What this class is:

A writing workshop

Why?

Scientists spend a ridiculous amount of time writing

Why?

Efficient writing leaves more time for the fun stuff

Why?

Writing is finishing.

Finishing = free to pursue new science.

Why?

Good writing makes your science more effective

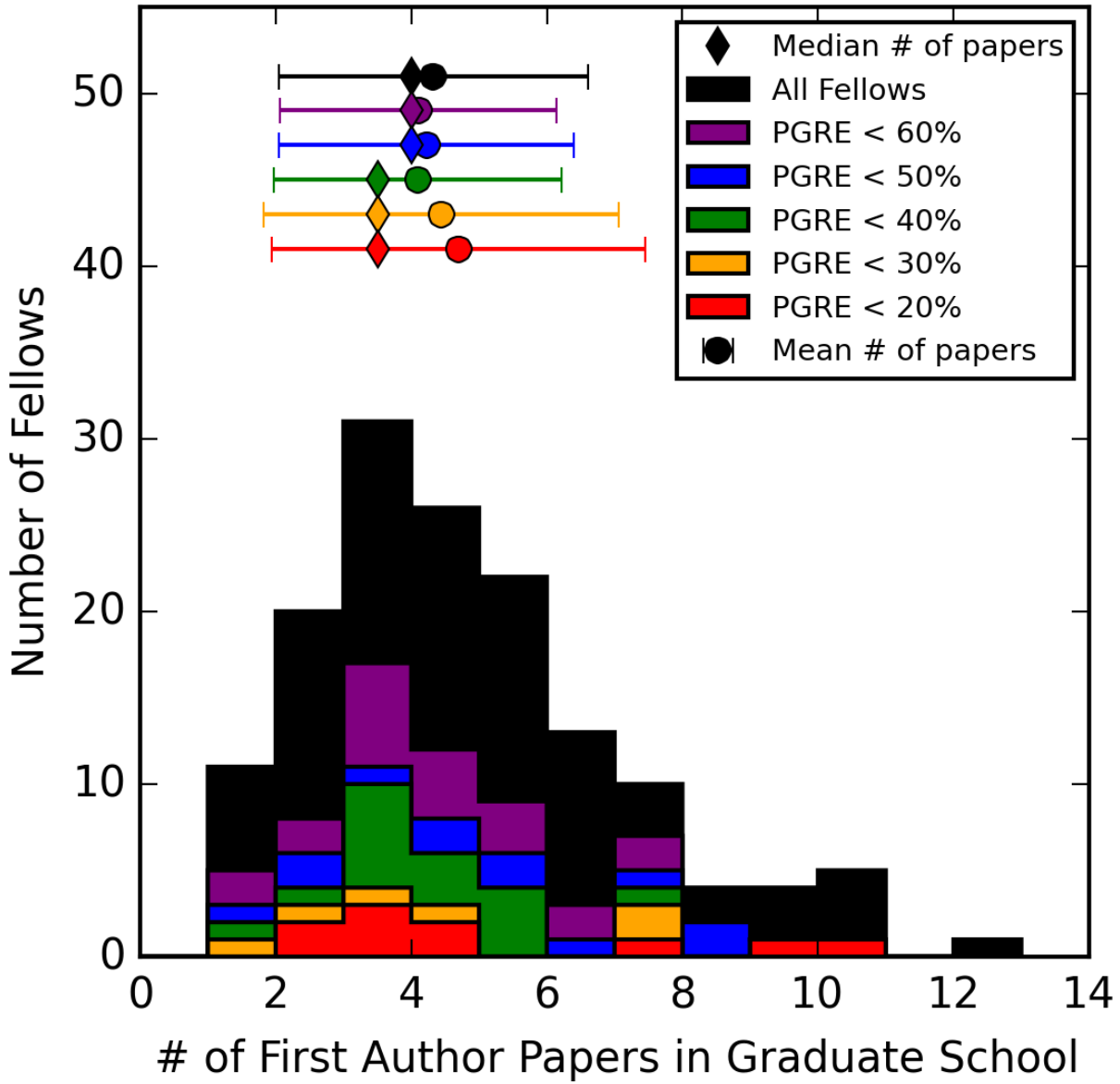
- Papers are understood
- Your ideas enter public discussion
- Your proposals are accepted

Why?

Productive, good writing is rewarded

- Influence
- Reputation
- Resources
- Jobs

1-2 First Author Papers a Year

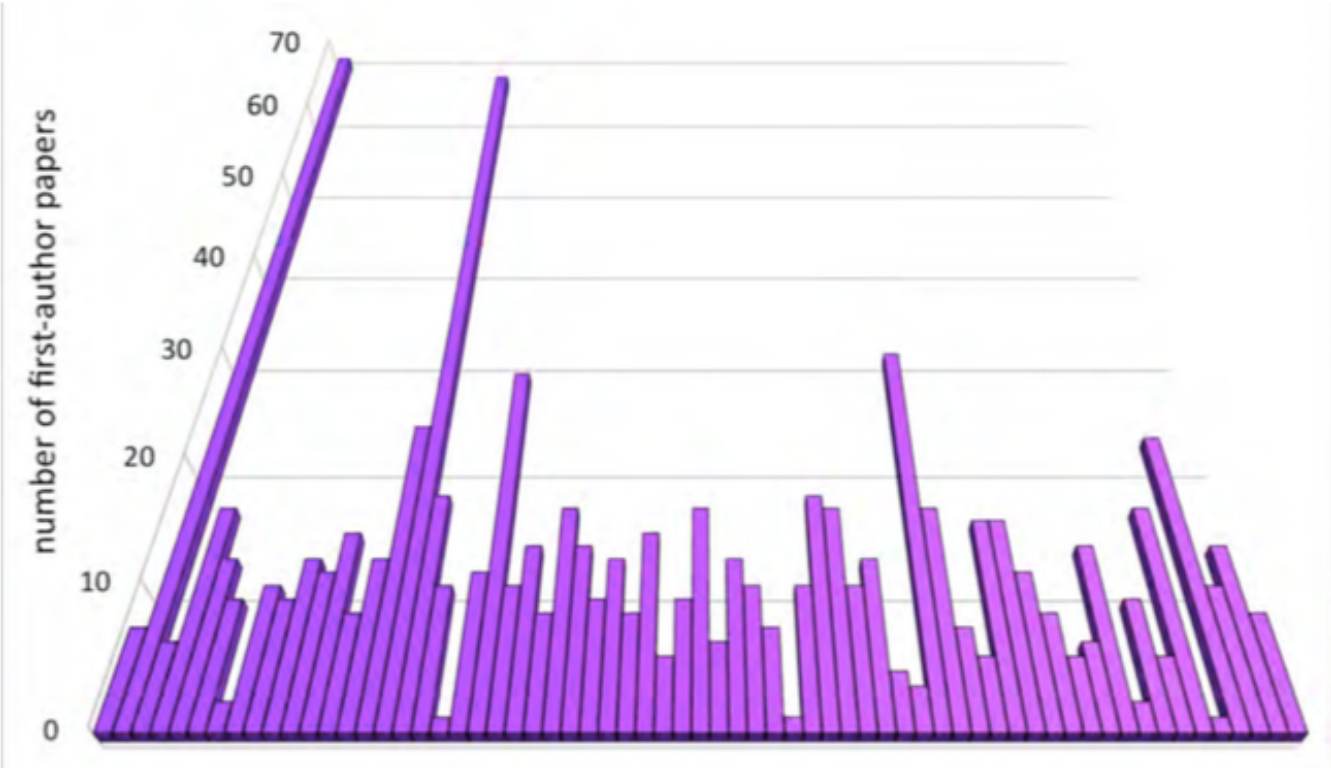


Levesque et al 2015: http://arxiv.org/abs/1512.03709

of first-author papers of 65 hires into tenure track positions in 2011

Astronomers who got a tenure-track or similar position last year typically had 10 first-author publications in peer-reviewed journals, and some people had many more than that.

Advice: Evidence of scientific leadership is important. It's fine to be part of a large team, but your publication record must also demonstrate your capacity to lead research projects.



Why is writing weighted so heavily?

Writing *is* science

Julianne Dalcanton @dalcantonJD · Oct 27

Very true. When I'm having trouble writing, it's usually always that I haven't actually finished thinking.

> **Robert McNees** @mcnees
> Like Vonnegut said: "If you can't write clearly, you probably don't think nearly as well as you think you do." theatlantic.com/education/arch…

7 16

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But to clarify, the writing (or at least, the attempt to write) is ESSENTIAL to figuring out what I need to think about.

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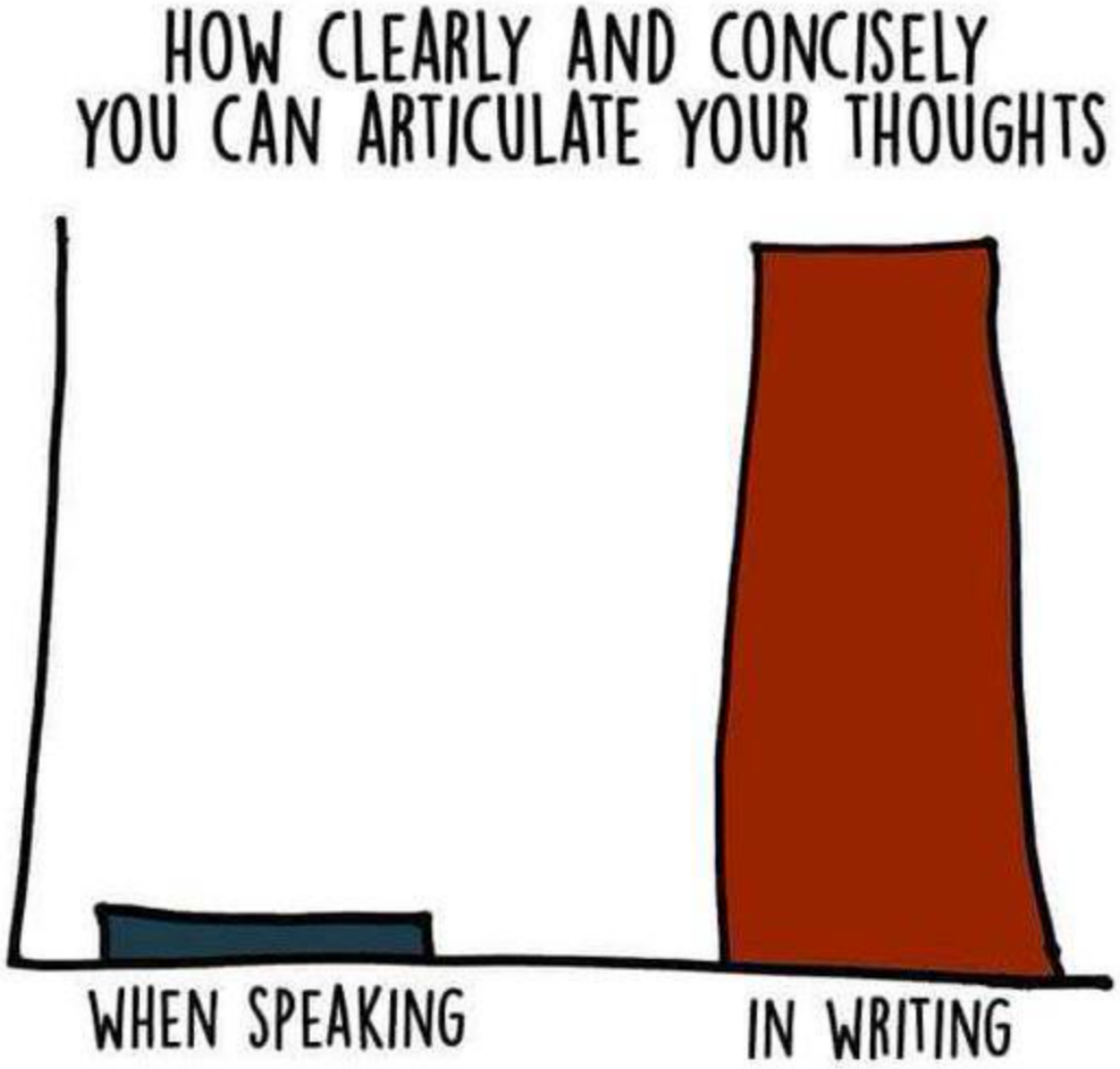
Writing isn't a different thing than science. The science *is* the writing, because writing is where the logical vetting happens.

RETWEETS	LIKES
5	9

Telling people your result is never as rigorous as writing it.

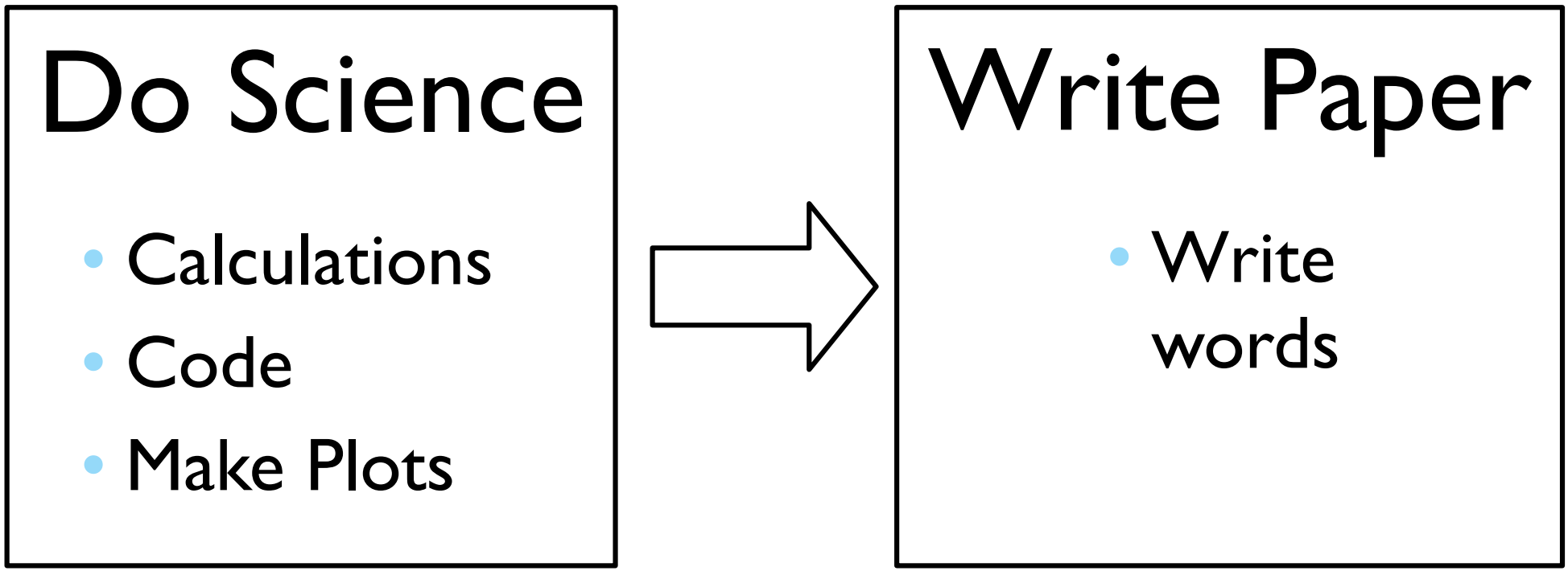


Greg Wilson
@gvwilson

Follow

"Writing is nature's way of showing us how sloppy our thinking is." - Leslie Lamport (as true of code as it is of prose)

How less experienced scientists think about writing



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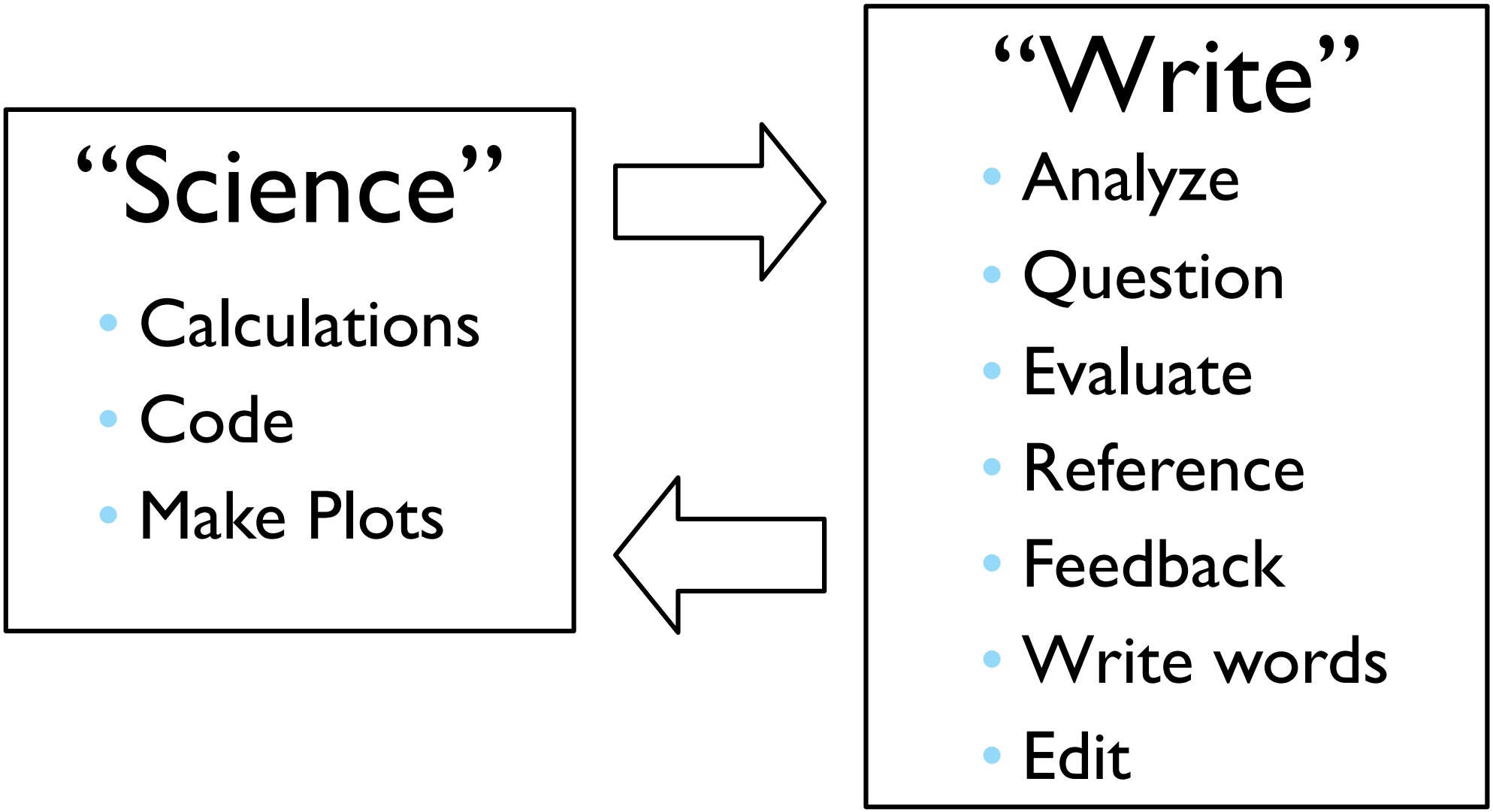
20%

How it actually works



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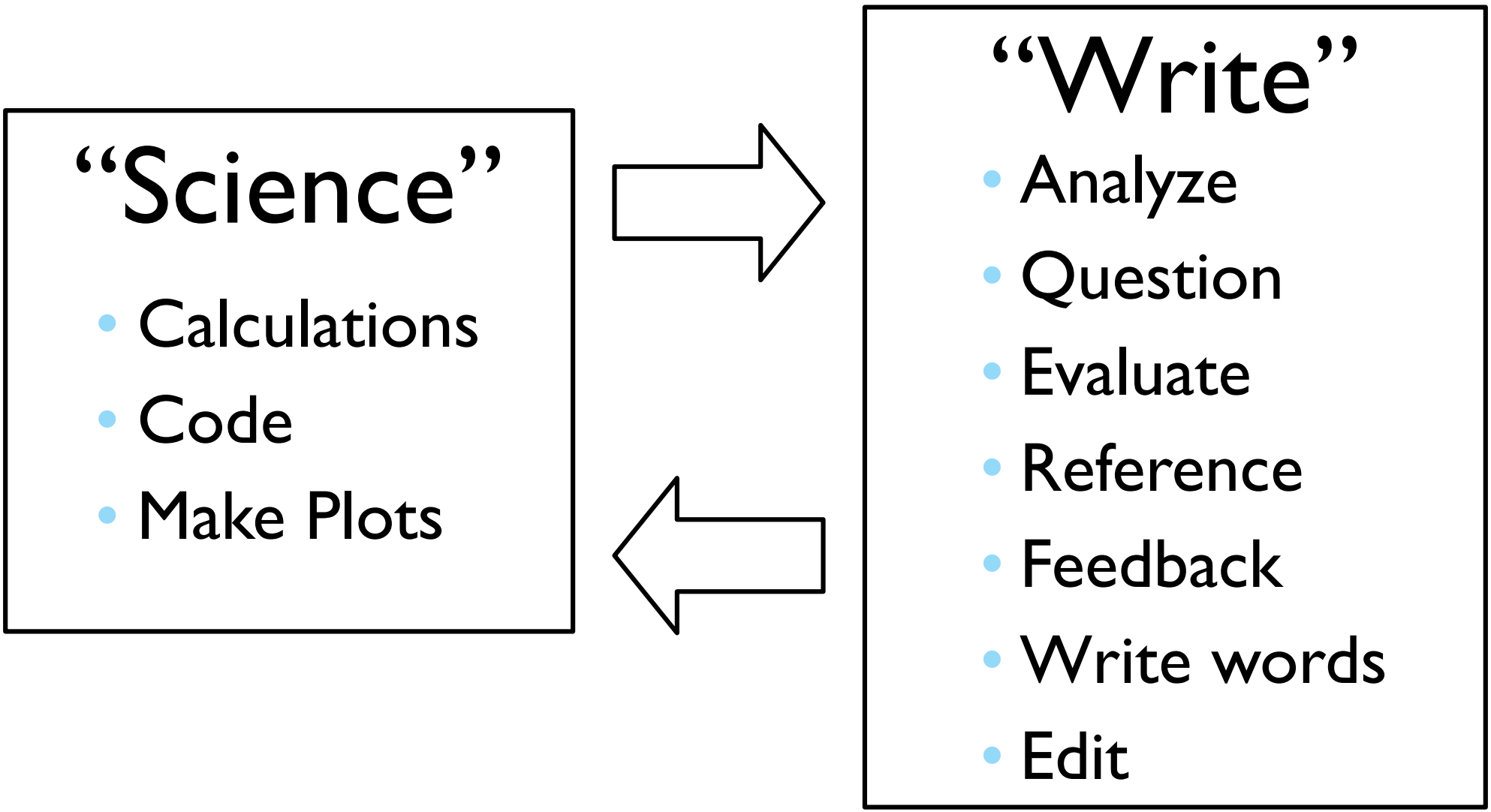
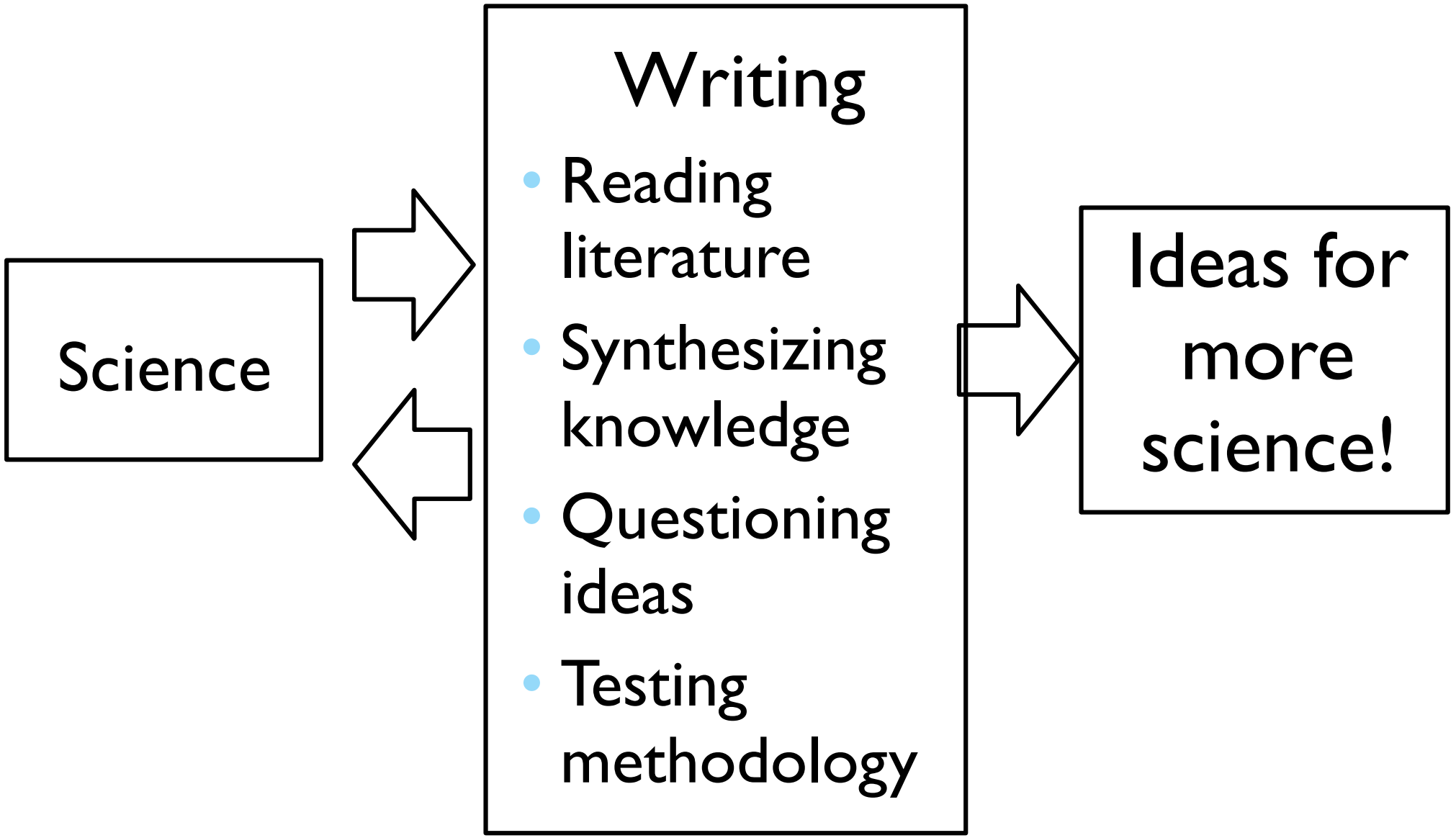
You don't really *know*, until you write



Writing inspires broad thinking



"The act of writing makes you decide what you think is true*"

- Valuable
- Necessary
- *Scaaaaaaaary*

*Kate McIntyre

Over this quarter you will:

Find a good writing process

Over this quarter you will:

Learn to analyze and edit*
(i.e., what's wrong, and how can it be fixed?)

*starting at the sentence, then paragraph, then document levels

Over this quarter you will:

Learn how to structure your writing for clarity & effectiveness*

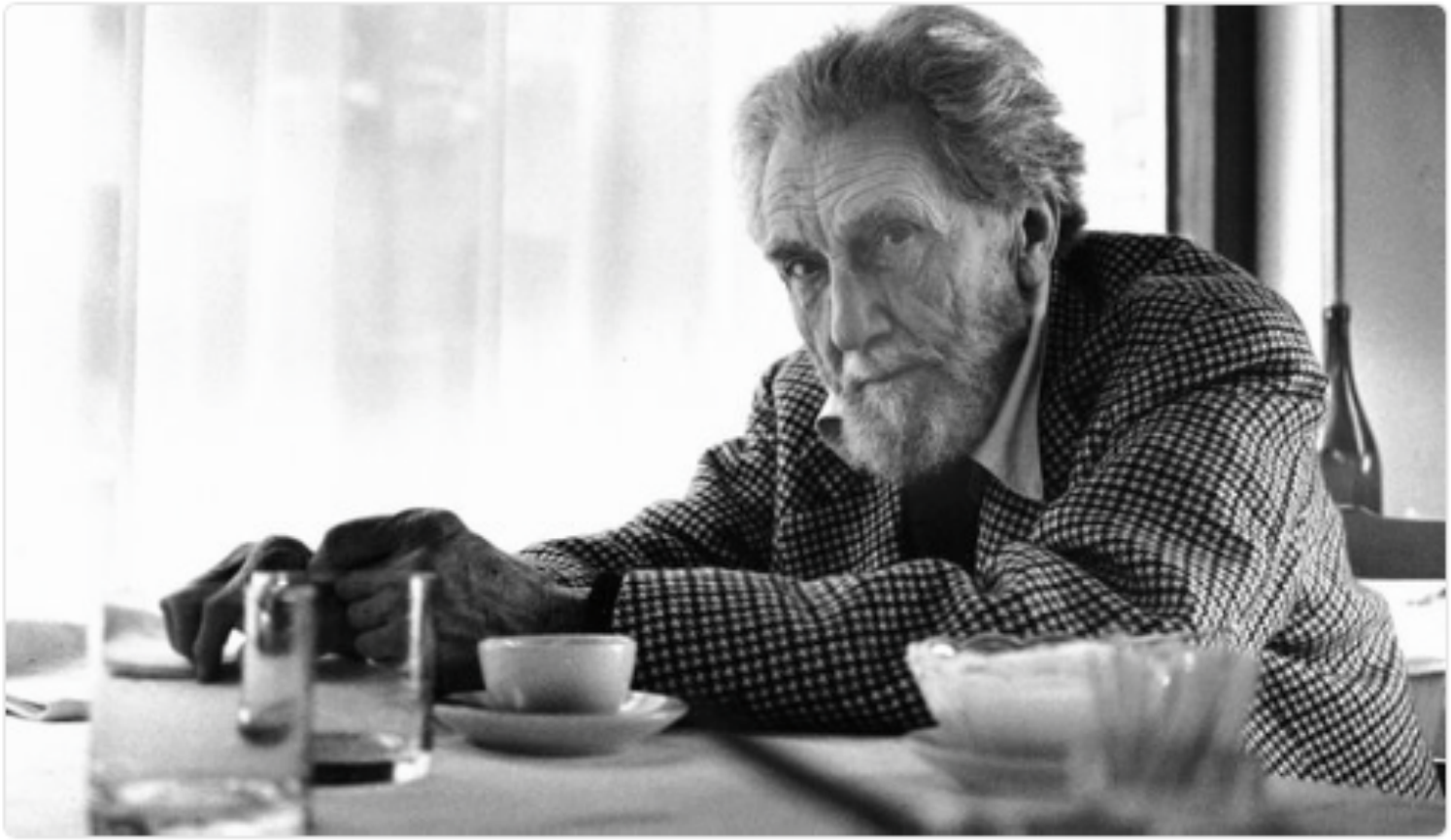
*strategies for papers and proposals

Step 1.

Making sentences better.

Jon Winokur @AdviceToWriters · Mar 24

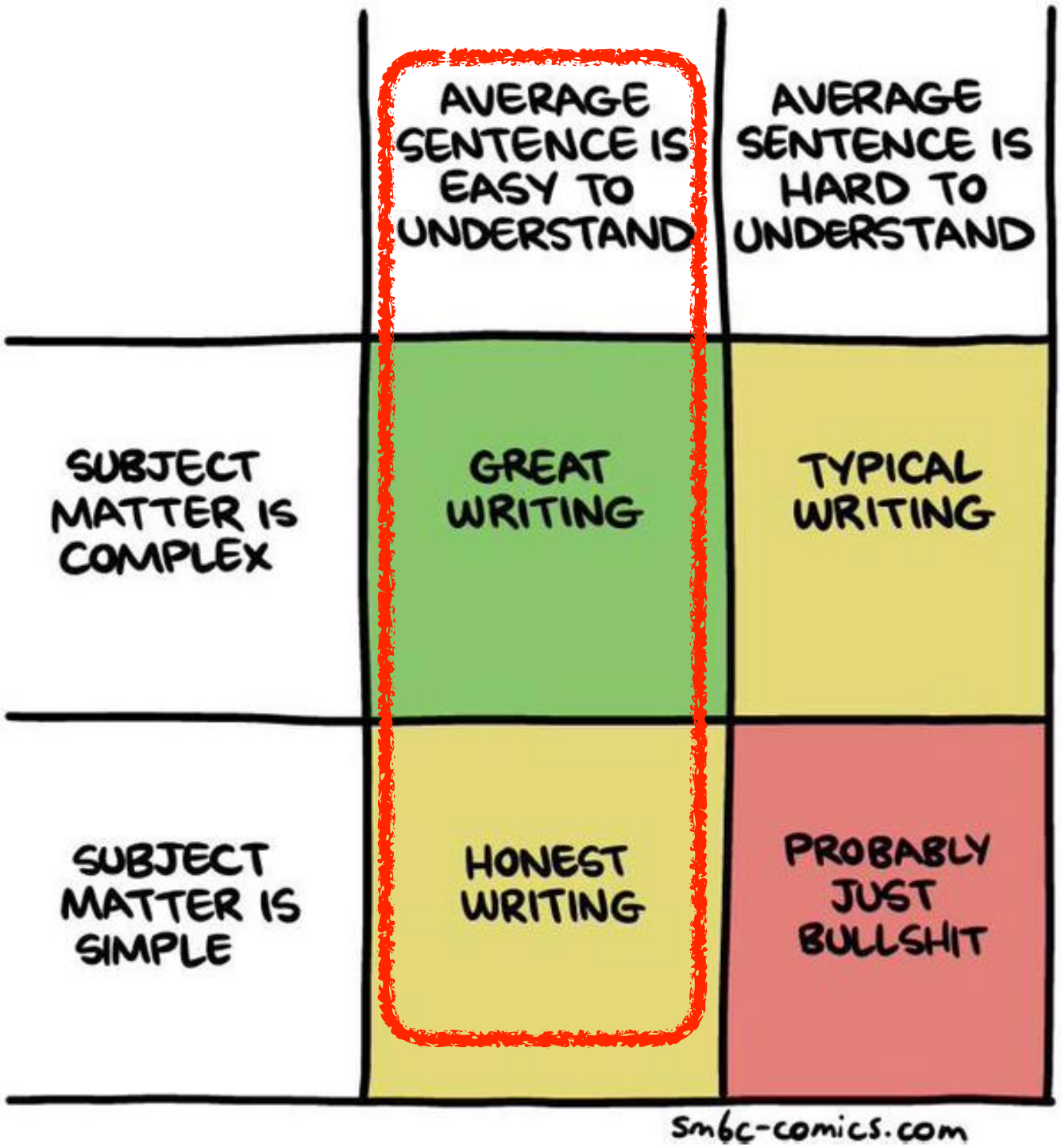
Good writers are those who keep the language efficient. That is to say, keep it accurate, keep it clear.
EZRA POUND



Making sentences better often means "Making sentences simpler*"

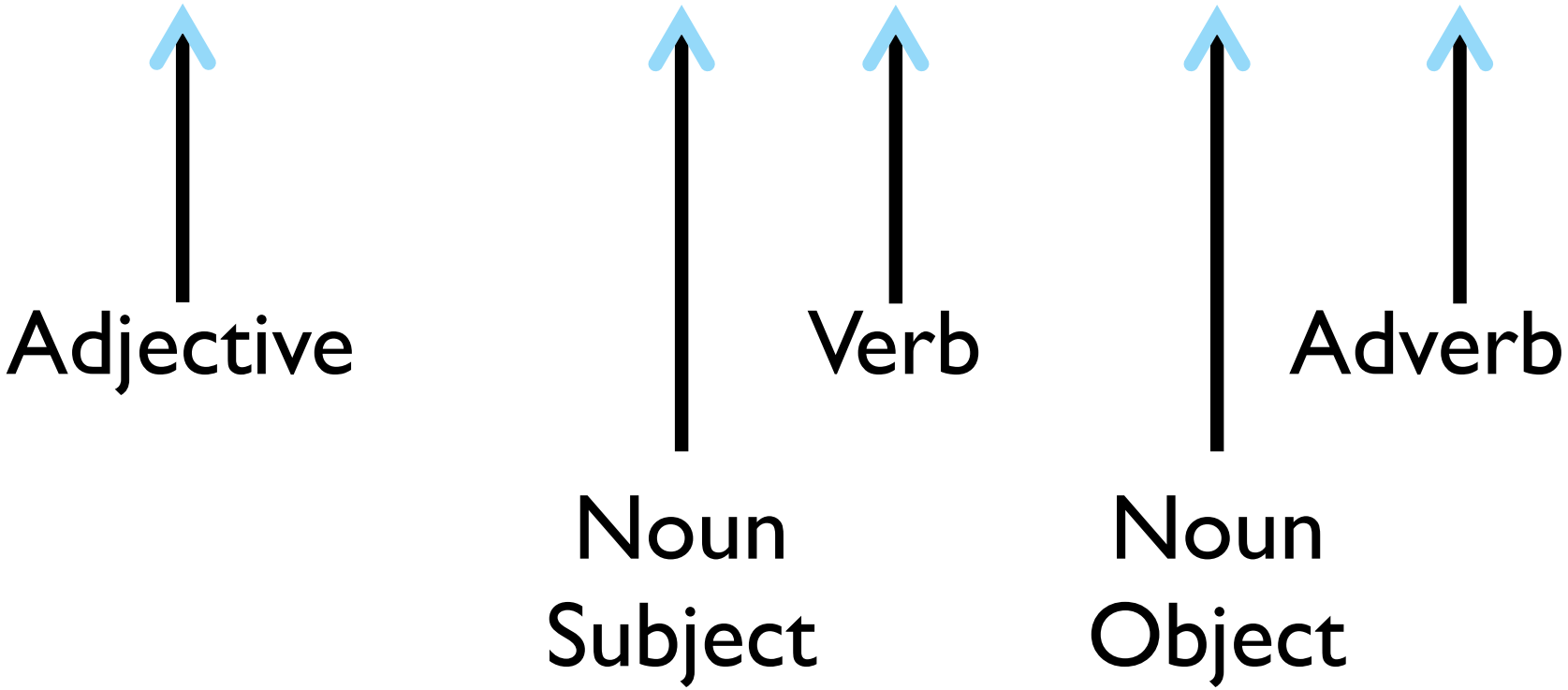
*simpler = efficient. "What is the most straightforward way to convey this thought?"

Note: this approach is characteristic of writing in American english, which dominates style for written scientific communication



First, terminology

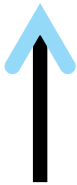
Their parameterized model fit the data well.



Their is an adjective. *The* is a definite article.

Subjects & Objects

Their parameterized model fit the data well.



Noun

Subject

Noun

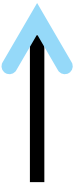
Object

the actor in a sentence, the thing/ person carrying out the activity described by the verb

Subjects & Objects

Their parameterized model fit the data well.

Noun
Subject



Noun
Object

the thing/ person being acted upon

Phrases and Clauses

Phrase

A group of words expressing something together

Clause

A group of words that include a subject and a verb

https://web.cn.edu/kwheeler/gram_clauses_n_phrases.html

Phrases and Clauses

Phrase	Clause
A group of words expressing something together	A group of words that include a subject and a verb

"I went to the store, *leaving behind the dog*."

Phrases and Clauses

Phrase	Clause
A group of words expressing something together	A group of words that include a subject and a verb

"I went to the store, *and I left the dog behind*."

Phrases and Clauses

Phrase	Clause
A group of words expressing something together	A group of words that include a subject and a verb

"I went to the store, *and I left the dog behind*."

Dependent or subordinate clause:

would make no sense on its own

Phrases and Clauses

Phrase	Clause
A group of words expressing something together	A group of words that include a subject and a verb

"*I went to the store*, and I left the dog behind."

Independent clause: could stand on its own

Sentence structure

Simple sentence structure is preferred in english scientific writing.

“Subject verb object”

Guideline #1

"Subject verb object"

Keep these as close together as possible*!

*especially verb and object. *Nothing* should separate them, not even punctuation

Guideline #2

"Subject verb object"

Use punctuation to signal phrases and dependent clauses*

*i.e., everything that's *not* "subject verb object"

"The greatest source of disconnect between what the writer means and what the reader understands is the failure to properly differentiate phrases and clauses from the main message of the sentence"

“Use punctuation to signal phrases and dependent clauses”

How?

The mighty comma.

Familiar uses of commas

Use commas after introductory…

Clauses: Especially if they begin with *after, although, as, because, if, since, when, while…*

Phrases: Words that come before the main clause

Yes, However, Although, Well, Indeed,..

In addition, Additionally, In contrast…

"*While I was out shopping, I bought milk. In addition, I bought cookies.*"

Familiar uses of commas

Use commas in the middle to isolate words, phrases, and clauses that are not essential to the meaning.

"*This method, in particular, allowed us to identify the source of the ionization.*"

Familiar uses of commas

Use commas to separate independent clauses when they are joined by any of these conjunctions: *and, but, for, or, nor, so, yet*

"We went to the store, and we bought milk."

"We went to the store, but they didn't have any milk."

Note: "We went to the store, we bought milk."

Less familiar: the power of the comma to convey your meaning to a reader

Immediately indicates
that an idea is
different than or secondary to
the main point of the sentence

Commas

"We went to the store, and bought milk."

The comma signals suggests that buying milk was incidental.

However: *"We went to the store and bought milk."*

The *lack* of a comma signals that these are of equal importance.

Comma depends on context

"Where did you go?"

"We went to the store, and bought milk."

"Is there any milk left?"

"We went to the store and bought milk."

Astronomy examples:

"CO observations are useful for identifying molecular clouds and for measuring their velocities."

Indicates "There are two really important things CO observations can do."

Suggests to the reader that you're talking about CO observations.

Astronomy examples:

"CO observations are useful for identifying molecular clouds, and for measuring their velocities."

Indicates, "We're really talking about identifying MC's, though velocities are nice".

Astronomy examples:

"CO observations are useful for identifying molecular clouds, and for measuring their velocities."

Can also signal progression from one topic to the next one, "We've been talking about identifying MC's, but now we're going to start talk about velocites."*

*though, would probably also reinforce this signal with "…*but also* for measuring velocities"

Let's edit, keeping in mind:

- Keep it simple.
- Keep subject-verb-object as close as possible.
- Separate phrases and clauses with commas.

Let's edit

"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas accreted from the intergalactic medium around Milky Way-sized galaxies (extending to the virial radius), which forms as infalling gas is heated to the virial temperature at an accretion shock."

This is a lot.

i.e., it's hard to understand without a lot of work by the reader

If you can't read a sentence out loud in one breath, it's too long

"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas accreted from the intergalactic medium around Milky Way-sized galaxies (extending to the virial radius), which forms as infalling gas is heated to the virial temperature at an accretion shock."

Usual problem: too many ideas crammed into a single sentence

There are 2 ideas here

- Where gas is.
- How it got there.

"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas ***accreted from the intergalactic medium*** *around Milky Way-sized galaxies (extending to the virial radius),* ***which forms as infalling gas is heated to the virial temperature at an accretion shock.***"

Separate these 2 ideas into 2 sentences

"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas ***accreted from the intergalactic medium*** *around Milky Way-sized galaxies (extending to the virial radius),* ***which forms as infalling gas is heated to the virial temperature at an accretion shock.***"

Broken into 2 sentences….

"A basic prediction of CDM galaxy-formation models is that Milky Way-size galaxies should be surrounded by hot haloes of gas out to their virial radii. ***This gas was heated to the virial temperature at an accretion shock, as it accreted from the intergalactic medium.***"

"A basic prediction of CDM galaxy-formation models is that Milky Way-size galaxies should be surrounded by hot haloes of gas ***out to their virial radii****. This gas was heated to the virial temperature at an accretion shock, as it accreted from the intergalactic medium."*

A few issues with "*out to their virial radii*"

- It's a less important supporting detail*
- It "interrupts" a story about gas.

Adding a comma signals the above.

"A basic prediction of CDM galaxy-formation models

*is that Milky Way-size galaxies should be surrounded by hot haloes of gas****, out to their virial radii****. This gas…"*

 *i.e., if you cut it, the most important info would still be there

"A basic prediction of CDM galaxy-formation models is that Milky Way-size galaxies should be surrounded by hot haloes of gas, out to their virial radii. This gas was heated to the virial temperature at an ***accretion*** *shock, as it* ***accreted*** *from the intergalactic medium."*

Let's tidy up the double accretion…

"This gas was shock-heated to the virial temperature as it accreted from the intergalactic medium."

This change also streamlines the sentence by absorbing an entire phrase ("*heated…at an accretion shock*") into the concise term "*shock-heated*")

Before.

"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas accreted from the intergalactic medium around Milky Way-sized galaxies (extending to the virial radius), which forms as infalling gas is heated to the virial temperature at an accretion shock."

After.

"A basic prediction of CDM galaxy-formation models is that Milky Way-size galaxies should be surrounded by hot haloes of gas, out to their virial radii. This gas was shock-heated to the virial temperature as it accreted from the intergalactic medium."

Before.

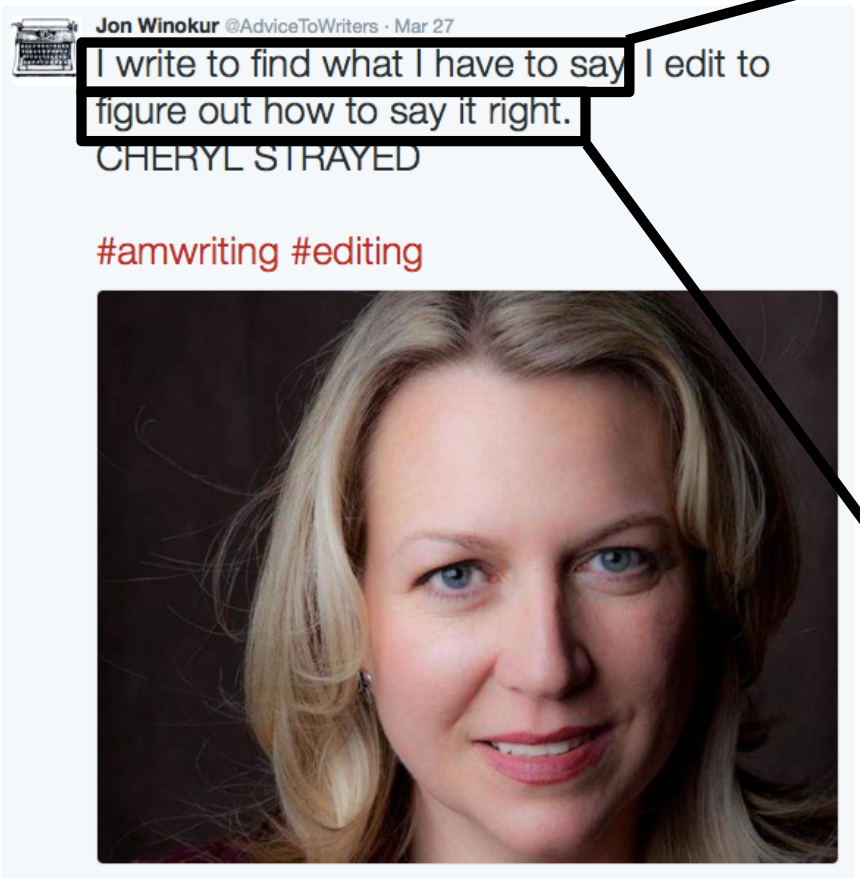
"A basic prediction of CDM galaxy-formation models is the existence of a hot halo of gas accreted from the intergalactic medium around Milky Way-sized galaxies (extending to the virial radius), which forms as infalling gas is heated to the virial temperature at an accretion shock."

This is *totally* acceptable writing for a first draft!!!!

There are *words*! And *content*!

The most important mind shift to make in this class

Get words down.
Edit ruthlessly.



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"A basic prediction of CDM galaxy-formation models is that Milky Way-size galaxies should be surrounded by hot haloes of gas, out to their virial radii. This gas was shock-heated to the virial temperature as it accreted from the intergalactic medium."

Let's edit

"Young radio sources ($<10^5$ years), are an ideal candidate to study the cold gas in the AGN, and the connection between the merger events and the triggering of radio activity"

How many commas should this have?

Let's edit

"Young radio sources (<10^5 years) are an ideal candidate to study the cold gas in the AGN and the connection between the merger events and the triggering of radio activity"

None!

It's still confusing because of the multiple "and"s

"Young radio sources ($<10^5$ years) are an ideal candidate to study the cold gas in the AGN and the connection between the merger events and the triggering of radio activity"

Is this a list of 3 items to study, or just 2?

Give some clues

"Young radio sources (<10^5 years) are an ideal candidate to study both the cold gas in the AGN and the connection between the merger events and the triggering of radio activity"

"Both" suggests that the list has 2 items

There are also some plural vs singular agreement issues…

"Young radio sources ($<10^5$ years) are an ideal candidate to study both the cold gas in the AGN and the connection between the merger events and the triggering of radio activity"

"The" conveys "a specific set or instance", but this is probably meant to be general*…

"Young radio sources (<10^5 years) are ideal candidates to study both the cold gas in the AGN and the connection between the merger events and the triggering of radio activity"

*article use can be very difficult when one's native language doesn't use them, like Russian

So, remove unneeded articles.

"Young radio sources ($<10^5$ years) are ideal candidates to study both cold gas in AGN and the connection between merger events and triggering of radio activity"

But, maybe we can simplify the last half further….

"Young radio sources (<10^5 years) are ideal candidates to study both cold gas in AGN and the connection between merger events and triggering of radio activity"

becomes…

"Young radio sources (<10^5 years) are ideal candidates to study both cold gas in AGN and triggering of radio activity by merger events."

"Young radio sources (<10^5 years) are ideal candidates to study both cold gas in AGN and triggering of radio activity by merger events."

One last tweak. The above can be read as "the radio sources study cold gas", which they can't.

"Young radio sources (<10^5 years) are ideal candidates in which to study both cold gas in AGN and triggering of radio activity by merger events."

"Young radio sources (<10^5 years) are ideal candidates in which to study both cold gas in AGN and triggering of radio activity by merger events."

But that made it longer. Maybe we can simplify further…

"Young radio sources (<10^5 years) are ideal for studying both cold gas in AGN and triggering of radio activity by merger events."

Before: 29 words

"Young radio sources (<10^5 years), are an ideal candidate to study the cold gas in the AGN, and the connection between the merger events and the triggering of radio activity"

After: 20 words

"Young radio sources (<10^5 years) are ideal for studying both cold gas in AGN and triggering of radio activity by merger events."

Before: confusing

"Young radio sources (<10^5 years), are an ideal candidate to study the cold gas in the AGN, and the connection between the merger events and the triggering of radio activity"

After: straightforward

"Young radio sources (<10^5 years) are ideal for studying both cold gas in AGN and triggering of radio activity by merger events."

"Young radio sources (<10^5 years) are ideal for studying both cold gas in AGN and triggering of radio activity by merger events."