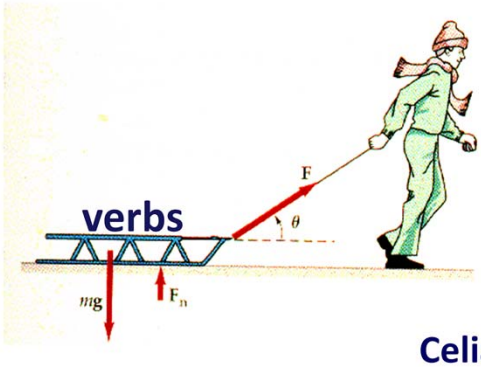
Voice, Person, Tense: Making Verbs Work



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In this class, we'll look at how proper verb choice can improve the clarity and vigor of your scientific writing.

Verbs provide the momentum of writing

The proper selection and use of verbs can be the difference between clumsy, bloated narrative and crisp, direct scientific writing.

Our friend is wrong here; the purpose of scientific writing is to ***convey meaning concisely and unambiguously***; if it sounds convoluted and hard to understand, it's not good writing.

"Any intelligent fool can make things bigger and more complex... It takes a touch of genius—and a lot of courage—to move in the opposite direction."

Albert Einstein

Voice—"to be" or "not to be"

Active voice: the subject of the sentence performs the action—the subject acts

Passive voice: the subject of the sentence receives the action of the verb—the subject is acted upon

The pitcher throws the ball.

The ball is caught by the catcher.

The active voice uses direct, action verbs, and the subject of the sentence *does* the action.

The passive voice uses "to be" verb forms, and the subject of the sentence *receives* the action.

The active voice is always more direct and is usually more concise, because it may avoid the need for clarifying prepositional phrases.

The "rule" for years has been that scientific papers should be written in the third-person passive voice, but that rule is breaking down, because passive voice can be awkward and wordy in the hands of amateurs. *

From the *AIP Style Manual,* 4th ed. (New York, American Institute of Physics, 1990), p. 14:

"The old taboo against using the first person in formal prose has long been deplored by the best authorities and ignored by some of the best writers... The passive is often the most natural way to give prominence to the essential facts: Air was admitted to the chamber. (Who cares who turned the valve?) But avoid the passive if it makes the syntax** inelegant or obscure..."

**We remain unmoved by this argument.*

*the meaning derived from the order of words in the sentence—*cme*

Using the passive voice offers two distinct advantages in technical writing

- ✓ Creates the appearance of objectivity and a facts-based approach
- ✓ Allows "front-loading" of key words and phrases to increase their impact

"We found that increasing the pressure resulted in shear failures along grain boundaries." (first person/active voice)

"Increasing pressure resulted in shear failures along grain boundaries." (impersonal/passive voice)

Consider the "authority" of the following statements:

"We found that increasing the pressure resulted in shear failures along grain boundaries." (first person/active voice)

"Increasing pressure resulted in shear failures along grain boundaries." (impersonal/passive voice)

The first sentence expresses the implicit, niggling possibility that although ***you*** obtained this result, somebody else might get different results. Or maybe you're just mistaken in what you think you saw.

The second sentence, which is also more concise even though it's passive voice, presents your result as a naturally occurring phenomenon, independent of who observed it.

Scientific writing has traditionally been third person, passive voice…

First person: I, we
Second person: you (singular), you (plural)
Third person: he, she, it, they

…but more editors are allowing first person, active voice, because it is usually more direct and concise

I still go highly nonlinear at first person in an abstract—*cme**

*So does AIP. From the *AIP Style Manual*, 4th ed.:

"Special standards for usage apply in two sections of a paper: (i) Since the abstract may appear in abstract journals in the company of abstracts by many different authors, avoid the use of "I" or "we" in the abstract..."

AIP makes an exception for the acknowledgments section:

"...(ii) Even those who prefer impersonal language in the main text may well switch to "I" or "we" in the acknowledgments, which are, by nature, personal."

What do you want to emphasize?

1. **"We used an SEM to examine the surface defects of the GaAs thin films." (AV)**
2. **"We examined the surface defects of the GaAs thin films using an SEM." (AV)**
3. **"An SEM was used to examine the surface defects of the GaAs thin films." (PV)**
4. **"Surface defects of the GaAs thin films were examined using an SEM." (PV)**
5. **"Gallium-arsenide thin films were examined for surface defects using an SEM." (PV)**

Use of the passive voice places the concept or observation that you want to emphasize at the beginning of the sentence, where readers pay the most attention. What you put in that first place depends on what you want to emphasize.

In these examples, if the paper reports the first use ever of an SEM for these types of studies, and that's the most important point, use sentence 3.

If the main point of the paper is the study of surface defects, use sentence 4.

If this experiment is the first time anybody has looked at GaAs thin films for surface defects, and that's the news, use sentence 5.

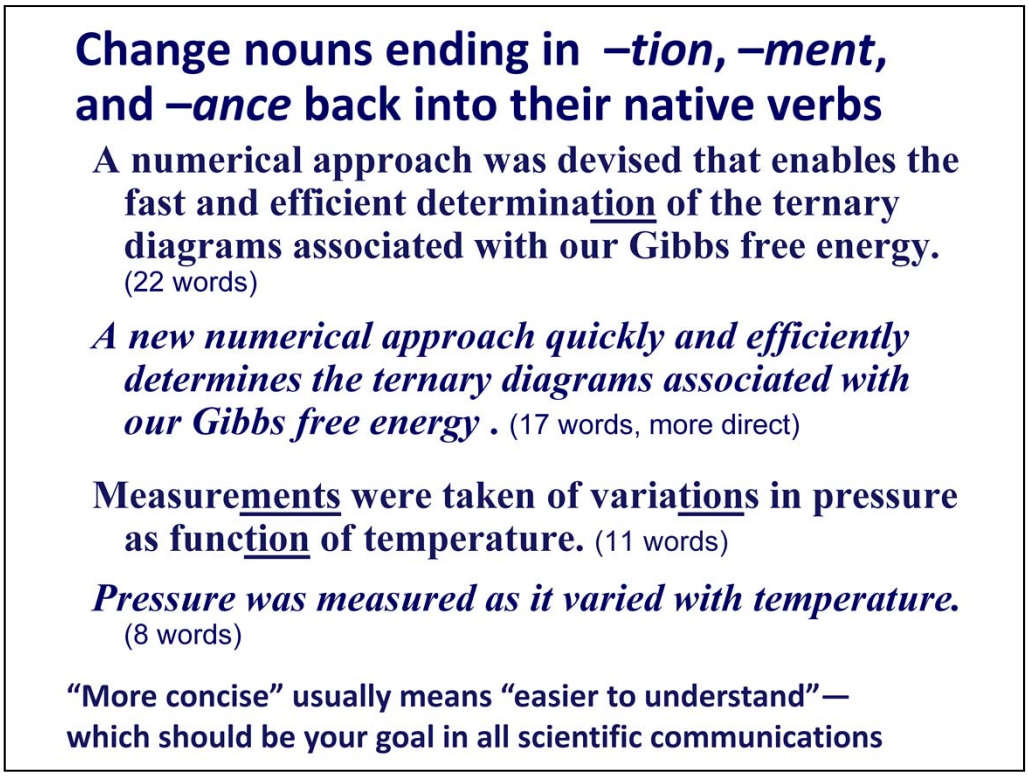
Replace wimpy verb phrases with strong action verbs

Weak verb phrases	Strong verbs
made a determination	determined
performed a measurement	measured
carried out the analysis	analyzed

The human immune system is responsible not only for the identification of foreign molecules, but also for actions leading to their immobilization, neutralization, and destruction. (25 words)

*The human immune system not only **identifies** foreign molecules, but also **immobilizes**, **neutralizes**, and **destroys** them.* (16 words, vigorous, more direct)

Instead of worrying about passive vs. active, replace weak verb phrases and "is" verbs with "action" verbs—they are always more concise, and they will make your writing crisper and more direct.



In English, for many words derived from Latin, we transmorgify verbs into nouns by adding "–tion," "–ment," or "–ance" to the root word. So "act" becomes "action"; "arrange" becomes "arrangement"; and "perform" becomes "performance."

An easy way to improve the directness and conciseness of your writing is to change every *–tion*, *–ment*, and *–ance* word back into its original verb.

Use "is" verbs judiciously

Weak verb phrases	Strong verbs
is beginning	begins
is used to control	controls

Restrict *is* to sentences that *define* or *equate*

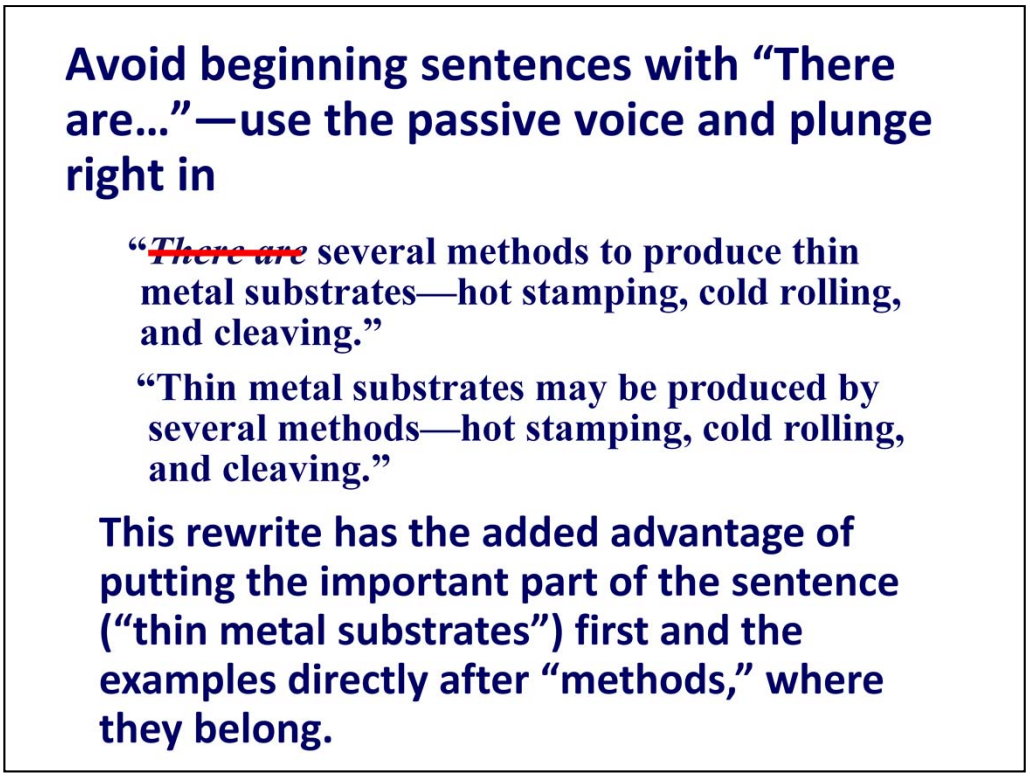
"A positron *is* a positively charged electron produced in the beta decay of neutron-deficient nuclides."

Use a strong verb in sentences that do not present a definition or equality

"Generally, a storage ring *is used* not only to store charged particles, but also *to define* their energy and trajectory." (20 words)

"Generally, a storage ring not only *stores* charged particles but also *defines* their energy and trajectory." (16 words, more direct)

Your writing will almost always be more concise if you use an "action" verb instead of an "is" verb form.



Train yourself to spot "There is..." and "There are..." sentences and rewrite them in the passive voice, which puts the important point first in the sentence ("front loads").

Don't jump back and forth between present and past tense

Horrible example:

"A single beam of light *was directed* obliquely into a waveguide formed by two parallel, movable mirrors. The beam *experienced* multiple reflections from the mirrors and *propagates* as a combination of many modes. Each mode *interferes* with every other mode, which *led* to a modulation transmitted through the waveguide. The number of reflections within the multimode waveguide interferometer *determines* the device's sensitivity."

The last verb (*determines*) should be in the present tense, because it is a *time-independent fact*

Everything you *did* should be written in past tense to make clear what you've done

I think the strongest argument that can be made for using the past tense in papers is that doing so makes what you've actually ***done*** clear.

Here's a recent abstract from arXiv that is a good example of what I mean (J.E. Villegas, I.K. Schuller, "Controllable manipulation of superconductivity using magnetic vortices," arXiv:1101.3846):

> "The magneto-transport of a superconducting/ferromagnetic hybrid structure consisting of a superconducting thin film in contact with an array of magnetic nanodots in the so-called "magnetic vortex-state" exhibits interesting properties. For certain magnetic states, the stray magnetic field from the vortex array is intense enough to drive the superconducting film into the normal state. In this fashion, the normal-to-superconducting phase transition can be controlled by the magnetic history. The strong coupling between superconducting and magnetic subsystems allows characteristically ferromagnetic properties, such as hysteresis and remanence, to be dramatically transferred into the transport properties of the superconductor."

So what exactly did the authors ***do*** that they're reporting in this paper? The abstract, written in the present tense, sounds like a collection of already known facts. It's not clear (at least to me) what the authors have contributed.

Avoid unruly verb forms as well as tense flips

A solution including DNA *is dropped* on the sample. The liquid *dries*, and with any luck, some of the DNA *has landed* across the trench, *creating* a perfect nanoscale bridge.

A solution containing DNA was dropped onto the substrate, and some of the DNA strands landed such that the ends of the strand lay on opposite sides of the trench. As the liquid evaporated, a perfect nanoscale "bridge" remained.

The first example, which was taken from a student's senior thesis draft, has several writing flaws, besides the out-of-control verbs.

1) It's generally better not to attribute any of your scientific results to "luck." "Hope" should also be avoided in scientific writing.
2) Solutions don't "include" things, they "contain" them. And liquids don't "dry"; they "evaporate." Train yourself to use language precisely.

Use parallel construction throughout

In verbs in sentences

"Further possible experiments include *stopping* an antiproton in a Cerenkov detector and the *observation of* antiproton annihilation in a cloud chamber."

"Further experiments could include *stopping* an antiproton in a Cerenkov detector and *observing* antiproton annihilation in a cloud chamber."

In lists and series

"The process involves three main steps: *cooling*, *pulverization*, and *being screened*."

The process involves three main steps: *cooling*, *pulverizing*, and *screening*."

"Parallel construction" is a rhetorical device whereby items in a series are given in the same grammatical form. Faulty parallelism is not merely inelegant; it often leads to wordiness and ambiguity.

Learn to spot faulty parallelism

"Once the earthquake has subsided, you are not yet out of danger. Often the electricity has gone out and it is dark. However, striking a match or an open flame may cause a gas explosion."

Ms. P's rewrite:

"During earthquakes, danger may still exist after the ground stops shaking. Breaks in electrical lines could interrupt electrical service and cause loss of lighting. And leaks from natural gas lines could result in explosions if a flame from a match or a candle were used for illumination."

Although it is 12 words longer, I think my version is more specific, and the language is much more precise

This example of faulty parallelism is taken from Michael Alley's *Craft of Scientific Writing* (q.v. http://www.writing.engr.psu.edu/exercises/grammar2.html#s2):

The verb phrase "striking a match" is not parallel with the noun phrase "an open flame." What the author has written is that you should not "strike" a match or an open flame. (How do you "strike" an "open flame"?—sounds dangerous to me.) You can correct this sentence by either making both elements in the series verb forms ("striking a match or creating an open flame") or making them both noun forms ("a lit match or an open flame").

The faulty parallelism is only part of the problem, however.

Ms. Particular quibbles:

1. Earthquakes don't "subside"; the tremors cease.
2. "Electricity" doesn't "go out"; electrical service fails.
3. Natural gas doesn't explode unless it leaks into the air.

Try Alley's writing exercises yourself at http://www.writing.engr.psu.edu/exercises/.

What's wrong with this sentence?

"The development of the theory of convection began some 85 years ago with Lord Rayleigh's analysis of instability in fluids heated from below, but it was not easy for geoscientists to accept that a mechanism applicable to a fluid like water could also be relevant to understanding the behavior of the solid mantle composed of silicates."

It's impossible to understand the meaning of this long, convoluted sentence on the first reading. Even if you're a native English speaker.

Even if you're a geophysicist.

What's wrong with this sentence?

> "The *development of* the theory of convection began some 85 years ago with Lord Rayleigh's analysis of instability in fluids heated from below, but *it was not easy* for geoscientists *to accept* that a mechanism applicable to a fluid like water could also *be* relevant *to understanding* the behavior of the solid mantle *composed* of silicates."

It's too long—56 words!

It uses noun-ified verbs (*development of*)

It uses "to be" verbs instead of active verbs

It uses infinitives and gerunds instead of active verbs

It violates the three-preposition rule* (10 preps)

One of the easiest ways to improve your writing is to write short (<25 words) declarative sentences using active verbs. If you routinely write sentences containing more than 25 words, you likely have long strings of prepositional phrases, weak verbs, misplaced modifiers, and indefinite pronoun references—all leading to difficulty in interpreting your meaning.

Refer to Ms. P on "like," which is used incorrectly in the example, but that's a rant for another day. (q.v. http://people.physics.illinois.edu/Celia/MsP/Like.pdf)

*More on the three-preposition rule (3PR) next semester—stay tuned!

Here's how to fix it:

"Convection theory began some 85 years ago, with Lord Rayleigh's analysis of instabilities in fluids heated from below. While convection clearly explained the behavior of fluids, geoscientists were reluctant to apply the theory to movement in the Earth's solid silicate mantle."

- Two sentences of ≈20 words each
- Verbs are verbs
- Concise and direct

To recap...

1. Use strong, active verbs, not weak verb phrases
2. Use "is" sentences only to define or equate
3. Use the passive voice to emphasize what was found, not who did the finding
4. Avoid starting sentences with "There are..." or "There is..."—use an active verb and plunge right in
5. Use past tense for what you did and present tense for time-independent facts
6. Write short (<25 words) sentences

NOTES: