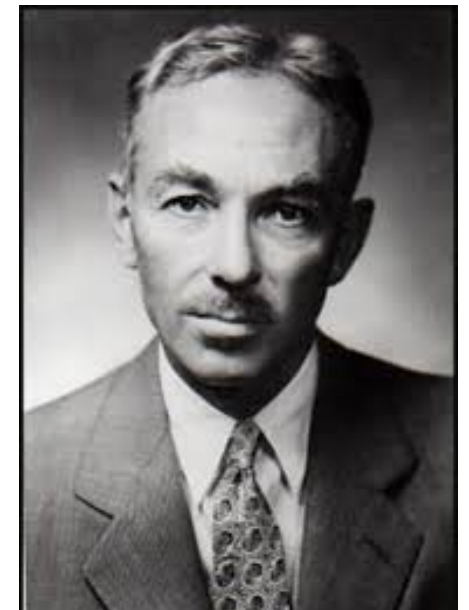
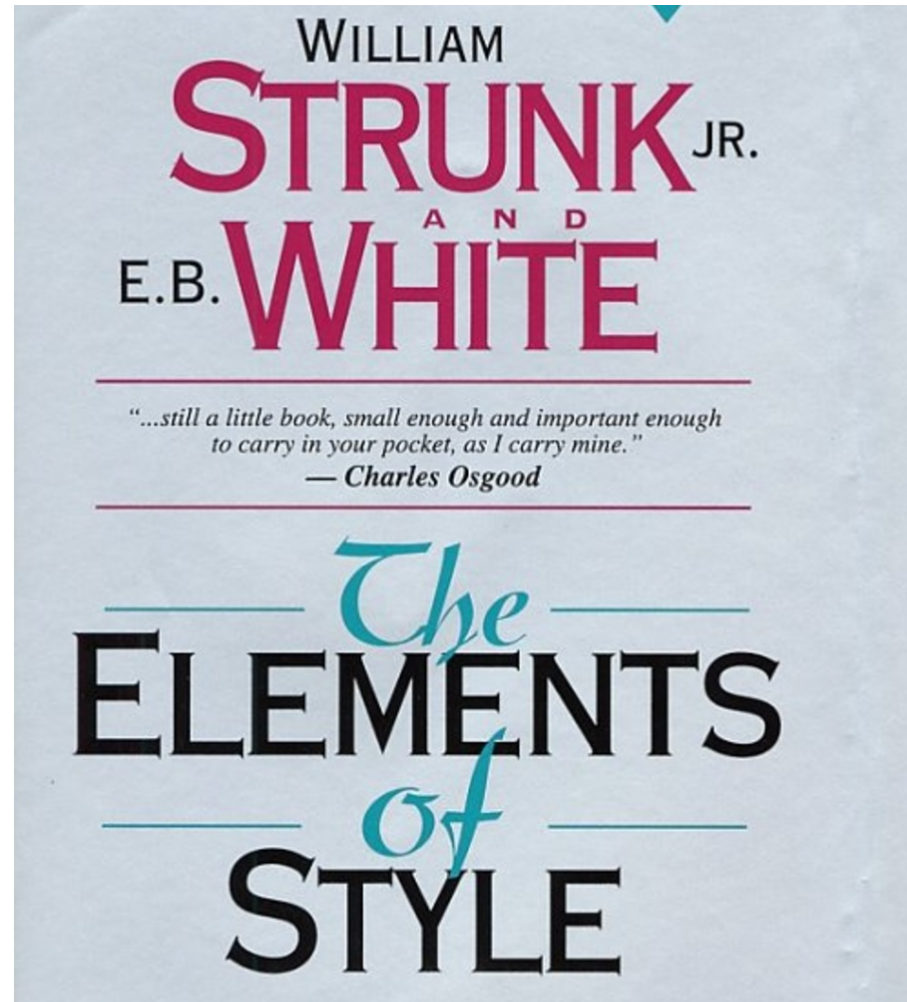


Scientific Writing IMB521:



Turning in assignments:

Goodrum_Outline.docx

Wilson_Aims.docx

Frelinger_Research Plan.docx

Doyle_Research Plan v2.docx

Please be on time to respect the time of the instructors!!

Words to write by...

You cannot hide bad science/ideas in good writing....

but, you can certainly hide good science/ideas in bad writing!

Types of Scientific Writing

Presenting your own work

Abstract

Research article

Grant proposal

Commenting on the work of others

Literature review

Comprehensive review

Commentary or minireview

Review of research articles

Review of grant proposals

Elements of Style: Strunk and White

Read Chapter I, II, V

- I. Simple grammar and punctuation that you may have forgotten or never knew to begin with.
 - commas
 - subject/verb agreement
 - sentence structure
 - clauses
- II. Composition
 - paragraph structure
 - active vs. passive voice
 - needless words
 - tense
 - definite, concrete, specific language
- V. Style

Elements of Style: Strunk and White

Style is a mystery that has few hard and fast rules!

Look what happens when we try to revise a familiar sentence with distinct style:

These are the times that try men's souls—Thomas Paine
(ordinary words in an anything but ordinary arrangement to have an extraordinary effect) point #1: ordinary words are best.

Times like these try men's souls.
How trying it is to live in times like these!
There are trying times for men's souls.
Soulwise, these are trying times.

(There is nothing grammatically wrong here, but the style does not have the same effect!)

Elements of Style: Strunk and White

Your challenge in writing science is to convey a clear and precise message with power using ordinary words...

....this comes down to finding your style!

Chapters I and II are critical for clarity and precision,
while chapter V is essential for impact.

Rules of Engagement ~~style~~

1. Place yourself in the background to draw the attention to the substance
2. Write in a way that comes naturally (do not adopt the style of others)
3. Work from a design (outline, plan)
4. Write with nouns and verbs (adj and adv are assistants, not the boss)
5. Revise and rewrite (revising is part of writing)
6. Do not overwrite (common fault)
7. Do not overstate (death in science; handily diminishes the whole)
8. Avoid empty qualifiers (rather, very, little...these are leaches that suck blood from words)
9. Do not affect a breezy manner—not everything that comes to your mind is of general interest and stream of consciousness is painful and boring.
10. Use orthodox spelling, no contractions in formal writing, or jargon
11. Avoid fancy words when a simple one will do
12. Do not take shortcuts at the cost of clarity

Style

```
graph TD; Style[Style] --- S1[1. Structure: Strategy]; Style --- S2[2. Language: Word choice and arrangement]; Style --- S3[3. Illustrations: mesh figures and text to tell the story; to persuade; 1000 word clarity; new level of detail]; S1 --- P1[Prescribed formatting]; S1 --- P2[By Design]; S2 --- P3[Precision]; S2 --- P4[Clear]; S2 --- P5[Forthright]; S2 --- P6[Concise]; S2 --- P7[Fluid]; S2 --- P8[Voice];
```

1. Structure: Strategy

Prescribed formatting

By Design

2. Language: Word choice and arrangement

Precision

Clear

Forthright

Concise

Fluid

Voice

3. Illustrations:

mesh figures and text to tell the story; to persuade; 1000 word clarity; new level of detail

Style

Precise: use words with exact meanings;
say what you mean

Clear: keep it as simple as possible;
avoid saying what is not relevant to the point

Forthright: use a straightforward tone;
assume the role of a teacher

Familiar: avoid or explain new terms;
do not alienate your reader

Concise: avoid needless words;
every word should count

Fluid: use transitions and vary rhythms;
flow should move through doc w/o tripping or tiring reader

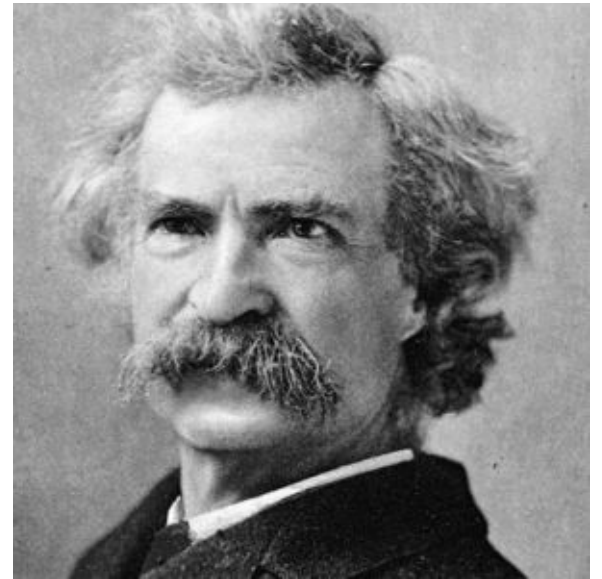
Voice: strive for active and limit passive;
engage your reader in YOUR story



Be Precise

“The difference between the right word and the almost right word is the difference between ‘lightning’ and ‘lighting bug’.”

—Mark Twain



Which paragraph is the most precise? Which is most clear?

Whales are large marine mammals of the order Cetacea. **Whales** are warm blooded, have hair, and breathe air into lungs. Female **whales** give birth to live young and nourish them with milk. Some **whale** species have teeth. Other **whale** species have strips of keratin called baleen through which they strain seawater to capture food.

Whales are large marine mammals of the order Cetacea. **These behemoths** are warm blooded, have hair, and breathe air into lungs. **Females** give birth to live young and nourish them with milk. Some **of these ocean giants** have teeth. Other **cetaceans** have strips of keratin called baleen through which they strain seawater to capture food.

Whales are large marine mammals of the order Cetacea. **They** are warm blooded, have hair, and breathe air into lungs. **They** give birth to live young and nourish them with milk. **Some** have teeth. **Others** have strips of keratin called baleen through which they strain seawater to capture food.

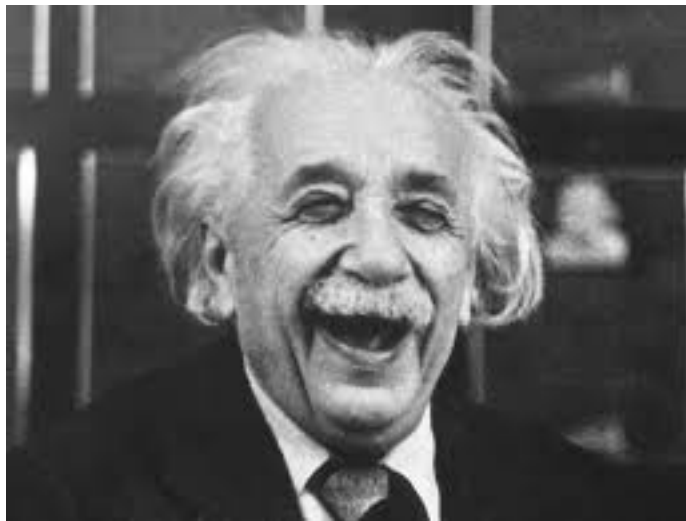


Be Clear

Be Clear

“When you are out to describe the truth,
leave elegance to the tailor.”

—Albert Einstein



Strategies for Clarity

Avoid needlessly complex words:

utilize

use

transpire

happen

aforementioned

mentioned

firstly

first

herein

here

facilitate

cause

Strategies for Clarity

Avoid needlessly complex sentences:

Each sentence should have one idea

The subject should be followed as soon as
possible by the verb

Place the subject at the beginning of the sentence

Place the new information/idea at the end of the
sentence

Strategies for Clarity

Avoid ambiguity: does your choice of words or punctuation have more than one interpretation?

Only I tested the bell jar for leaks yesterday.

I **only** tested the bell jar for leaks yesterday.

I tested **only** the bell jar for leaks yesterday.

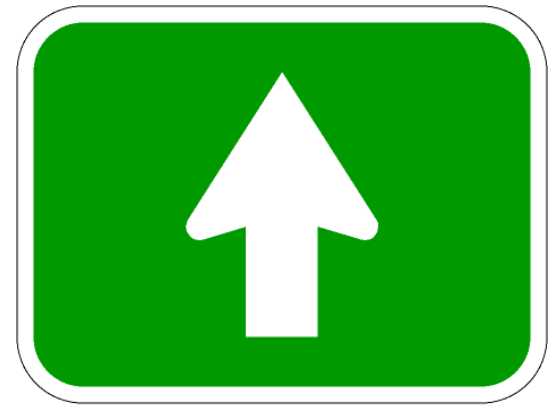
I tested the bell jar **only** for leaks yesterday.

I tested the bell jar for leaks **only** yesterday.

Be Fortright

“Short words are best, and old words, when short, are best of all.”

—Winston Churchill



Be Concise

Avoid: Pretension (big, unwieldy words)

Arrogance (As well known..., clearly demonstrates)

Obsequiousness (fawning flattery)

Silliness (cliché)

Colloquialisms (slang, jargon)

Weak nouns and verbs

Be Familiar

Avoid unfamiliar terms if possible

For the first year, the links with SPDC and the HAC were not connected, and all required OCS input data were artificially loaded. Thus, CATCH22 and MERWIN were not available.

Because some of the links in the computer system were not connected the first year, we could not run all the software codes.

Be Familiar

Define unfamiliar terms when they cannot be avoided

Simple definition

Brief explanation

Explanation illustrated by examples

Explanation illustrated by analogy

Be Concise

“Vigorous writing is concise. A sentence should have no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make every sentence short, or that he avoid detail and treat his subject only in outline, but that every word tell.”

—William Strunk



Be Concise

Avoid redundant words:

(already) existing	introduced (a new)
(alternative) choices	mix (together)
at (the) present (time)	never (before)
(basic) fundamentals	none (at all)
(completely) eliminate	now (at this time)
(continue to) remain	period (of time)
(currently) being	(private) industry
(currently) underway	(separate) entities
(empty) space	start (out)
had done (previously)	(still) persists

Be Concise

Reduce fat phrases:

At this point in time	Now
At that point in time	Then
Has the ability to	Can
Has the potential to	Can
In light of the fact that	Because
In the event that	If
In the vicinity of	Near
Owing to the fact that	Because
The question as to whether	Whether
There is no doubt but that	No doubt

Be Concise

Avoid meaningless phrases:

It is interesting to note that . . .

As a matter of fact . . .

It should be pointed out . . .

I might add that . . .

In the course of . . .

It is noteworthy that . . .

The fact that . . .

It is significant that . . .

Avoid useless, parasitic intensifiers:

Virtually

Remarkably

Extremely

Valuable

Very

Diametrically

Completely

Basically

Actually

Be Concise

Clean it up!

To be indicative of → to indicate

To be reflective of → to reflect

To be supportive of → to support

To be implicative of → to imply

The cells responded in a rapid *manner* → the cells responded rapidly

The results are *suggestive* of a.... → The results suggest...

The protein *functions to promote* progression of the cell cycle progression
→ The protein promotes cell cycle progression

We *observed disruption* of cytoplasmic membranes *during infection* →
Virus infection disrupts cytoplasmic membranes

Be Concise

Write the way you speak.

Convolutd

EC infection lacking UL135 displays virions without envelopes or containing aberrant envelopes

Revised

Viruses lacking UL135 fail to envelop virions or do so aberrantly

Be Concise

Write the way you speak...or your writing becomes wordy and convoluted

Convoluted

The replication kinetics of each mutant will be examined against the WT and full deletion mutant. Virus replication will be measured by TCID50.

Revised

We will analyze the replication of each mutant virus relative to WT or UL135STOP by TCID50.

Be Concise

... direct and assertive/strong

Weak verb phrase

Made the arrangements for
Made the decision to
Made the measurement of
Functions to promote
Performed the development of
Is used to detect

Strong

arranged
decided
measured
promotes
developed
detects

Be Clear, Forthright and Concise

The protein functions to activate a the mTOR signaling pathway.

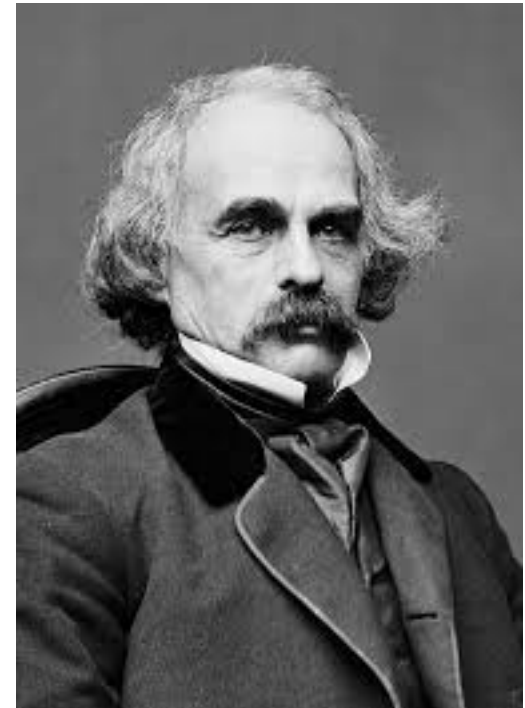
revise to...

The protein activates mTOR signaling.

Be Fluid

“The greatest possible merit of style is, of course, to make the words disappear into the thought.”

—Nathaniel Hawthorne



Hint: Read what you wrote out loud to yourself or someone else

Be Fluid: Vary Rhythms

Sentence openers:

Subject-Verb

The enzyme catalyzed . . .

Prepositional Phrase

Within minutes . . .

Transition word

Recently, . . .

Introductory clause

Although we found . . .

Infinitive clause

To understand . . .

Participial phrase

Its oxygen dwindling, the . . .

Verb (Question)

Is the reaction accelerated . . . ?

We will infect cells and measure yield. We will determine if the drug affects pathogen replication. We will examine this over a time course.

Be Fluid: Vary Rhythms

Sentence lengths:

Keep the average length in teens of words

Occasionally use a short or long sentence

Change lengths often

Sentence structures:

Simple sentence (one subject)

The yfg deletion mice were viable.

Compound sentence (and, but; two clauses that can stand alone)

The yfg deletion mice were viable, but had abnormal claw development.

Complex sentence (add a dependent clause)

Despite abnormal claw development, the yfg deletion mice could run as fast as wild type littermates.

Be Fluid: Vary Rhythms

Use parallel sentences:

- Parallel structures easily express relationships
- Do not consider them repetitive
- Prevents skewing

People in the reading condition read the words. Other subjects heard to a recording in the listening condition

Better:

People in the reading condition read the words. People in the listening conditions heard a recording of the words.

or

People in the reading condition read the words; people in the listening conditions heard a recording of the words.

Be Fluid: Vary Rhythms

Make transitions

Continuation

also

moreover

first . . . second

Pause

for instance

for example

in other words

Reversal

however

on the other hand

conversely

Voice: Make sure they hear you

Passive vs. Active

The levels of YFG transcripts will be determined by RNA blot analysis.

We will measure levels of YFG transcripts by RNA blot analysis.

Voice: Make sure they hear you

Passive = Limp and wordy

Active is the way to go 99% of the time

- People speak actively so active writing captures the compelling sound of everyday thought and speech
- Passive writing hides the structure and is vague and evasive; impersonal
- AVOID passive by avoiding “to be”, -ive and -ion

Voice: Make sure they hear you

Active vs. Passive

Passive: The patient will be asked to breath in and out of a tube while the doctor measures the flow.

Active: Ask the patient to breath in and out of the tube while the doctor is measuring flow.

Passive: The treated cells will be analyzed for their ability to respond to subsequent stimulation.

Active: We will analyze the ability of cells treated with X to respond to subsequent stimulation.

Voice: Make sure they hear you

Which voice to use?

Concise, assertive, direct

I will always remember my first trip to Boston.

Passive

My first trip to Boston will always be remembered by me

Indefinite

...by whom? You or the Boston PD?

My first visit to Boston will always be remembered

Voice: Make sure they hear you

Concise, assertive, direct

Dead leaves covered the ground.

Passive

There were a great number of dead leaves covering the ground.

Voice: Make sure they hear you

Consider what you want the reader to “hear”?

I will determine the levels of YFG transcripts by
RNA blot analysis.

I will use RNA blot analysis to determine the levels of
YFG transcripts.

I will analyze gene expression by RNA blotting.

Be Fluid: Logical Flow

- State main point of each paragraph in the first sentence to orient the reader
- An outline is critical to keep the logic in tact and not circular
- Come up with a formula for presentation of experimental plan, be consistent



Examples of writing needing help

Small group exercise

Example 1: The propagation of viruses in cultured cells results in the selection of more highly replicative and cytopathic viruses

Better: The propagation of viruses in cultured cells selects for more highly replicative and cytopathic viruses

Examples of writing needing help

Small group exercise

Example 2: As the main difference between intact genomes and 180.92 was restricted to ORFs other than Rh128, it is plausible to deduce that the attenuated growth of strain 180.92 in MKE cells results from a minimum of one ORF within the translation impaired or genetically deleted portion of the psi genome region.

Examples of writing needing help:1
Oh, give up.

Failure to inhibit suppression did not occur.

Examples of writing needing help:2

Make more concise

Using proteomics, we have identified cellular proteins that interact with pUL135. The proteins identified predominantly regulate ubiquitin pathways.

Using proteomics, we have identified several cellular proteins that interact with pUL135 and are known to regulate ubiquitin pathways.

Examples of writing needing help:3

Be direct

We will determine the residues targeted for ubiquitination of each cellular target.

We will determine the residues **ubiquitinated** on each cellular target.

We will determine the residues in each cellular protein targeted for **ubiquitination**

Beware of the –tion!
(it is generally preceded by a non-specific verb)

Examples of writing needing help:4

Needless words

RTA is hypothesized to function to promote viral reactivation from latency through the pathways it accesses by co-opting ubiquitin pathways

We hypothesize that RTA promotes reactivation from latency through the pathways it co-opts via ubiquitination.

We hypothesize that RTA promotes reactivation from latency by co-opting ubiquitin pathways.

Examples of writing needing help:5

Imprecise and unnecessarily confusing

We, therefore, hypothesize a mechanism whereby protein Z modulates innate immunity by modulating TLR 3 activation thereby limiting reactivation.

We hypothesize that protein Z restricts viral reactivation by inhibiting the TLR3-mediated innate immune response.

Examples of writing needing help:6

Indirect and wordy

As Robovirus infects a wide variety of cells throughout the human body, there are many potential sites for chronic infection.

Robovirus chronically infects a variety of human cells.

Examples of writing needing help:7

Wordy, subject at the end

In previous studies, we have shown that a invasion defect exists in epithelial cells for a bacterial strain lacking gene Y.

We demonstrated that a bacterial strain lacking gene Y is defective for epithelial cell invasion.

Examples of writing needing help:8

Passive

GFP expressed from the viral genome was utilized to compare viral entry and delivery of the genome to the nucleus in glial cells infected with the wild type of mutant virus.

We analyzed viral entry and delivery of the genome to the nucleus during wild-type or mutant virus infection in glial cells by comparing GFP expression from the virus genome.

No shorter, but clearer.