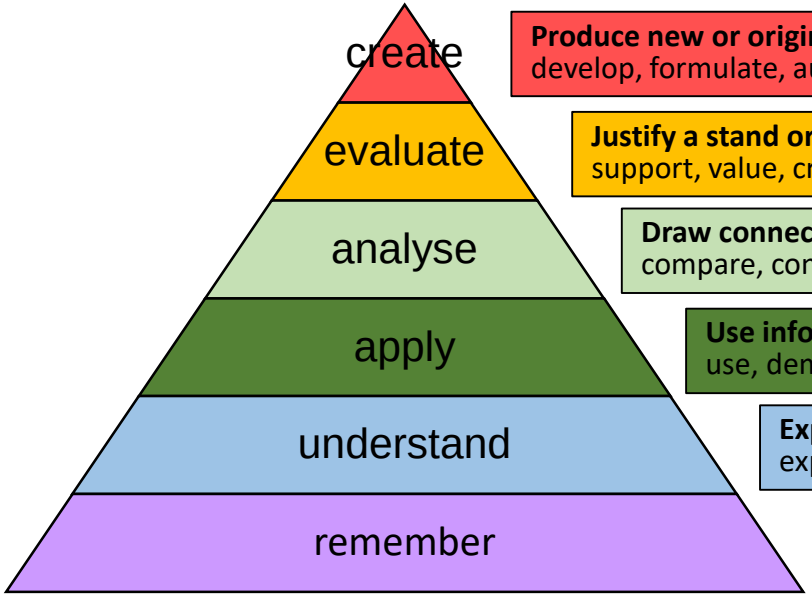
"*The Elements of Style* remains an unwavering beacon of light in these grammatically troubled times. I would be lost without it." (Ann Patchett)

"Strunk and White's gigantic little book must be the most readable advice on writing ever written. Side by side with Roget, Shakespeare, the Bible, and a dictionary, it's an essential for every writer's shelf." (X. J. Kennedy)

"Buy it, study it, enjoy it. It's as timeless as a book can be in our age of volubility." (Charles Poore, *The New York Times*)

Introduction to scientific writing

These are the learning outcomes for today's lecture; here written as part of Bloom's taxonomy*



Produce new or original work: design, assemble, construct, conjecture, develop, formulate, author, investigate

Justify a stand or decision: appraise, argue, defend, judge, select, support, value, critique, weigh

Draw connections among ideas: differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

Use information in new situations: execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

Explain ideas or concepts: classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

Recall facts and basic concepts: define, duplicate, list, memorise, repeat, state

* Vanderbilt university

- Communicate concisely, precisely and attractively
- Author a practical handbook for scientific writing

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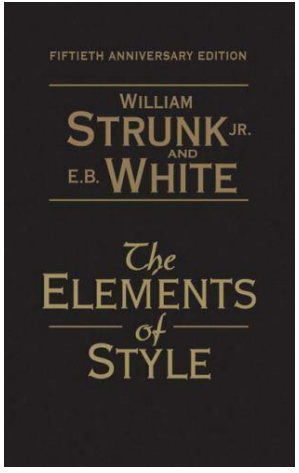
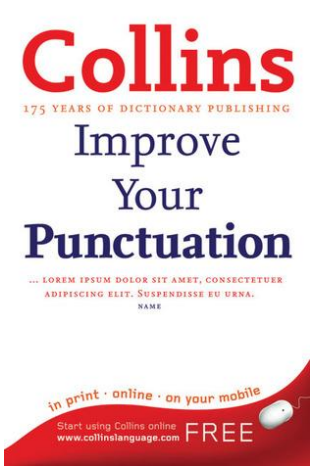
We'll work through following concepts and author a handbook

- Elementary rules of usage*
- Principles of composition*
- Style*
- Practical guide to scientific writing
- Handbook on Practical Scientific Writing, CANVAS



A must-read*



Recommended

Elementary rules of usage

2. In a series of three or more terms with a single conjunction, use a comma after each term except the last:
   - red, white, and blue
   - He opened the letter, read it, and made a note of its contents

3. Enclose parenthetic expressions between commas:
   - The best way to see a country, unless you are pressed for time, is to travel on foot

4. Place a comma before a conjunction introducing an independent clause:
   - The early records have disappeared, and the story can no longer be reconstructed

5. Do not join independent clauses with a comma; [instead, use a semicolon]:
   - It is nearly half past five; we cannot reach town before dark (strong)
   - It is nearly half past five, and we cannot reach town before dark (weak)

7. Use a colon after an independent clause to introduce a list of particulars, an appositive, an amplification, or an illustrative quotation:

   - The whittler requires: a knife, a piece of wood, and a back porch (wrong)
   - The whittler requires three props: a knife, a piece of wood, and a back porch (correct)

8. Use a dash to set off an abrupt break or interruption and to announce a long appositive or summary:

- His first thought on getting out of bed—if he had any thought at all—was to get back in again (em-dash)

9. The number of the subject determines the number of the verb:

- The bittersweet flavour of youth—its trials, its joys, its challenges—is not soon forgotten (the list does not make the subject plural)
- The walrus and the carpenter were walking close at hand (compound subject)
- His speech as well as his manner is objectionable (still a singular subject)

Principles of composition

13. Make the paragraph the unit of composition

- May be of any length (avoid too short or too long paragraphs)
- Visual aid to reader
- Contain one topic, hence typically the need for several paragraphs
- Begin each paragraph either with a sentence introducing the topic or providing a transition from the previous paragraph (again, therefore, for the same reason…)

14. Use the active voice

- Usually more direct and vigorous
- Usually makes sentences shorter and stronger

- There were a great number of dead leaves lying on the ground.
- Dead leaves covered the ground.

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15. Put statements in positive form

- Make definite statements

• He was not very often on time • not honest • did not pay any attention to	• He usually came late • dishonest • ignored

16. Use definite, specific, concrete language

- Prefer the specific to the general
- Avoid large, vast, huge, immense unless you have quantified and put findings in context
- Quantify

• A period of unfavourable weather set in	• It rained every day for a week

17. Omit needless words

- Vigorous writing is concise
- Avoid unnecessary words and sentences
- Every word should tell
  - there is no doubt but that
  - use for fuel purposes
  - the reason why is that
  - no doubt
  - used for fuel
  - because

18. Avoid a succession of loose sentences

- Especially: two clauses, the second introduced by a conjunction (and, but, who, which, when, where, while…)
  - The third concert…, and a large… Mr Appleton was the…, and the … The former showed.. , while the latter…The interest…, and it is… The fourth...
- Instead, add adverbial phrases, adverbs and conjunctions etc.
  - however, indeed, for example, as we have seen

21. In summaries, keep to one tense

- If in present tense, antecedent action is in present perfect; if in past tense, in past perfect

An approach to style

2. Write in a way that comes naturally
5. Revise and rewrite
6. Do not overwrite (by adding unnecessary words)
8. Avoid the use of qualifiers (e.g. very , little,)
16. Be clear
17. Do not inject opinion (unless for a good reason)

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A practical guide to scientific writing

Use verb tenses as you would in ordinary writing

- **Past tense:** report what happened in the past; e.g. what you did, what someone reported, what happened in an experiment
- **Present tense:** express general truths, such as conclusions (drawn by you or by others) and atemporal facts (including information about what the paper does or covers)
- **Future tense:** outline perspectives (what you will do in the coming months or years)

https://www.nature.com/scitable/topicpage/effective-writing-13815989/

Here are examples of past tense

- **Work done**
  - We collected blood samples from
  - Groves et al. determined the growth rate of
  - Consequently, astronomers decided to rename
- **Work reported**
  - Jankowsky reported a similar growth rate
  - In 2009, Chu published an alternative method to
  - Irarrázaval observed the opposite behavior in
- **Observations**
  - The mice in Group A developed, on average, twice as much
  - The number of defects increased sharply
  - The conversion rate was close to 95%

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https://www.nature.com/scitable/topicpage/effective-writing-13815989/

Here are examples of present and future tense

- **General truths**
  - Microbes in the human gut have a profound influence on
  - The Reynolds number provides a measure of
  - Smoking increases the risk of coronary heart disease
- **Atemporal facts**
  - This paper presents the results of
  - Section 3.1 explains the difference between
  - Behbood's 1969 paper provides a framework for

- **Perspectives**
  - In a follow-up experiment, we will study the role of
  - The influence of temperature will be the object of future research

https://www.nature.com/scitable/topicpage/effective-writing-13815989/

Here are examples of present and past tense

- Use past tense to describe your methodology and report your results and when referring to the work of previous researchers

- Use present tense to express findings that continue to be true. Use present tense to express general truths or facts or conclusions supported by research results that are unlikely to change—in other words, something that is believed to be always true
- Use present tense to refer to the article, thesis or dissertation itself; and to discuss your findings and present your conclusions. Example: "Weight increased as the nutritional value of feed increased. These results suggest that feeds higher in nutritional value contribute to greater weight gain in livestock."

Mix active and passive voice; and yes, the personal voice is allowed

- In English, verbs can express an action in one of two voices
- Active voice focuses on the agent:
  - John measured the temperature
- Passive voice focuses on the object that is acted upon:
  - The temperature was measured by John
- The desire to be objective in scientific writing has led to an overuse of the passive voice
- Passive voice is usually less interesting or more difficult to read than active voice
- A verb in the active voice does not require a person as the agent; an inanimate object is often appropriate:
  - The temperature was measured… (uninteresting, passive voice)
  - The measured temperature of 253°C suggests a secondary reaction in … (interesting, active voice)
- Personal voice (first-person perspective): I, we (plural)
  - We measured the temperature
- Passive voice removes first-person references

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https://www.nature.com/scitable/topicpage/effective-writing-13815989/

Advice for the Title

- Is concise, informative and meaningful to the whole readership of the journal
- Includes key terms, to help make it more discoverable when people search online
- Avoids the use of long systemic names and non-standard or obscure abbreviations, acronyms or symbols

Advice for Abstract

- Gives readers a brief summary of your article.
- Concisely describes the contents of your article and include key terms (especially in the first two sentences, to increase search engine discoverability)
- Is informative, accessible and not only indicate the general scope of the article but also state the main results obtained and conclusions drawn
- Is complete in itself; it should not contain undefined acronyms/abbreviations and no table numbers, figure numbers, references or equations should be referred to.
- Is suitable for direct inclusion in abstracting services and should not normally be more than 300 words

Advice for Keywords

- Is relevant to your work
- Used to index an article, helping to make it more discoverable
- When choosing keywords, think about the kinds of terms you would use when searching online for related articles

Advice for Introduction

- Is concise and describes the nature of the problem under investigation and its background.
- Sets your work in the context of previous research, citing relevant references.
- Expands on highly specialized terms and abbreviations used in the article to improve readability

- Broadly speaking,
- In practice, the choice
- In essence,
- In short,
- Perhaps the first to demonstrate the
- To extend … , the aim of the work presented here is threefold: first, to develop a …; second, to study … ; and third, to quantitatively compare …

- This paper primarily addresses…with the aim to develop
- The study is motivated by the fact that most
- Furthermore, our approach differs from most of the previous work in that we apply
- The layout of the paper is as follows. … Finally, conclusions are drawn and possible extension of… are highlighted

Advice for Materials & Methods

- Provides sufficient details of the experiment, simulation, statistical test or analysis carried out to generate the results such that the method can be repeated by another researcher and the results reproduced

- For the sake of brevity, the
- In the above set of equations,
- As an indication of computational cost,
- In this section, we derive a
- To elucidate the relative importance of the mechanisms
- In doing so, we will not only provide some of the means by which we can interpret the computational results but also allow for simplifications of the governing equations.
- a priori to computations

- Before proceeding to write down the nondimensionalized equations, we will attempt to identify some of the scales
- Recalling the definition of the
- The time scale for the deformation can then conveniently be chosen as
- Before proceeding with the identification of the remaining scales

Advice for Results & Discussion

- Details the main findings and outcomes of your study
- Discusses the significance of the results and compare them with previous work using relevant references
- Uses tables only to improve conciseness or where the information cannot be given satisfactorily in other ways such as histograms or graphs
- Tables are numbered serially and referred to in the text by number
- Each table should have an explanatory caption which should be as concise as possible

Advice for Results & Discussion

- Generally, increasing …. This is indeed the case, as can be seen from Fig…
- Furthermore, as expected, increasing
- This indicates that at
- This is due to the fact that
- Like liquid cooling, the results indicate that increasing air flow rate improves stack performance, as can be inferred from Fig
- Conversely, at
- Moreover, a higher
- Thus far, we have examined…Now, let us have a look at
- Here, several features are apparent; foremost is that
- We expect that the
- This in turn implies that
- In the following, several
- We will then proceed with several transient deformation studies for the three aforementioned cases; whilst discussing these, it is instructive to recall the scales and dimensionless numbers and in particular see how well they predict the behavior of
- As mentioned in the Introduction,
- In an effort to extend previous work, we shall not only study the…, but also

- We begin with the
- …as depicted in Fig. ... Here, several features are apparent; foremost is that
- Can we explain that shrinking is significantly faster than the swelling for NC030? The answer is in the affirmative: returning to the scale analysis, the…
- This behavior is in line with experimental findings by…, who investigated..
- Clearly, the
- Turning our attention towards the…, as illustrated in Fig. 5a–b, we find that the
- In other words, for
- A closer look at the … in Fig. 5a–b reveals that
- This seems to suggest that the
- The fact that … indicates otherwise, implying… The question that arises is therefore whether we need… The answer can be found in
- An explanation for the … could be related
- The question is now whether… For this purpose,…
- It is well known that while a
- Finally, we address
- These results suggest that

Advice for Conclusions

- Highlights the novelty and significance of the work, and any plans for future relevant work

- Future work will seek to incorporate

Advice for Acknowledgements

- All sources of financial support for the project must be disclosed in the acknowledgments section
- The name of the funding agency and the grant number should be given, for example: This work was partially funded by the National Institutes of Health (NIH) through a National Cancer Institute grant R21CA141833
- Acknowledge those who helped you

- The authors gratefully acknowledge the financial support from…

Advice for Figures

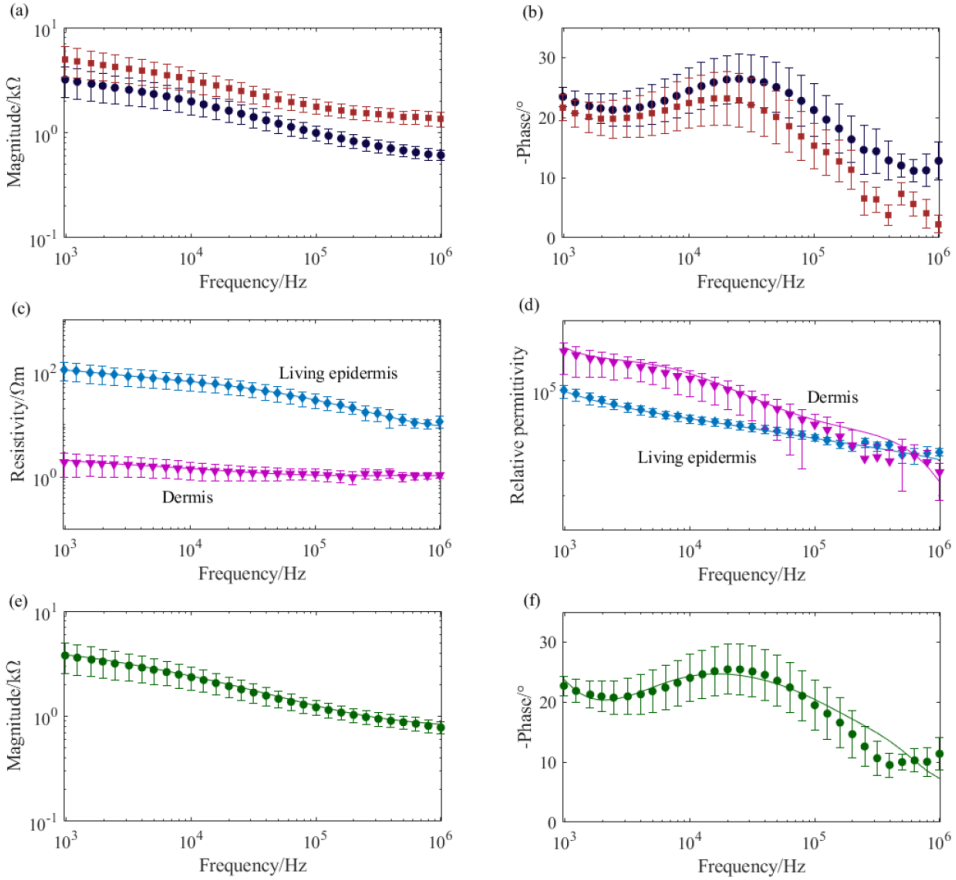

Fig. 2: The mean (depth 1 ●; depth 5 ■] and standard deviations (error bars) for the (a) magnitude and (b) phase of the experimentally measured impedances. The fitted mean resistivity and relative permittivity and their standard deviations can be found in (c) and (d) respectively for the living epidermis (♦) and dermis (▼); the fitted equations, Eqs. 7-8, are shown as lines. In (e) and (f), the validation set for depth setting 3 is shown for the experiments (●) and model predictions (lines).

- Font size (Matlab; typically 14)
- Line thickness (use thin lines)
- Higher fidelity: symbols (experiments [validation]; full set of equations [verification])
- Lower fidelity: lines (model predictions)
- Save as eps for Latex; if not, Tiff (check journal paper; beware resolution)
- See PostprocessingExample.m in CANVAS

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Tsai et al.: Dielectric properties of living epidermis and dermis. J Electr Bioimp, 10, 14-23, 2019

Advice for Tables

Text	Text	Text
1	2	3
1	2	3
1	2	3
1	2	3
1	2	3

Tab. 1: Table caption…

Text	Text	Text
1	2	3
1	2	3
1	2	3
1	2	3
1	2	3

Tab. 1: Table caption…

Text	Text	Text
1	2	3
1	2	3
1	2	3
1	2	3
1	2	3

Tab. 1: Table caption...

Handbook in CANVAS

Introduction

Phrase	Original text	DOI
In view of the lack of..., we apply and extend...	In view of the lack of in-vivo dielectric properties in the living epidermis and dermis between 1 kHz and 1 MHz, we apply and extend our old methodology of fitting a mechanistic mathematical model to experimental EIS measurements	https://doi.org/10.2478/joeb-2019-0003
The layout of the paper is as follows: First, ...	The layout of the paper is as follows: First, we summarize the experiments from our earlier study [9] and estimate the thicknesses of living epidermis and dermis from a literature survey. We then work through the main steps in the derivation towards the approximate analytical solution, which combines the idea of model reduction [10] and the generic, multi-electrode and -layer approximate solution [11]. After an outline of the parameter fitting, we discuss the experimental measurements at the three depth settings as well as the fitted dielectric parameters. Finally, we suggest extensions that seek to resolve the skin layers in more detail and end with conclusions.	https://doi.org/10.2478/joeb-2019-0003

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Do not plagiarize! We only use half-sentences and phrases etc.