

SWE

Scientific Writing in English

Christiane Schmidt

course webpage: <http://webstaff.itn.liu.se/~chrsc91/teaching/s20/swe/>

Today: Intro

- + Good writing
- + Cutting the clutter
- + How to make a story sticky

Next time:

- Punctuation, paragraphs, sentences
- + Common mistakes
- + Parts of paper

Homework discussion

Written exam

Part 2: Discuss timing with me!

Text:

- The wording of anything written or printed; the structure formed by the words in their order; the very words, phrases, and sentences as written. (Oxford English Dictionary)
- Narrative text (story-telling) and expository text (no room for fiction and descriptive literary tools)

Scientific text?

- Expository text
- Written specifically to explain or explore a (scientific) idea
- Ensure that the information is credible and real
- Follows the problem-solution structure
- More straightforward than other texts
- Provides facts in a way that is educational and purposeful
- Goal: make the essay as clear as possible and edit it in order to remove all information that is not strictly necessary

Working with scientific texts:

- ❖ Read — understand
 - ❖ Listen — understand
 - ❖ Write — make it easy for others to understand, and enjoy!
 - ❖ Present
- It is the author's job to make the reader's job easy.**

(Joshua Schimel, *Writing Science, How to write papers that get cited and proposals that get funded*, Oxford University Press, 2012)

- ❖ Scientific texts
- ❖ Technical writing
- ❖ Research
- ❖ Teaching
- ❖ ...

Literature:

- ❖ William Strunk Jr. and E.B. White, *The Elements of Style*.
- ❖ Joshua Schimel, *Writing Science: How to write papers that get cited and proposals that get funded*, Oxford University Press, 2012.
- ❖ William Zinsser, *On Writing Well: The Classic Guide to Writing Nonfiction*, HarperCollins, 1998.
- ❖ Lyn Dupre, *BUGS in Writing: A Guide to Debugging Your Prose*, Addison-Wesley Professional, 1998.
- ❖ Tim Skern, *Writing Scientific English*, Facultas wuv, 2009.
- ❖ R.L. Trask, *The Penguin Guide to Punctuation*, Penguin Books, 1997.
- ❖ Chip Heath & Dan Heath, *Made to Stick: Why Some Ideas Survive and Others Die*, Random House New York, 2010

- ❖ Kristin Sainani, Stanford online course “Writing in the Sciences”

Good Writing

What makes good writing??*

- Communicate an idea clearly and effectively
- Write elegantly and stylishly

takes time, revision
(and a good editor)

We need:

- Something to say
- Clear thinking

*from Kristin Sainani, Stanford online course "Writing in the Sciences"

What makes a good writer??*

- ❖ Talent?
- ❖ Years of English classes?
- ❖ Inspiration?
- ❖ ...?
- ❖ Having something to say.
- ❖ Logical thinking.
- ❖ A few simple, learnable rules of style.

*from Kristin Sainani, Stanford online course “Writing in the Sciences”

How do we get there?

Homework 0:
read something you
would not have read
otherwise.

- Read!! and pay attention.
- Talk about your research/work before you try to write about it.
- Stop waiting for inspiration.
- Start writing. Write a first draft.
- Revise.
- Learn how to cut.
- Find a good editor/peer editing group.

Effective storytelling:

1. Content: what makes a story engage and stay with us?
2. Structure: how do you put together that content and make it easy for us to get?
3. Language: how do you write the story in the most compelling way possible?

from Joshua Schimel, *Writing Science: How to write papers that get cited and proposals that get funded*

Writing Principles

Writing Principles

- ❖ Active voice is preferred.
- ➔ Do not switch to passive voice without a reason.
- ❖ Use precise words.
 - Avoid jargon, redundancies, and vague words.
- ❖ Use strong verbs, do not turn them into clunky nouns.
- ❖ Cut unnecessary words and phrases.
- ❖ Use paragraphs to structure your work.
- ❖ Avoid repetition.

Active Voice

Use the active voice

Passive: you can say only that an event or action took place, without necessarily admitting what or who the causal agent was.*

- More than 300 aircraft were ordered.

Active voice:

- + American Airlines ordered more than 300 aircraft.

Passive voice is boring even if you name the agent:

More than 300 aircraft were ordered by American Airlines.

Of course, you can still write some sentences in the passive voice.

“Passive voice emphasises the receiver of an activity (the object), rather than the actor (the subject), and there may be occasions when that emphasis is important.”

*from Lyn Dupré: “BUGS in Writing: A Guide to Debugging Your Prose”, Addison-Wesley

Use the active voice

- ❖ “You should not mix in one sentence parts that contain the verb form *to X* (to laugh, to cry, to write, and so on), called *infinitives*, and parts in passive voice.”

To get advice, an expert must be consulted.

creates the expectation of an agent

To get advice, you must consult an expert.

Correct, but ugly, in passive mode:

For advice to be gotten, an expert must be consulted.

*from Lyn Dupré: “BUGS in Writing: A Guide to Debugging Your Prose”, Addison-Wesley

Cut the Clutter

Cutting the clutter

From William Zinsser, *On Writing Well, The Classic Guide to Writing Nonfiction*:

Clutter is the disease of American writing. We are a society strangling in unnecessary words, circular constructions, pompous frills and meaningless jargon. Who can understand the clotted language of everyday American commerce: the memo, the corporation report, the business letter, the notice from the bank explaining its latest "simplified" statement? What member of an insurance or medical plan can decipher the brochure explaining his costs and benefits? What father or mother can put together a child's toy from the instructions on the box? Our national tendency is to inflate and thereby sound important. The airline pilot who announces that he is presently anticipating experiencing considerable precipitation wouldn't think of saying it may rain. The sentence is too simple—there must be something wrong with it.

But the secret of good writing is to strip every sentence to its cleanest components. Every word that serves no function, every long word that could be a short word, every adverb that carries the same meaning that's already in the verb, every passive construction that leaves the reader unsure of who is doing what—these are the thousand and one adulterants that weaken the strength of a sentence. And they usually occur in proportion to education and rank.

Government memo, 1942

Such preparations shall be made as will completely obscure all Federal buildings and non-Federal buildings occupied by the Federal government during an air raid for any period of time from visibility by reason of internal or external illumination.

"Tell them," Roosevelt said, "that in buildings where they have to keep the work going to put something across the windows."

from William Zinsser, *On Writing Well, The Classic Guide to Writing Nonfiction*

Cutting the clutter

“I have only made this letter rather long because I have not had time to make it shorter.” —Blaise Pascal, 1656

Cutting the clutter

Example 1:

“This paper provides a review of the basic tenets of cancer biology study design, using as examples studies that illustrate the methodologic challenges or that demonstrate successful solutions to the difficulties inherent in biological research.”

In this paper we review cancer biology study design, using examples that illustrate specific challenges and solutions.

from Kristin Sainani, Stanford online course “Writing in the Sciences”

Example 2:

This paper provides a review of 3D aircraft object recognition methods based on 2D images.

Practice

In this paper we review 3D aircraft object recognition based on 2D images.

Cutting the clutter

Example 3:

“As it is well known, increased athletic activity has been related to a profile of lower cardiovascular risk, lower blood pressure levels, and improved muscular and cardio-respiratory performance.”

Increased athletic activity is associated with lower cardiovascular risk, lower blood pressure, and improved fitness.

Increased athletic activity lowers cardiovascular risk and blood pressure, and improves fitness. (stronger level of evidence)

from Kristin Sainani, Stanford online course “Writing in the Sciences”

Cutting the clutter

You wrote the text, most likely you will find it difficult to delete words that took a long time to come up with in the first place.

Try the sentence without the extra words.

Decide which is better: gives the same idea with more power.

Example 4:

Yet, only very recently, cases are reported where companies in the bus, railway and airline industry are using advanced OR techniques for solving crew planning problems (almost) optimally.

Recently, OR techniques for solving crew planning problems optimally are used in the bus, railway and airline industry.

Simplify!

a considerable amount of	many, much
absolutely essential	essential
a majority of	most
a number of	many
an order of magnitude more	ten times
are of the same opinion	agree
completely full	full
considering the fact that	although, because
decline	decrease
due to the fact that	because
each and every	each
end result	result
exact same, exactly the same	identical
exhibit a tendency	tend
having gotten	having got
help and	help to
higher in comparison to	higher than
in close proximity to	near
in spite of the fact that	although

“From research to manuscript”, M. Katz and from Kristin Sainani, Stanford online course “Writing in the Sciences”

Simplify!

in the final analysis	finally
including but not limited to	including
last but not least	finally
methodology	method, methods
multiple	many
nearly unique	rarely, uncommon
orientate	orient
prove conclusively	prove
referred to as	called
regarded as being	regarded as
seeing that	because
the question of whether	whether
very unique	unique
the reason that/why is because	because

“From research to manuscript”, M. Katz

Example 5: Dead weight words and phrases

It is well known (eg. [5, 25]) that both the aircraft routing and crew pairing problems are individually NP-hard.

The aircraft routing and the crew pairing problem are NP-hard ([5, 25]).

Example 6: Long words or phrases that could be short

For this reason, the paper restricts itself to hub-and-spoke systems.

Thus, we restrict this paper to hub-and-spoke systems.

Example 7: Repetitive words or clauses

A robust cell-mediated immune response is necessary, and deficiency in this response predisposes an individual towards active TB.

Deficiency in T-cell-mediated immune response predisposes an individual to active TB.

Put statements in positive form

She was not often right.
She was usually wrong.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Put statements in positive form

She did not want to arrive late.

She wanted to arrive in time.

He did not believe his homework was incomplete.

He believed his homework was complete.

Put statements in positive form

not honest	dishonest
not harmful	safe
not important	unimportant
does not have	lacks
did not remember	forgot
did not pay attention to	ignored
did not succeed	failed

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Cutting the clutter

Eliminate there are/there is

On the topic of generating the schedule itself using mathematical models, there are a few articles that have been published.

A few articles were published on generating the schedule using mathematical models.

Cutting the clutter

Omit needless prepositions:
“that” and “on” are often superfluous

On the topic of generating the schedule itself using mathematical models, there are a few articles that have been published.

A few articles were published on generating the schedule using mathematical models.

Cutting the clutter

Eliminate there are/there is

If at a turn node, there are more arriving flights than departing flights, it means that there is a plane that sits on the ground for a while and then turns to a departing plane at one of the turn nodes below it.

Practice

If more flights arrive than depart at a turn node, a plane sits on the ground for a while and becomes a departing plane at one of the turn nodes below.

We also assume that for every equipment type there is a single station where balance-checks for that equipment type can be done and that this station is also a regular maintenance station.

Practice

We also assume that a single regular maintenance station can accommodate balance-checks for every equipment type.

Cutting the clutter

There is a one-to-one correspondence between Euler tours in the original graph and Hamilton circuits in the line graph.

Practice

Euler tours in the original graph correspond one-to-one to Hamilton circuits in the line graph.

Anti-inflammatory drugs may be protective for the occurrence of Alzheimer's Disease.

Practice

Anti-inflammatory drugs may protect against Alzheimer's Disease.

Cutting the clutter

Injuries to the brain and spinal cord have long been known to be among the most devastating and expensive of all injuries to treat medically.

Practice

Injuries to the brain and spinal cord are among the most devastating and expensive.

from Kristin Sainani, Stanford online course “Writing in the Sciences”

We will refer to this model as a flight (leg) based spill model.

Practice

We call this a flight (leg) based spill model.

Cutting the clutter

The airline has to decide the equipment type to use on each leg so that it can fly the schedule, while matching capacity to demand as much as possible and minimizing the total operating cost.

Practice

The airline decides the equipment type for each leg so that it can fly the schedule, while matching capacity to demand as much as possible and minimizing the total operating cost.

The airline decides the equipment type for each leg so that it can fly the schedule and minimizes the total operating cost, while matching capacity to demand as much as possible.

Cutting the clutter

An IQ test measures an individual's abilities to perform functions that usually fall in the domains of verbal communication, reasoning, and performance on tasks that represent motor and spatial capabilities.

Practice

An IQ test measures an individual's verbal, reasoning, or motor and spatial abilities.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Express co-ordinate ideas in similar form.

Express co-ordinate ideas in similar form

“This principle, that of parallel construction, requires that expressions of similar content and function should be outwardly similar. The likeness of form enables the reader to recognize more readily the likeness of content and function. [...]

The unskilful writer often violates this principle, from a mistaken belief that he should constantly vary the form of his expressions.”

[Strunk, W., Jr. and White, E.B.: The Elements of Style]

Express co-ordinate ideas in similar form

Formerly, science was taught by the textbook method, while now the laboratory method is employed.

Formerly, science was taught by the textbook method; now it is taught by the laboratory method.

An article or a preposition applying to all the members of a series must either be used only before the first term or else be repeated before each term.

The French, the Italians, Spanish, and Portuguese

The French, the Italians, the Spanish, and the Portuguese

In spring, summer, or in winter

In spring, summer, or winter (In spring, in summer, or in winter)

from Strunk, W., Jr. and White, E.B.: The Elements of Style

Express co-ordinate ideas in similar form

Correlative expressions (both, and; not, but; not only, but also; either, or; first, second, third; and the like) should be followed by the same grammatical construction.

It was both a long ceremony and very tedious.

The ceremony was both long and tedious.

A time not for words, but action.

A time not for words, but for action.

from Strunk, W., Jr. and White, E.B.: The Elements of Style

Express co-ordinate ideas in similar form

Not Parallel:

If you want to be a good pilot, you must study hard, permanently plan ahead, and you should be a good team player.

Practice

Parallel:

If you want to be a good pilot you must study hard, work well in a team, and plan ahead all the time. (imperative, imperative, imperative)

Parallel:

If you want to be a good pilot, you must be a good student, a good team player, and a foresighted thinker. (noun, noun, noun)

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Write with verbs

Write with verbs

- ❖ Use strong verbs
- ❖ Avoid turning verbs into nouns
- ❖ Don't bury the main verb

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Use strong verbs

Compare:

“Loud music came from speakers embedded in the walls, and the entire arena moved as the hungry crowd got to its feet.”

With:

“Loud music **exploded** from speakers embedded in the walls, and the entire arena **shook** as the hungry crowd **leaped** to its feet.”*

*from the novel: Bringing Down the House, Ben Mezrich
from Kristin Sainani, Stanford online course “Writing in the Sciences”

Use strong verbs

Pick the right verb!

The WHO reports that approximately two-thirds of the world's diabetics are found in developing countries, and estimates that the number of diabetics in these countries will double in the next 25 year.

The WHO estimates that two-thirds of the world's diabetics are found in developing countries, and projects that the number of diabetics in these countries will double in the next 25 years.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Use strong verbs

Pick the right verb!

The WHO **reports** that **approximately** two-thirds of the world's diabetics are found in developing countries, and estimates that the number of diabetics in these countries will double in the next 25 year.

The WHO **estimates** that two-thirds of the world's diabetics are found in developing countries, and projects that the number of diabetics in these countries will double in the next 25 years.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Use strong verbs

Pick the right verb!

The WHO **reports** that **approximately** two-thirds of the world's diabetics are found in developing countries, and **estimates** that the number of diabetics in these countries will double in the next 25 year.

The WHO **estimates** that two-thirds of the world's diabetics are found in developing countries, and **projects** that the number of diabetics in these countries will double in the next 25 years.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Use strong verbs

- ❖ Use “to be” verbs purposefully and sparingly.
- ❖ Don't kill verbs by turning them into nouns.
 - ⦿ During DNA damage, recognition of H3K4me3 by ING2 results in recruitment of Sin3/HDAC and repression of cell proliferation genes.
 - ⦿ During DNA damage, H3K4me3 recruits ING2 and Sin3/HDAC, which together repress cell proliferation genes.
 - ⦿ During DNA damage, ING2 recognises H3K4me3, which together recruit Sin3 and repress cell proliferation genes.
- ❖ Don't bury the main verb.
 - ⦿ **In one study** comparing the effect of aircraft noise to the effect of alcohol on cognitive performance, it **was found** that simulated aircraft noise at 65 dB(A) had the same effect on individuals' ability to recall auditory information as being intoxicated with a Blood Alcohol Concentration (BAC) level of at 0.10.
 - ⦿ One study found that simulated aircraft noise at 65 dB(A) had the same effect on individuals' ability to recall auditory information as being intoxicated with a Blood Alcohol Concentration (BAC) level of 0.10.

from Kristin Sainani, Stanford online course “Writing in the Sciences”

Use strong verbs

Really long subject!

Negatives

Passive verb

Buried predicate

“Hedge” word

The fear expressed by some teachers that students would not learn statistics well if they were permitted to use canned computer programs has not been realized in our experience. A careful monitoring of achievement levels before and after the introduction of computers in the teaching of our course revealed no appreciable change in students' performances.

Many teachers feared that the use of canned computer programs would prevent students from learning statistics. We monitored student achievement levels before and after the introduction of computers in our course and found no detriments in performance.

from Kristin Sainani, Stanford online course “Writing in the Sciences”

Use strong verbs

Important studies to examine the descriptive epidemiology of autism, including the prevalence and changes in the characteristics of the population over time, have begun.

Practice

Studies have begun to describe the epidemiology of autism, including recent changes in the disorder's prevalence and characteristics.

from Kristin Sainani, Stanford online course "Writing in the Sciences"

Writing: Reasons, Types & Audience

Writing: Reasons, Types & Audience

Determine length, structure, and the (language) level of your writing

Why?	What?	For whom?
disseminate ideas	(conference) paper	peer (same field)
proof we understood a topic	seminar paper, thesis, survey	professors (and peers)
educate somebody	newspaper article, book	laymen
clarify own ideas	(research) notes	ourselves, coauthors
ask for support	grant/fellowship proposal	peers, grant agencies
“make money”	recommendation letters	employers

Writing: Reasons, Types & Audience

- ❖ Assess the background of your readers.
- ❖ Judge your reader's level of expertise.
- ❖ Determine the degree to which formality is required.
- ❖ (Know enough about the demographics of your audience that you can avoid inadvertently insulting or infuriating some of your readers or listeners.)

from Lyn Dupré: "BUGS in Writing: A Guide to Debugging Your Prose", Addison-Wesley

How to make a story sticky?

How to make a story sticky?

Why do some ideas stay with you while others are eminently forgettable?

SUCCES*

S: Simple

U: Unexpected

C: Concrete

C: Credible

E: Emotional

S: Stories

*from Chip and Dan Heath, Made to Stick (Random House, 2007)

How to make a story sticky?

Simple:

Simple message that captures the essence of an issue.

Prioritise.

NOT simplistic: a simple message does not trivialise the issue.

Even a great idea loses its meaning if it is bogged down by details.

“It’s the economy, stupid.”

Schemas:

Express your thoughts in a language that builds off ideas that your readers already know.

How people learn: start with existing schemas and then attach new information.

It’s hard to learn if you cannot fit it into an existing schema.

Establish schemas and then expand and modify them.

If you build off established schemas it makes ideas feel simple.

from Chip and Dan Heath, *Made to Stick* (Random House, 2007)
and from Joshua Schimel, *Writing Science*; how to write papers that get cited and proposals that get funded

How to make a story sticky?

Unexpected:

Use surprise—generate *interest* and *curiosity*.

The surprise shouldn't be too outlandish!

Best way to keep the reader's attention is to open gaps of knowledge.

And then fill those gaps.

from Chip and Dan Heath, *Made to Stick* (Random House, 2007)

How to make a story sticky?

Concrete:

“If those who have studied the art of writing are in accord on any one point, it is this: the surest way to arouse and hold the reader’s attention is by being specific, definite, and concrete.” [Strunk, W., Jr. and White, E.B.: The Elements of Style]

Abstract ideas are difficult to remember and understand, and they leave room for interpretation.

Explain your ideas in terms of human actions, in terms of sensory information.

“A bird in hand is worth two in the bush.”

Proverb: abstract truth, concrete language.

from Chip and Dan Heath, Made to Stick (Random House, 2007)

How to make a story sticky?

Credible:

Honesty and trustworthiness of a source.

A few people enjoy authority on certain topics, but most of us do not.

We have to establish the credibility of our ideas:

- Ground them in previous work, cite the sources
- Describe the methods how you obtained your data, present the data clearly
- Show that your conclusions grow from the credible data

Not just presentation of statistics:

- Can be helpful to illustrate a relationship between two concepts
- Rarely meaningful in themselves
- Remember that it's the relationships, not the numbers, that are important

from Chip and Dan Heath, *Made to Stick* (Random House, 2007)

How to make a story sticky?

Emotional:

“How do we get people to care about our ideas?”

Research shows that people are more likely to make a charitable gift to a single needy individual than to an entire impoverished region.

We are wired to feel things for people, not for abstractions.

from Chip and Dan Heath, *Made to Stick* (Random House, 2007)

How to make a story sticky?

6

MADE TO STICK

The Truth About Movie Popcorn

Art Silverman stared at a bag of movie popcorn. It looked out of place sitting on his desk. His office had long since filled up with fake-butter fumes. Silverman knew, because of his organization's research, that the popcorn on his desk was unhealthy. Shockingly unhealthy, in fact. His job was to figure out a way to communicate this message to the unsuspecting moviegoers of America.

Silverman worked for the Center for Science in the Public Interest (CSPI), a nonprofit group that educates the public about nutrition. The CSPI sent bags of movie popcorn from a dozen theaters in

CSPI called a press conference on September 27, 1992. Here's the message it presented: "A medium-sized 'butter' popcorn at a typical neighborhood movie theater contains more artery-clogging fat than a bacon-and-eggs breakfast, a Big Mac and fries for lunch, and a steak dinner with all the trimmings—combined!"

showed, coconut oil was also brimming with saturated fat.

The single serving of popcorn on Silverman's desk—a snack someone might scarf down between meals—had nearly two days' worth of saturated fat. And those 37 grams of saturated fat were packed into a *medium*-sized serving of popcorn. No doubt a decent-sized bucket could have cleared triple digits.

The challenge, Silverman realized, was that few people know what "37 grams of saturated fat" means. Most of us don't memorize the USDA's daily nutrition recommendations. Is 37 grams good or bad? And even if we have an intuition that it's bad, we'd wonder if it was "bad bad" (like cigarettes) or "normal bad" (like a cookie or a milk shake).

from Chip and Dan Heath, *Made to Stick* (Random House, 2007)

How to make a story sticky?

Emotional:

Slightly awkward for scientists.

Good science = objective about your work

But, fundamental: curiosity.

Engage our curiosity: ask a novel question.

E is closely aligned with U—unexpected things create curiosity.

Shift from “what’s my answer?” to “what’s my question?”

Engage and then satisfy our curiosity.

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

How to make a story sticky?

Stories:

See your work as a story and present it that way.

Stories are modular: a single large story consists of a collection of small stories.

Think about the internal structure of your paper and how to integrate story modules.

When a leader makes an argument in support of a new idea, these arguments encourage evaluation, judgment, debate, and criticism. When a new idea is presented as part of a story, however, the audience is engaged in the idea and welcomed to participate in exploring its implementation.*

from Joshua Schimel, *Writing Science*; how to write papers that get cited and proposals that get funded

* from Kylie Goodell, review of Chip and Dan Heath, *Made to Stick* (Random House, 2007)

Story Structure

Story structure

Opening (O).

Whom is the story about? Who are the characters? Where does it take place? What do you need to understand about the situation to follow the story? What is the larger problem you are addressing?

Challenge (C).

What do your characters need to accomplish? What specific question do you propose to answer?

Action (A).

What happens to address the challenge? In a paper, this describes the work you did.

Resolution (R).

How have the characters and their world changed as a result of the action? What did you learn from your work?

OCAR

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

OCAR

There exist other story structures that do not follow this order, here, we concentrate on just that.

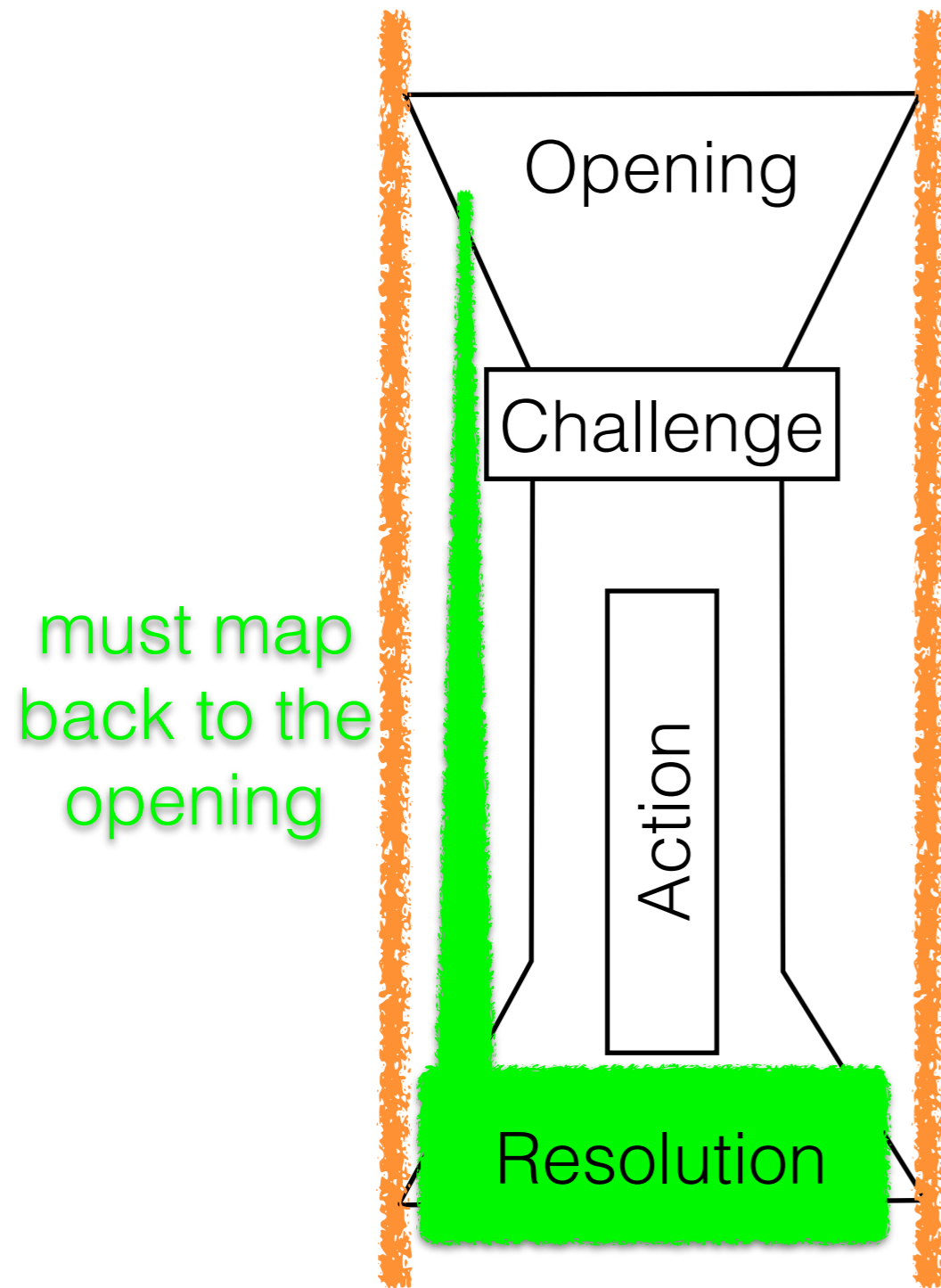
OCAR needs a “patient” reader.

Paper’s challenge at the end of the introduction.

Paper’s conclusion at the end.

Other structures, see for example Joshua Schimel, *Writing Science*; how to write papers that get cited and proposals that get funded.

Story structure



Introduction: introduce characters and question. Give Background. Narrow down to your specific question.

Materials, Methods, Results: What you did and what you found

Discussion: What it means

Conclusion: Take home message

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

Story structure

Opening (O).

Identify the problem that drives the research/the report, introduce the characters, and target an audience.

Identify a problem of broad interest and give the reader a sense of where the story is going.

Do not use an opening that explains a widely held schema.

Ok to explain things to yourself in a first draft, but when you revise, figure out where the real story starts.

You must know the intended audience to tailor the writing to them.

Schimel et al. submitted proposals to two agencies:

- National Science Foundation
- Agency with a management focus (California Environmental Protection Agency)
- The influence of fog on ecological and hydrological processes in coastal zones has long intrigued scientists.
- California's coastal forests are among its most distinctive and treasured national resources.

from Joshua Schimel, *Writing Science*; how to write papers that get cited and proposals that get funded

The Funnel: Connecting the O and C

Opening: Identifies a large problem

Challenge: Defines a specific question

Main body of the introduction must connect these elements.

Build the argument that to make progress on the large problem, you must answer the specific question.

Frame the knowledge gap: U and E

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

Challenge (C).

Describe the specific knowledge you hope to gain.

Start with the question that drove your work!

“to learn X, we did Y.”

Not just “we did Y”, and leave out “to learn X...”

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

Action (A).

“You are not just presenting your results, you are telling a story.”

In a paper: Materials, Methods, Results, most of the Discussion.
Embed the action within the larger story.

What is the point of all that work?

What do these results mean?

Do they answer your question?

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

Story structure

Resolution (R).

People remember the last thing you say.

“Take-home message”

Show how your understanding has advanced.

Good resolution: reiterates the action, answers the questions raised in the challenge, and demonstrates how those answers contribute to the larger problem.

Do not put anything but that new insight in your resolution.

If the most important thing you discover is that there is a new question, make the question concrete, and be clear how it grew from your work—you didn't fail to fill one knowledge gap but identified a new one.

Not good:

- Weak: summarise the results, tell your reader that they are important, but do not clarify how. Not an answer to the questions raised.
- Distracting: include ideas that should be in the introduction or in a textbook.
- Undermine your conclusions: “more research is needed to clarify our findings”.
➔ Focus on what you *haven't* accomplished.

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

Resolution (R).

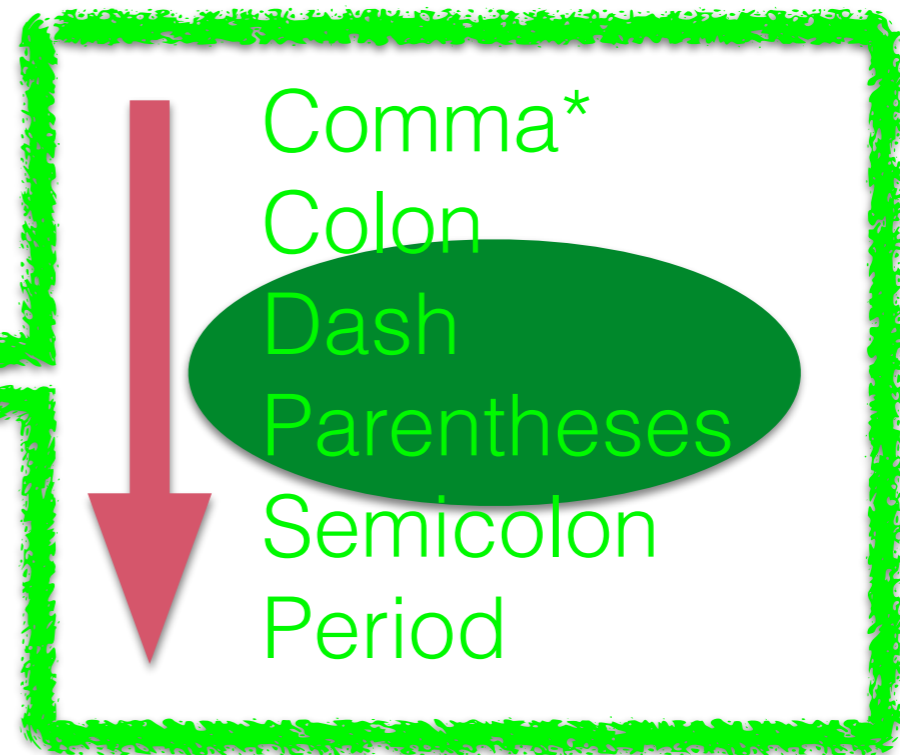
To conclude, 3-methyl-ambrosia offers a new approach for thyroid carcinoma therapy. Our data provide evidence on safety and in vivo activity of this compound in patients with this condition, although the proof for clinical benefit remains to be established in future clinical trials.

While further clinical trials will be necessary to establish the full benefits of 3-methyl-ambrosia as a therapeutic agent, our data provide evidence that it is safe and shows in vivo activity against thyroid tumors. 3-Methyl-ambrosia therefore may offer a new approach for treating patients with thyroid carcinoma.

from Joshua Schimel, Writing Science; how to write papers that get cited and proposals that get funded

less formal

- Use punctuation
- ❖ Correctly
 - ❖ To vary sentence structure



Increasing power to separate

*from Kristin Sainani, Stanford online course "Writing in the Sciences"

Punctuation

Why correctly?

What should this mean?

We had one problem only Janet knew we faced bankruptcy

We had one problem: only Janet knew we faced bankruptcy.

We had one problem only: Janet knew we faced bankruptcy.

We had one problem only, Janet knew: we faced bankruptcy.

We had one problem only Janet knew we faced: bankruptcy.

Bad punctuation:

We had one problem only, Janet knew we faced bankruptcy.

from R.L. Track, Penguin Guide to Punctuation

Punctuation

FULL STOP/PERIOD:

- ❖ Marks the end of a sentence expressing a statement.

Something wrong?

Norway has applied for EC membership, Sweden is expected to do the same.

Two complete sentences, but the first one has been punctuated only with a comma.

Norway has applied for EC membership. Sweden is expected to do the same.

Each statement has its own full stop.

Norway has applied for EC membership, and Sweden is expected to do the same.

We used the connecting word *and* to combine the two statements into a longer statement.

from R.L. Track, Penguin Guide to Punctuation

COMMA:

- ❖ When making lists.
- ❖ Bracketing information that is not central to the sentence.
- ❖ After linking words like however, furthermore, additionally, ... at the start of a sentence, or after a phrase that qualifies or introduces the main part of the sentence.
 - In this section, we survey the airline fleet assignment problem.
- ❖ NO comma goes before “that” in sentences like:
 - ..., and we demonstrate that schedule reliability is highest for direct routing.

COMMA:

❖ *Listing comma:*

- As a kind of substitute for the word *and*, or sometimes for *or*.
- Used in a list when three or more words, phrases or even complete sentences are joined by the word *and* or *or*.
- In a series of three or more terms with a single conjunction, use a comma after each term except the last. (Oxford comma, serial comma.)
 - ➔ ...red, white, and blue.
 - ➔ He opened the letter, read it, and made a note of its contents.

from R.L. Track, Penguin Guide to Punctuation and Strunk, W., Jr. and White, E.B.: The Elements of Style

Punctuation

Oxford comma



<https://www.youtube.com/watch?v=0jS3VyRYYCQ>

COMMA:

❖ *Joining comma:*

- Joins two complete sentences into a single sentence, and it must be followed by a suitable connecting word: and, or, but, while and yet.
- ➔ Norway has applied for EC membership, and Sweden is expected to do the same.
- ➔ Many airlines use a combination of hub-and-spokes and direct routings, and Jeng has shown that a mixed system is generally more efficient.

from R.L. Track, Penguin Guide to Punctuation and Strunk, W., Jr. and White, E.B.: The Elements of Style

Punctuation

COMMA:

❖ *Gapping comma:*

- To show that one or more words have been left out when the missing words would simply repeat the words already used earlier in the sentence.
- ➔ Some Norwegians wanted to base their national language on the speech of the capital city; others, on the speech of the rural countryside.

❖ *Bracketing comma:*

- A **pair** of bracketing commas is used to mark off a weak interruption of the sentence—that is, an interruption which does not disturb the smooth flow of the sentence.
- ➔ These findings, we would suggest, cast doubt upon his hypothesis.
- ➔ An airline schedule, for our purposes, is a list of flight legs that the airline plans to fly.

from R.L. Track, Penguin Guide to Punctuation

Punctuation

❖ Do not join **independent clauses** by a comma.

If you join two or more clauses, that are

- Grammatically complete and
- Not joined by a conjunction

➔ Use a **semicolon**

⦿ It is nearly half past five; we cannot reach town before dark.

We could just write it as two sentences.

⦿ It is nearly half past five. We cannot reach town before dark.

If we insert a conjunction, the proper mark is a comma.

⦿ It is nearly half past five, and we cannot reach town before dark.

If the second clause is preceded by an adverb (accordingly, besides, so, then, therefore, or thus), and not by a conjunction, the semicolon is still required.

[Strunk, W., Jr. and White, E.B.: The Elements of Style]

Punctuation

COLON:

- ❖ A colon signifies that what follows it expands on or explains what precedes it.**
- ❖ To introduce a list, quote, explanation, conclusion, or amplification.
 - ⦿ Participants of this course are: , , ...
 - ⦿ In the following, passenger travel time components are grouped into three categories: In-flight time, ground time [...], planned delay time included in the schedule as a buffer against random delays.
 - ⦿ Washington has a simple solution to most governments it doesn't like: isolate them, slap sanctions on them, and wait for their downfall.*
- “The colon has more effect than the comma, less power to separate than the semicolon, and more formality than the dash.” [Strunk, W., Jr. and White, E.B.: The Elements of Style]
- ❖ To divide the title of a manuscript into two halves.
 - ⦿ Selecting Aircraft Routes for Long-Haul Operations: A Formulation and Solution Method
 - ⦿ The Fleet Assignment Problem: Solving a Large-Scale Integer Program
 - ⦿ Airline Scheduling: An Overview

*from Kristin Sainani, Stanford online course “Writing in the Sciences”

**from Lyn Dupré: “BUGS in Writing: A Guide to Debugging Your Prose”, Addison-Wesley