abbreviations that aren't standard.
2. Avoid use of colloquial expressions and laboratory jargon such as "We spun the cells at 5,000 rpm". You didn't "spin" them, you centrifuged them.
3. When specifying "percent solution", indicate whether it is weight/volume (w/v) or volume/volume (v/v).
4. Don't start a sentence with a numeral (e.g., "100 g of E. coli paste was extracted with..."). Better to write "One hundred grams of ..." or, better yet, "E. coli paste (100 g) was extracted with ..."
5. Express rpm in terms of gravitational force (x g).
6. Minimize the number of zeros you use when specifying quantity (e.g., 0.5 ml instead of 0.0005 L).
7. Don't mix Arabic numbers and nouns for numbers in the same sentence (e.g., instead of: "4 controls and six cases"; use "four controls and six cases" or "4 controls and 6 cases").

Chapter 7

The Results section

I. Writing the Results section.

The results section represents the 'meat' of your paper.
Organize into subheadings.
Start with description of subjects.

Roger Angel wrote in **The New Yorker** (6/30/03) that "*Baseball is so implacably difficult to play well, day in and day out, that it almost requires a little cheating now and then to make it bearable...*" When you are writing a scientific manuscript and find yourself tempted to drop a closed circle from a figure or change a number in a table, think about Mr. Angel's words and ask yourself: Is science in general and manuscript writing in particular so difficult to do that you have to do a little cheating to turn out a paper that is suitable for publication?

The Results section is where you strut your tables, figures, patterns, correlations, etc. It is wise to use a mix of tables and figures and not rely on just tables or figures alone. Each table or figure should be on a separate page. Figure legends should follow the Bibliography. The Legends to Figures should be listed on a separate page. Tables may have headings or titles above them, but figures should not. Except for the content of the figure (symbols, lines), all other information should be listed under the Figure Legend, unless it is key to the graphics of the figure, but even with these most should be indicated in subscripts (e.g., o, glucose; +, galactose; -, mannose).

Each figure should have on the back, lightly written in #2 pencil, the surname of name of the first author only, the title of the paper, and the number of the figure. Do not write in ink, ball point or marker pens which have a tendency to leak through onto the surface. Typed stick-on labels containing information are acceptable.

As for legends to figures, devote thoughtful attention to writing clear, unambiguous descriptions of what is contained in the figure and what it shows. Explain every item in the figure. Avoid abbreviations in legends to figures, unless they are either standard or defined and used frequently in the text, or follow a "list of abbreviations" published in some relevant place in the text, before reference to the figures.

A. General considerations/questions about the Results section:

1. Write in the past tense (e.g., "It was found that ..."; "We observed ..."), never in the present tense.
2. Decide on whether to use the passive voice (It was found....) or personal pronouns (I, we found....). Use more of the active voice (e.g., "We found a strong positive correlation ofwith..." as opposed to "It was found that.... had a strong positive correlation with...."
3. What is the best way to refer to and use tables and figures? It is advantageous to alternate tables and figures as you present your results.
4. Use subtitles. How do you decide on which subtitles to use? Use specific, informative nouns and verbs. Avoid bold declarative. A useful tried and true approach is to write "The effect of X on Y". There are usually two parts to the subtitle: "Determination of the effect of X on Y"; "Cloning of Z". However, if you are inclined to brevity, you may tend towards use of the one-part subheading; "Myristic acid labeling". The first sentence of the very first subtitle should state your major finding or new result. That is, put your main finding right up front.

An example: Instead of writing as a sub-heading "Interleukin 2 increases GAP-43 mRNA levels three-fold", it is better to write "The effect of interleukin 2 on the levels of GAP-43 mRNA".

5. Should you combine Results with Discussion? No! Never! What are the advantages and disadvantages of combining the two? It is advisable that you separate the two. It's very difficult to pull off a successful combined Results and Discussion.
6. As Joe Friday said in *Dragnet*¹: "Just the facts, ma'am." When you are writing a stand-alone Results section, don't mix in any interpretation or discussion of your data. Present most of your data in tables. Do not repeat all the contents of the tables in the text, highlight only key table contents. Use figures to highlight important findings such as trends.
7. Link the subheading to one another. Give special attention to the rationale of your experiment, transition sentences and mini-summary statements. Offer rationale statements where helpful and appropriate; e.g., "Having shown that..., we wanted to...", or "Having found that ..., we next investigated ..."

¹ *Dragnet* was a 1950's detective series in the U.S.

8. A poor illustration (figure) doesn't get better with publication. If your originals are of low quality, the reproduction will invariably be even worse!
9. The tables and figures should "stand alone". You accomplish this by writing complete stand-alone legends. If you borrowed data from the literature, provide a credit line to the legend. You will need to secure written permission from the copyright holder, usually the journal in which the data appeared.
10. Be careful with significant figures. In most biological systems, three figures are allowed based on the accuracy of most measurements.
11. State only relevant, representative data. Describe only the most important findings. Emphasize only the key point(s) in each table and figure.
12. Avoid unnecessary repetition of data in the text.
13. Never write "The results of this experiment are summarized in Table 3 and Figure 2", or "Table 4 shows..." Use parentheses instead.
14. Compare the experimental versus the control groups.
15. State your results simply and clearly.
16. The sequence in which you present your data is important: follow a natural progression; the results should flow and the sequence should be logical or chronological. It is like telling a story.
17. Specificity of language is especially important in the Results section. First-time manuscript writers are often careless in defining what they are referring to. Be sure you specify what you're referring to each time you cite a piece of data. This is talking about the ambiguous reference. This occurs when a pronoun makes unclear reference to two antecedents so that the reader is confused as to which of the antecedents is meant; that is, the compound antecedent followed by the single pronoun he, it, or who. Watch out for the ambiguous antecedent.

Example: Once cholesterol has entered the membrane it is able to transport sodium ions. What transports the sodium ions, cholesterol or the membrane? The sentence should read: Once cholesterol has entered the membrane, the membrane is able to transport sodium ions.

18. Give careful consideration to how to present your data to best advantage: a) in the text; b) in graphs or figures; c) in tables; d) in histograms; or e) in photographs. Do not represent the same data in more than one place, unless there are special circumstances (a figure drawn from some data in a table).

II. Presenting results

The Results section of a manuscript is composed of text that is usually supplemented with tables or figures. There is no “one way” to present data, but one may be better than another. Many readers often look at the Results section before reading the entire manuscript, so you want your data to be shown in a clear manner and make the reader want to read your manuscript in entirety.

Why are tables and figures useful?

To convey information that can not be presented effectively or concisely by text alone. Examples:

- description of subjects
- comparisons between groups
- relation between two parameters
- picture of cells, gels
- summary of treatment effects
- list diagnoses of patients

A. Tables. Following are some guidelines for preparing tables:

1. Do not use a table when your data can be summarized easily in the text.
2. Do not present “raw data” or data that has not been analyzed (summarized).
3. Do not use an excessive number of tables when the same information can be relayed in text. Some journals limit the number of tables and figures.
4. Avoid excess repetition of data in text and tables. If there is some overlap, make sure that there is agreement between the text and tables.
5. Do not use abbreviations in tables unless they are defined in a footnote.
6. Do not use vertical lines in tables.

Features of an informative table:

1. A good table should be simple and self-explanatory; that is stand alone.
2. The table should be formatted according to the style of the journal.
3. Tables as well as text should be double-spaced.
4. Information in tables should be presented in a logical order.
5. Do not decrease the font size in order to fit a table onto a page. If necessary, switch to “landscape” format to accommodate the size of the table
6. Each table should be numbered and cited in the text. State the key point of each table in the text of Results.
7. Each table should have a title. The title is not a “sentence”; therefore there is no period at the end of the title. Only the first word of the title is capitalized.
8. All columns in the table should have a title.

9. Give units for all variables.
10. When comparing groups or treatments, provide statistical information such as p-values.
11. Be consistent in the number of significant figures for numerical data.
12. Don't use vertical or horizontal lines to set off lines of data.

B. Figures. Following are some guidelines for preparing figures:

1. Use programs that are "graphics" programs. Statistical programs provide graphs, but they are not usually of publication quality.
2. Figures can be of various types: scatter graphs, bar graphs, histograms, micrographs, gels, etc.
3. Figures, like tables, should stand alone.
4. Do not show data in a graph when trends or relationships are not significant.
5. Label axes and provide units. Do not use abbreviations for labels. Capitalize only the first word.
6. Use a font size for axes labels and tick labels that will be readable when reduced for publication.
7. Choose axes ranges that fit your data.
8. Do not label figures on the front. Attach a printed label or use a soft pencil to label figure on the back before mailing.

Top
Einstein, A. et al.,
"The most recent theory...."

9. Do not put text in the figure. This information belongs in the figure legend. Be specific. Figure legends are not printed on the same page of the figure. They are given on a separate sheet with the title: Figure legends
10. If showing multiple lines, decide if a figure can be better represented by a panel of figures: A,B,C.

11. Use a high quality printer for the final printout.
12. Items are “compared with” not “compared to”.
13. Avoid white (i.e., empty) space.
14. Figure titles end with a period.
15. Avoid lots of zeros.

A view of writer’s block.

In a short story by W.G. Sebald entitled “**Austerlitz**” (*The New Yorker*, September 3, 2002, pp. 50-71), the main character, a man named Austerlitz, describes his own writer’s block:

“I found writing such hard going that it often took me a whole day to compose a single sentence, and no sooner had I thought such a sentence out, with the greatest effort, and written it down, than I saw an awkward falsity of my constructions and the inadequacy of all the words I had employed. Soon I could not even venture on the first step. Like a tightrope walker who has forgotten how to put one foot in front of the other, all I felt was the swaying of the precarious structure on which I stood, stricken with terror at the realization that the ends of the balancing pole gleaming far out on the edges of my field of vision were no longer my guiding lights, as before, but malignant enticements to me to cast myself into the depths. Now and then, a train of thought did succeed in emerging with wonderful clarity inside my head, but I knew even as it formed that I was in no position to record it, for as soon as I picked up my pencil the endless possibilities of language, to which I could once safely abandon myself, became a conglomeration of the most inane phrases. There was not an expression in the sentence but it proved to be a miserable crutch, not a word but it sounded false and hollow. It was as if an illness that had been latent in me for a long time were now threatening to erupt, as if some soul-destroying and inexorable force had fastened upon me and would gradually paralyze my entire system.” (In 2002, Mr. Sebald was killed in a car crash at the age of 57 years.)

Athol Fugard, speaking of writer’s block in his play, “*Sorrows and Rejoicing*”:

“The ink in my fountain pen has clotted and dried up like the blood in a dead man’s veins. God knows I’ve tried to get it flowing again, but if my writing ever had a heart it has stopped beating. I’m drought-stricken.”

Chapter 8

The Discussion

Writing the Discussion.

Ask any senior scientist who has written 100 papers or more and seen them published what they consider the most difficult part of a manuscript to draft and they will likely tell you it is the Discussion section. At the same time, especially if they have a positive attitude about writing in general, they will also tell you the Discussion is the most enjoyable aspect of the paper to write because it is that component which offers the greatest freedom for creative expression. In the Discussion section you have many more options; you have great latitude in deciding on:

- A. The sequence in which you present your ideas,
- B. The balance or proportion of space you devote to the various points you wish to make,
- C. The claims you make for the significance and implications of your findings, and
- D. The way in which you relate your observations to those of other scientists.

Decisions to make beforehand:

- 1. Sequence of topic presentation
- 2. Proportion or balance between elements (e.g., significance versus work of others).
- 3. Strength of assertion (choice of verbs)
- 4. Use of literature (re-use of literature cited in the Introduction)

A. The basic elements of the Discussion:

- 1. The main finding, result or observation. State the major finding first, followed by the minor findings. You must muster evidence to defend your claims.
- 2. Compare and contrast your data with what is in the literature. What is the basis for the observed differences? Diet? Gender? Genetics? Environmental/cultural? etc.
- 3. What is the significance of your results (for basic science, for the clinical world)?
- 4. What are the practical implications of your findings? Public health? Education? Diagnosis? Therapeutics? Pathobiologic? Prognosis? Resource utilization? etc.
- 5. What are the limitations of your study? (don't list too many). Sample size? Gender differences? Lack of available diagnostic techniques? Time? Funds? Seasonal variation? Here is a suggestion on how to begin your paragraph on limitations: "In retrospect..."

6. What future directions in research do your findings point to? List just a few; not more than three.
7. State your overriding conclusion (put the last sentence in the abstract).

B. What should your Discussion accomplish? It should:

1. State the meaning of your study's results. Emphasize what is new and important. Make clear what your contribution is.
2. Restate the definitive findings/results. Do they support your original hypothesis? Cite the basis for each claim or assertion you make.
3. State the study's conclusions. The strength of the verb is important. "Our result show that ..." Perhaps one of the following verbs works better: prove, establish, conclude, suggest, indicate, demonstrate, support, etc. If the verbs you use here are too strong, you risk annoying the reviewer/editor of your manuscript.
4. Discuss the implications of your data.
 - a. What are the basic science implications of your data? For example, does your study provide greater insight into the mechanism behind some biological process or phenomenon? Have you discovered some new pathway, molecule, or enzyme?
 - b. What are their practical applications/significance to the quality of human life, improved diagnostics and therapy, a better understanding of pathophysiologic mechanism, etc.
5. Summarize the evidence for each conclusion.
6. Compare and contrast your results with the work of others (What agrees, disagrees?). If your results conflict with those of others, address the possibility that use of different methods, populations, etc. might account for the discrepancy.
7. Acknowledge alternative interpretations.
8. Acknowledge limitations to your analyses and any reservations you may have about your findings (e.g., sampling bias, sample size, confounding variables you didn't/couldn't control for).

I like the following lead-in to the 'limitations' paragraph: Our study has several limitations.

9. Amplify the questions raised in the Introduction.
10. Suggest, in very specific terms, future experiments/studies/directions. Avoid platitudes, generalizations, or statements of the obvious (e.g., "Further studies are needed in this area").
11. Be specific and avoid global, sweeping generalizations and unreasonable speculation.
12. Avoid use of "may have", "might have", and "perhaps".

C. Some guidelines for writing the Discussion:

1. Write a topic outline specifying the order and content of each paragraph.
2. Carefully consider transition sentences (i.e., consider how you will enter and exit each paragraph seamlessly).
3. Limit the length of the Discussion to one-third of the combined IMRAD sections. The Discussion should be 3-6 pages long (double-spaced). If it is shorter than three pages, then you have probably under-interpreted your data. Some journals like the BMJ will specify the length of the discussion as not exceeding a maximum of 2500 words and will insist on a structured discussion.
4. The last paragraph should be a short summary (two to three sentences long) of the main conclusion and its significance.
5. Open the Discussion with a sentence that articulates the most significant result of your study; for example: "The main conclusion of the present study was ...", or "The most important finding of this study was ..." Then follow up with a marshaling of the evidence. *Don't forget, the first test of a good discussion is the opening sentence.* Next, address the lesser conclusions and the supporting evidence. Then deal with the issue of implications.
6. End with a strong concluding sentence (e.g., "In conclusion, our study shows that..."). Be only as emphatic as your data warrant. It is also useful to end your Discussion with a statement or two about future studies or directions.
7. Avoid self-congratulatory expressions such as: 1) "This is the first demonstration of ..."; 2) "Ours is the most definitive study of ..."; 3) "We used the largest study population..."; 4) "Our results convincingly answer the question of ...".

8. One test of whether you've written an effective Discussion is does it answer the following questions:
 1. What did I find?
 2. Why is it important?
 3. What does it mean?

What a panel of Nigerian scholars had to say regarding what should belong in the discussion section.

1. Highlight your main findings.
2. Compare and contrast your results with what is reported in the literature.
3. Remind the reader early in the Discussion about why you carried out the study.
4. List the conclusions clearly and concisely.
5. Provide creative speculations.
6. Provide alternative explanations and interpretations of your data.
7. Inform the reader of the meaning of your findings.
8. Acknowledge data that you could not interpret or which doesn't fit your hypothesis.

In your Discussion, avoid use of the following words or phrases: unique, never, always, all, perfect, finally established. They are usually associated with careless or unwarranted generalizations, extrapolations or amplifications. Avoid the temptation to exaggerate.

D. Editing

Here is an advice about editing, credited to the Earl of Roscommon in 1864 (cited in **The New York Review of Books**, March 14, 2002).

“Write with fury but correct with phlegm”, that is, calm, cool, stolid, and composed.

Accept the fact that revising is an integral aspect of writing. It requires discipline. Compare your text with your outline to see if you've omitted something important, or to see if the sequence in which you've presented the components of the Introduction or Discussion is optimal and what you intended.

Check to see that you've not used colloquialisms or pretentious prose, or over-interpreted your findings. Are there places where you rushed through an explanation, thereby failing to provide

sufficient specificity? Is each sentence informative and necessary? Are you clear? Are there instances where a transition sentence between paragraphs or sub-sections would be helpful? Have you used abbreviations excessively? Are there enough numbers in the Abstract? Have you clearly articulated the significance of your study?

“A manuscript is never really finished, for when the morning next begins there is still time for one more revision, even if only the substitution of a hot verb with a colder one.” -RH Glew

People who are happy to have you read their manuscript usually want you to return it to them free of red ink. They do not want to be told that there is room for improvement, even if your comments are of the most trivial nature. They are not interested in suggestions; instead of red ink, they seek praise and adulation.

Creating a manuscript can be an endless process of writing and revising unless at some point you put the paper in the mail. However, there is a danger when you conclude a manuscript. There is a sort of vacuum in which you doubt you have the resources to start another paper. So it is wise to always be working on at least two manuscripts so that when one is finished, something – even if only a few sentences – has been started on the second manuscript. The issue here is interrupting the writing. Don't let that happen. Always have something you're working on. Don't assume the motivation will always be there when you need it or want it to be.

If you are one who publishes regularly and extensively and if you become recognized widely in your institution for your writing skills, watch out! Beware of offering to read and edit other people's manuscripts. Editing is time-consuming. If you agree to edit more than the occasional manuscript, you risk pushing your own work to the back burner and never getting your own papers out the door. Tell them: “I've got to write and edit my own papers and those of my students and collaborators”. Is it churlish and ungenerous to say no? I don't think so. On the other hand, it is the obligation of senior, established investigators to improve the manuscript writing skills and productivity of younger faculty and to help them advance their careers.

Subjecting one's writing for review and criticism should not be a cause of dread. The way to avoid this is to submit your paper to someone you trust and respect. Do not put your work into the hands of someone whose judgments are invariably pitiless and insulting. Do not expose yourself to such indignity.

It is time-consuming to do a thorough job of editing someone else's writing.

When editing someone else's work, or your own for that matter, every word should be justified.

You don't want to waste your time giving criticism to an author or manuscript for which advice would be wasted.

On spontaneity and editing:

“My vocabulary dwells deep in my mind and needs paper to wriggle out into the physical zone. Spontaneous eloquence seems to me a miracle. I have rewritten – often times – every word I have ever published. My pencils outlast their erasers.”

(Vladimir Nabokov, in *Strong Opinions*, p.4)

Some thoughts about writing from Borges in Jorge Luis Borges: Selected Non-Fictions, Ed. E. Weinberger, Viking Press.

1. An argument against perfection and over-editing, in: **The Superstitious Ethics of the Reader**

“The perfect page, the page in which no word can be altered without harm, is the most precarious of all. Changes in language erase shades of meaning, and the “perfect” page is precisely the one that consists of those delicate fringes that are so easily worn away. On the contrary, the page that becomes immortal can traverse the fire of typographical errors, approximate translations, and inattentive or erroneous readings without losing its soul in the process.”

Too many revisions can drain the life and excitement out of a manuscript.

2. The danger of using too definitive, too strong a word; (Borges, *ibid*, p. 54):

“The most common literary mistake today is emphasis. Definitive words, words that postulate prophetic or angelic wisdom, or supernatural resolutions—unique, never, always, all, perfection, finished – are the habitual barter of all writers. They do not understand that overstating something is as inept as not saying it at all, and that readers sense the impoverishment caused by careless generalizations and amplifications. Such imprudence depletes the language.”

3. Flaubert was a believer in proofreading and revision. (In the same essay by Borges)

“Correction (in the highest sense of the word) does to thinking what the waters of Styx did with Achilles’ body, that is, makes it invulnerable and indestructible.”

4. The fallacy of thinking there is a definitive draft of your paper (in: J.L. Borges, **The Honorable Versions**, *ibid*, p.69.)

“To assume that every recombination of elements is necessarily inferior to its original form is to assume that draft nine is necessarily inferior to draft H – for there can only be drafts. The concept of the “definitive” text corresponds only to religion or exhaustion.”

5. *“Harrison, the inventor of the marine chronometer that allowed sailors to know their longitude on the globe, never could express himself clearly in writing. He wrote in the scrivener’s equivalent of marbles in the mouth. No matter how brilliantly ideas formed in his mind, or*

*crystallized in his clock-works, his verbal descriptions failed to shine in the same light.” (Dava Sobel, **Longitude**, p. 66)*

6. *“It is unpleasant to have your (writing) rejected, doubly unpleasant if (it is) rejected by one you admire, trebly unpleasant if you are used to adulation.” (J.M. Coetzee, **Dusklands**, p.5)*
7. Good writing comes when we *“learn how to do our work, to be masters of our material And never be afraid of anything. (Success) depends on being master of the bricks and mortar of the trade. But the instant we begin to think about success and the (impact) of our work – to play with one eye on the gallery – we lose power and touch with everything else. Instead of being quiet and giving every power you possess to your work, you’re fretting over something you can neither help nor hinder” (Kipling, **The Light That Failed**, p.98)*
8. A preoccupation with detail and comprehensiveness without the goal of telling an interesting story that flows results in a dull and soulless monument to the author.
9. For more than half the people that are awarded tenure, manuscript-writing is just a phase they pass through on their academic path/career.
10. In the perfect manuscript, structure and content are inseparable.
11. One should strive to acquire an efficient and productive habit of writing and a consistent and coherent individual style.
12. One of the rewards of writing many papers is that the process of manuscript-writing becomes intuitive. All that experience gets distilled and condensed in your sun-conscious. The sense of structure, organization and content gets so hard-wired into your brain that you aren’t even aware of it, like tying your shoes or riding a bicycle. The intuitive choice- and decision-making of the experienced writer of scientific papers allows him/her to forego the formulaic and logical steps involved in manuscript writing because the process has become automatic as a result of the repeated application of the orderly and systematic steps taken in the past.
13. Data: good or bad? The difficult question is *“deciding between dishonestly rejecting inconvenient observations and rejecting data from flawed experiments.” (R.C. Lewontin, **The New Yorker**, p.47). Lewontin also wrote: “Science, indeed scholarship in general, is a domain in which the integrity of the process is more important than the value of any particular result. This is not a question of a priori ethic but of the very survival of the process of investigation.”*
14. *“I asked how you can ever be sure
that what you write is really
any good at all and he said you
can’t,
you can’t, you can never be sure,*

*you die without knowing
whether anything you wrote was
any good
if you have to be sure don't write.*" (A poem, Opening the Hand, by W.S. Merwin)

15. I write to win readers to my point of view, not just to educate them. When I succeed, I assert my existence. (R.H. Glew)
16. Writing is like painting; the final product should manifest a sense of structure and balance. (R.H. Glew)
17. Wherever I write – at the kitchen table, out on the patio or in my study – it must be a quiet and secluded place where I can concentrate, where there are no interruptions and where I can shut out the world.
18. *"It is ... because I want to do something well that I don't do it well."* (The poet, Elizabeth Bishop; cited in the **New York Review of Books**, April 27, 2006 in an article by Charles Simic entitled The Power of Resilience, pp. 17-19).
19. One sure way to avoid the critics is to never publish anything. (R.H.Glew)
20. A syntax faux pas I encountered in a chapter I was editing on Neonatal Hyperbilirubinemia for my textbook: *"The mother decided to breastfeed prior to delivery, and the child was allowed to continue to suckle immediately following birth."*
21. Writing and doing it well when we are disinclined to doing so takes more than discipline; it takes a kind of moral courage. (R.H.Glew)
22. A comment about perfection: During World War II, Winston Churchill asked for good ships now, not perfect ships after the war was over.
23. Never use "et cetera" or "etc." *"It is a sign of exhaustion; inspiration has momentarily given out."* (**The New York Review of Books**, June 9, 2005; The Anatomy Lesson, by Charles Rosen, pp. 55-57)
24. Getting a letter from an editor rejecting your manuscript leaves you with a sense of shame, like that which the heavyweight boxer feels when he has been knocked out in the third round, or the general feels when he retreating from a lost battle. (R.H.Glew)
25. Each time I write is a new time and I never think about the other pages I have written when I am working on the new one. (R.H. Glew, inspired by Hemingway in **The Old Man and the Sea**, p. 66.)

26. On writing, by W.G. Sebald in **The Rings of Saturn**, p.283 (with slight paraphrasing): “ *That Scholars and writers, together with weavers with whom they (have) much in common, (tend) to suffer from melancholy and all the other evils associated with it, is understandable given the nature of their work, which forces them to sit bent over, day after day, straining to keep their eye on the complex patterns they (are creating).*”
27. Writing any manuscript, even a bad one, is never easy. (R.H. Glew)
28. Having your manuscript published in a peer-reviewed journal does not necessarily certify the validity of the paper’s contents or quality. (R.H.Glew)
29. Don’t be discouraged from writing a paper because you think your observations are not of earth-shattering import. The world is full of average scientists that Thomas Kuhn nevertheless regards respectfully as being engaged in what he refers to as “ *normal science.*” He wrote: “ *Mopping-up operations are what engage most scientists throughout their careers.*” He sees us as fact gatherers who describe our experiments and observations in technical journals, thus informing our colleagues of our continuing research. Most of the time we are not pursuing truly novel discoveries or hypotheses or extraordinary problems, but instead reinforcing an existing, accepted paradigm by expanding its scope to include a larger variety of situations or securing more precise measurements. Normal research, he contends, does not aim to produce major novelties. (Thomas S. Kuhn, **The Structure of Scientific Revolutions**, third edition, pp. 24-16 and p. 35)
30. Is this a syntax problem or just plain sloppy language: “ *Yankees’ Bob Sheppard returned to the public address microphone ... after missing opening day for the first time since 1950 when he threw out his artificial hip.*” (in the **New York Times**, April 22, 2006, p. 4C of the sports section) I wonder what kind of mitt the catcher had to use to catch the hip?

Some advice about writing:

1. Avoid jargon, use common ordinary words.
2. Assume the reader is NOT an expert in the subject/problem of your paper.
3. Write simply, clearly and without ambiguity.
4. Present ideas in a logical sequence, one at a time.
5. Avoid even the appearance of dogmatism. Give opposing views and conflicting studies due consideration.
6. Quantify whenever possible; that is, use numbers (e.g., “five percent increase” or “ten-fold increase” as opposed to “moderate increase” or “substantial increase”).

7. Don't be verbose; get right to the point.
8. Make liberal use of rationale statements.
9. Use the active voice (e.g., "We extracted the homogenate with..." as opposed to "The homogenate was extracted with...")
10. Use verb forms as opposed to noun forms (e.g., Don't write: "the lungs eliminate acid by the discharge of carbon dioxide"; instead, state "the lungs eliminate carbon dioxide by discharging carbon dioxide").
11. Don't use nouns as adjectives.
12. Ask a colleague who publishes frequently and who writes well to edit your penultimate draft.

Chapter 9

References

"Getting all your references right is a sort of good manners, like not slamming doors in people's faces." (A.D. Nutall. "Why Scholarship Matters" In: **The Wilson Quarterly**, Autumn 2003, pp. 60-71).

- I. **Citing the Literature.** The error rates in references cited in the literature range from 20 to 46%.

References as cairns:

"The transmission of scholarly citation is the equivalent of leaving a trail that can be easily followed."-RH Glew

- A. What are the various formats for citing references?

1. *The Vancouver System.* This is the one most widely used today. It is referred to as the 'citation order system'. One numbers references consecutively or sequentially as they are cited in the text using Arabic numerals in superscript or parenthesis. You have the option of ordering your references alphabetically; however, this is not usually done.
2. *The Harvard System,* in which in the text of your manuscript you do not number citations but instead specify the name and year of each citation. Cite "Smith and colleagues, 1997" or "Framitz and co-workers, 1996", but not "Smith et al., 1997." In this system references are always listed in alphabetical order.

- B. Pay attention to the following guidelines:

1. After selecting the journal in which you plan to publish your paper, read the 'Instructions to Authors' and follow them to the letter. Cite the volume but never the number of an issue.
2. Don't cite abstracts, "unpublished observations", or personal communications under "References". However, it is acceptable to cite a paper as being "in press".
3. Never abbreviate a one-word journal title (e.g., Biochemistry, Science, Lancet).
4. In deciding what to include in your list of references: be comprehensive; cite only relevant, pertinent and significant papers; be critical of those you cite; and cite only key, seminal papers.

5. Many journal editors urge contributors to limit the number of references to 20.
6. Start the references on a fresh sheet of paper.
7. Formats for quoting from books are highly variable: Consult the "Instructions to Authors" of the journal to which you are submitting your paper.
8. Double space all text and references, leaving 1½ inch margins at top, bottom, and right-hand side of the page, and 1 inch margin at the left side of the page.

II. What are the specific rules to follow when citing references?

- A. Refer to the "instructions to authors" section of the particular journal.
- B. Use the "Uniform Requirements for Submission of Manuscripts" to biomedical journals issued by the International Committee of Medical Journal editors.
- C. Cite only seminal papers.

III. **Mailing your manuscript.** Xerox an exact copy of your paper and the covering letter before you mail it, regardless of whether you have it on a disc or saved on the hard drive of your computer. Check to be sure every page is numbered. Be sure that all the pages are contained in the original and the copies. Submitted hard and electronic copies must be exactly the same. If there are photographs, include cardboard stiffeners in the mailing envelope, and mark the envelope "PHOTOS - DO NOT BEND". Enclose a self-addressed post-card bearing a postage stamp that acknowledges receipt of your manuscript. If you do not receive a decision regarding acceptance or rejection of your paper within three months, then phone or e-mail the editor and inquire as to the status of your submission. Most journals now provide an option for on-line submission of manuscripts. You can also track the progress of your paper once it is accepted and has been assigned a manuscript number.

IV. Observations of writers about writing:

Joan Didion:

"The peculiarity of (writing) is that the entire enterprise involves the mortal humiliation of seeing one's words in print." ("Last Words". In: The New Yorker, Nov. 9, 1998 pp.74-80). For a scientist who publishes his/her work, there is the ever-present risk of being wrong.

"Writer's block is simply a failure of the ego." (Ibid)

Ernest Hemingway writing to F. Scott Fitzgerald:

"You just have to go on when it is worst and most helpless - there is only one thing to

do ... and that is go straight on through to the end of the damn thing."

Henry Miller:

"It requires more concentration to detect a missing comma than to epitomize Nietzsche's philosophy. You can be brilliant sometimes, when you're drunk, but brilliance is out of place in the proofreading department." (Tropic of Cancer, p.175)

"A good proofreader is a little like God Almighty; he's in this world but not of it." (Ibid, p. 147) Paraphrasing Miller, "The proofreader is like the man in the paddock whose job is to sweep up the manure and shovel up hot turds. It is the bottom rung of degradation."

"All you need to write is security ... peace ... protection." (Ibid, p. 117)

"The process of putting words down is the equivalent of giving oneself a narcotic." (Ibid, p. 22)

"The best thing about writing is not the actual labor of putting word upon word brick upon brick, but the preliminaries, the spade of work which is done in silence, under any circumstances, in dream as well as in the waking state. In short, the period of gestation." (Ibid, p. 22)

"Writing is a compulsive and delectable thing. Writing is its own reward." (Ibid, p.104)

"Writing is a voyage of discovery." (Ibid, p. 106)

"Why write like (someone else)? Write like you are, that's so much better." (Ibid, p. 49)

Henry Miller, early in his career, wondered: *"Will I ever write anything acceptable?" (Ibid, p. 60)*

"To be born an eagle one must get accustomed to high places; to be born a writer one must like privation, suffering, humiliation. Above all, one must learn to live apart. Like the sloth, the writer clings to his limb while beneath him life surges by steady, persistent, tumultuous." (Ibid, p. 73)

Robert H Glew:

"Writing is finding the words."

“One of the greatest enemies of writing is interruption.”

“A writing task successfully completed encourages the next one.”

“Writing well and publishing your work will gain you acceptance into the academic club.”

“Fortitude is a requirement for writing.”

“You must first decide you have something important and useful to report. But, it takes courage to act and to write, for there is the risk that others including colleagues, editors, reviewers will disagree with you.”

“A published paper is evidence of your ability to focus and bring a major task to completion.”

“For the tenure-track Assistant Professor, the down-side of not writing up your research and submitting it for publication is denial of tenure and promotion. However, I’m more interested in the more subtle implications or consequences of allowing good and useful publishable data to languish on a dusty shelf in the office or laboratory or in an unpublished doctoral thesis, which are: 1) the moral obligation to share your findings with the scientific community; 2) your data may become outdated or others will have published what you found; 3) the loss of confidence of your peers and students. You will be regarded as being undisciplined. Your peers will be disinclined to collaborate with you, consult with you, or seek your advice. You will be cut off and isolated. Students and fellows will not want you as their mentor; and your writing skills will surely deteriorate.”

“Write for two hours each day and you will write more papers than any one hundred of your peers. Write before going off to the office or laboratory and then have the rest of the day to do experiments, lecture, enjoy discussions with your students or colleagues, or read in the library.”

“Time alone; writing requires being alone with yourself for long stretches.”

“If you are a true writer, you will be deeply concerned about two things: 1) the quality of your writing, and 2) its fate (i.e., is it ultimately published, read and appreciated by others?)”

“You must learn the importance of imposing deadlines for yourself.”

“Writing a manuscript should not be viewed as a competitive sport but instead as an

internally rewarding intellectual and creative activity.”

Judgment Day: that’s the day you receive the editor’s decision letter regarding your manuscript.

“If you know you can write, and do it well, recognize it as such and appreciate it and honor that gift by using it.”

“My writing desk at home is made of 2 1/2-inch thick oak planks that were once the knot-rich floor boards of a tobacco barn that had stood for more than 100 years in Kentucky. It sits snugly in a corner in the kitchen, right next to a window that offers me a view of the magnificent Sandia Mountains. The best time for me to start writing is just before dawn when the eastern sky is the color of salmon fillets. I think of my writing desk as a kind of digestive tract, a place in which I digest thoughts, transform raw ideas, absorb what is useful, and excrete that which is waste. Where elemental ideas take on unpredictable forms, where progress is sure but spontaneous. Where a sense of intellectual satisfaction and satiety comes. A well-functioning digestive tract, full of good food, is something all of us appreciate.”

“When I finish a manuscript, the moment I put it in the mail I experience an explosive feeling of satisfaction and a euphoric sense of great accomplishment.”

Doris Lessing:

“ (Writing) is boring and hardly describable. Work begins. I do not sit down but wander about the room. I think on my feet, while I wash up a cup, tidy a drawer; drink a cup of tea, but my mind is not on those activities. I find myself in the chair by the machine. I (type) one sentence.... Will it stand? But never mind, look at it later, just get on with it, get the flow started. And so it goes on.” (Cited by Rosemary Dinnage in The New York Review of Books, Nov. 19, 1998. pp. 55-57; from Lessing’s book, Walking in the Shade: Volume Two of My Autobiography, 1942-1962, Harper Collins)

“If you think your paper must be absolutely original, perfect in every respect, and of great significance, you will never write the first word of the introduction.”

Newton Arvin:

“Reading student papers, blue books, etc., (is) a form of torture ... A matter of rubbing an iron file over one’s teeth, or holding urine in one’s mouth, or having the racket of a bulldozer in one’s ear for an hour or two on end.” (The New Yorker, October 5, 1998, pp. 57-67)

Wilkie Collins:

“One of the rarest of all intellectual accomplishments that man can possess is the grand faculty of arranging his ideas.” (The Woman in White, p. 533)

Claude Levi-Straus (Tristes Tropiques):

(Paraphrase) Writing can increase one's prestige, power and authority. (On the other hand, my view (RHG) is that if you put your manuscript in a shoe-box or the bottom drawer of your desk and never disseminate it, then it never existed.)

(Paraphrase) We write in order to preserve knowledge. *“Writing can be thought of as an artificial memory, the development of which ought to lead to a clearer awareness of the past, and hence to a greater ability to organize both the present and the future.”* (Ibid, p. 360)

Degas once complained to Mallarmé that he had wasted the whole day over a sonnet without achieving what he wanted. *“Yet I have plenty of ideas!”* he complained. To which Mallarmé replied: *“But Degas, one makes verses with words, not with ideas.”*

Cited in **The New York Review of Books**, November 7, 2002 in “Almost Forgotten Women” by Larry McMurtey, p. 51 of pp.51-52.

If you are a scientist who regards yourself as a scholar but you do not write, then you are like the man who *“presume(s) to know the art of navigation but who has not ploughed the sea.”* Cited in **The New York Review of Books**, in “The Modern Machiavelli” by Paul Kennedy, p. 53 of pp. 52-55.

The length to which some people will go to write their story

According to Ovid, in Greek mythology Philomela, the daughter of Pandion who was King of Athens, was raped by her brother-in-law Tereus, King of Thrace. Philomela wove a cloth that told of how she had been raped. She embroidered her story because Tereus had cut her tongue out.

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