How to write a text
How to give a talk

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Science = Research + Communication

Outline

- Telling a story
- Message trees
- Anatomy of a paragraph
- Anatomy of an introduction
- Anatomy of conclusions
- Managing expectations
- Talking to audiences
- Practicalities

Telling a Story

- A career as a scientist/engineer is a career as a writer. Both create good contents and write about them.
- A scientific text or a talk must tell a story with logical flow
- The logic/connections are often more important for understanding than the detailed facts supporting them.
- The story should capture and maintain the reader’s/listener’s attention
- Make it simple (because this also requires you to deeply understand it)
- It’s about teaching others something, not about showing them how much you know.
- Communication is an enabler, not a bottleneck

How?

- Do not focus on the product, but on the process of writing.
- Writing is never a linear process. It consists of iterations of planning, drafting, and revising. It’s never “done”.
- Do not fall in love with what you write, but be prepared to put it to the test and revise/rewrite if beneficial. (truth is in the eye if the beholder)
- Do not report work in chronological order (unless you write a diary), but in logical order as it appears best after the fact.
- Archive any detail not required for the story.
- Be concise and short.

Planning

- What is the overall message? (“X allows doing Y”). If it cannot be spelled out in <10 words, then it is too complex.
- The top-level message is the title (and not what has been done/ studied, or how!)
- From the overall message, what sub-messages do you need to convince people (“I’m going to convince you that…”)
- Do not make the reader work in order to get the point. Work for her/him.
- Design the message tree down to the leaves, which as the elementary messages/results of your work.
- The plan is not a text, nor a draft.

Revising Plans

- Revise the plan
- Analyze the tree for clarity of messages
- Prune unnecessary branches
- Collapse unnecessary or indirect edges
- Check if all support required for the top-level message is there
- Be prepared to make big changes and try drastically different alternatives (don’t be lazy)

Drafting

- Take the message tree as a starting point, then linearize it by traveling in a certain order.
- Write it start to end without stopping or too much thinking.
- Focus on the story, not on style, grammar, or language.
- Aim at producing something highly imperfect. This is the best that can happen because realizing that it’s imperfect tells you how to improve it.
- Write as if nobody is ever going to read it again.
- Don’t think, just write. Get in the flow.
- Do not slow down by trying to be perfect.

Writer’s Block

- Go tell someone what you want to write about, but just don’t now how.
- Read something (anything!)
- Take a text and start copying it word by word
- Ask yourself: what did I do that I want to report on? What results did I get? What did I find and how did I find it? What does it mean? Why did I do it?
- Exercise: write about **something** in 5 sentences in 10 minutes.

Revising Drafts

- Read your text (ideally some time later) and ask yourself: is it clear? is it communicated in logical order? is it concise?
- Give it to a colleague to read and ask which parts they understood and which not (do not ask for “feedback”!). Ask yourself why they did not understand those parts.
- What would an outsider find cool? Be brutal to yourself!
- Overcome your tendency to report unnecessary details.
- Is it catchy? Does it draw people in?
- Is the draft covering the entire message tree in logical order? Can the tree be reconstructed from the text without knowing the tree?
- Do not be perfectionist. Everything can be improved.

Anatomy of Text/Talk

- Smallest unit: paragraph / slide
- Each level (Messages —> Paragraphs —> Sections —> Core message = Title) is a elevator pitch
- Each paragraph / slide has ONE, SIMPLE message and makes a clear point
- This message is the title of the slide or the last sentence of the paragraph, explicitly spelled out.
- Corresponds to a leaf node in the message tree
- Must link from previous and to next slide / paragraph by a literal concept.

Elevator Pitch

- Within 5 sentences you must be able to tell your story, and why others should care.
- Start from the most significant, catchy bit
- Give more detail as you retain attention

Iterate

Replan and redraft. Do not just revise.

Writing is about linearizing the multi-level message tree
by a specific tree traversal.

It’s not about documenting our work, but about thinking of
the most logical way of linearizing it and figuring out what it
actually is that you have to say.

Paragraph Anatomy

- Proceed from more general to more specific
- Provide older information before newer
- New information of a paragraph becomes old information of the subsequent paragraph —> flow!
- Flow must be easily visible to the reader. Best by literally repeating the same word/concept.
- Do not present new information out of the blue. Creates cognitive dissonance.

Paragraph Anatomy

detached with trypsin (Supplementary Fig. 1b, c). Therefore, we conclude that a detached, isolated cell will be nearly spherical, independent of its cell cycle phase. This suggests that loss of adhesion as cells enter mitosis permits cell rounding[3].

A role for actin-based processes has previously been demonstrated in mitotic cell rounding[1,4,6,8,9]. Therefore, we tested the role of the actin cytoskeleton in maintaining a spherical shape by adding cytochalasin D to rounded cells (Supplementary Fig. 1a, e). After treatment, both detached mitotic and interphase cells remained round. However, if retraction fibres were present, rounded cells sagged to height-to-width ratios of <0.5 on cytochalasin D treatment. Therefore, the actomyosin cytoskeleton is necessary for generating a rounding force against adhesion.

To quantify the force of cell rounding, a tipless cantilever was positioned over a prophase HeLa cell, 8 μm above the substrate (Fig. 1a), and held there while the cell underwent mitosis. We refer to this

Extracting the Plan

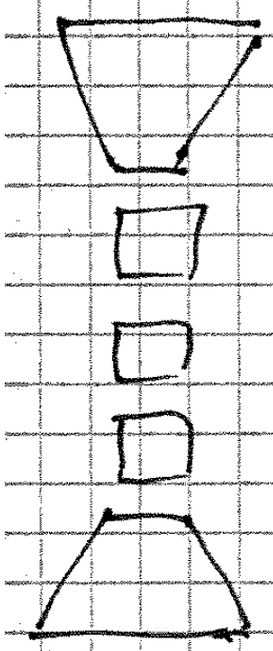
- Plans can be extracted by just taking the first and last sentences of each paragraph.
- Higher levels of organization come from subsections and sections.
- Discuss contents on the level of the plan, not the text
- When reading a paper, try to extract the plan. Typically, read figure captions and headings first and then decide where to zoom in to get the information you need to be convinced.
- Do not read linearly, but according to the plan. If you don’t get it, ask yourself why. Reading differently teaches how to write better.

Revising Paragraphs

Go through each paragraph / slide and ask:

- Does it make a single point? Is the point clear and simple? (explicitly spelled out in the last sentence)
- Does it contain unnecessary information (for this point)?
- Is information missing to convince of the point?
- Is the point compellingly demonstrated or does the paragraph allow doubts?
- Does the paragraph orient the reader (topic sentence should the the first sentence).
- Does it pick up from the previous paragraph and lead into the next?
- Does it go from general to specific?
- Does the point fit the message tree (i.e., is the paragraph in the right place)?

Paragraphs make stories



- Creating a research space
  - establish a territory / area
  - establish a niche
  - occupy that niche

general → specific

- Results are linear
- Conclusions go from specific to general

Intro → this is what I will show you
Results → this is what it shows
Conclusion → this is what I have shown
Discussion → there is really no other way of interpreting this, so this is what it is.

Goal

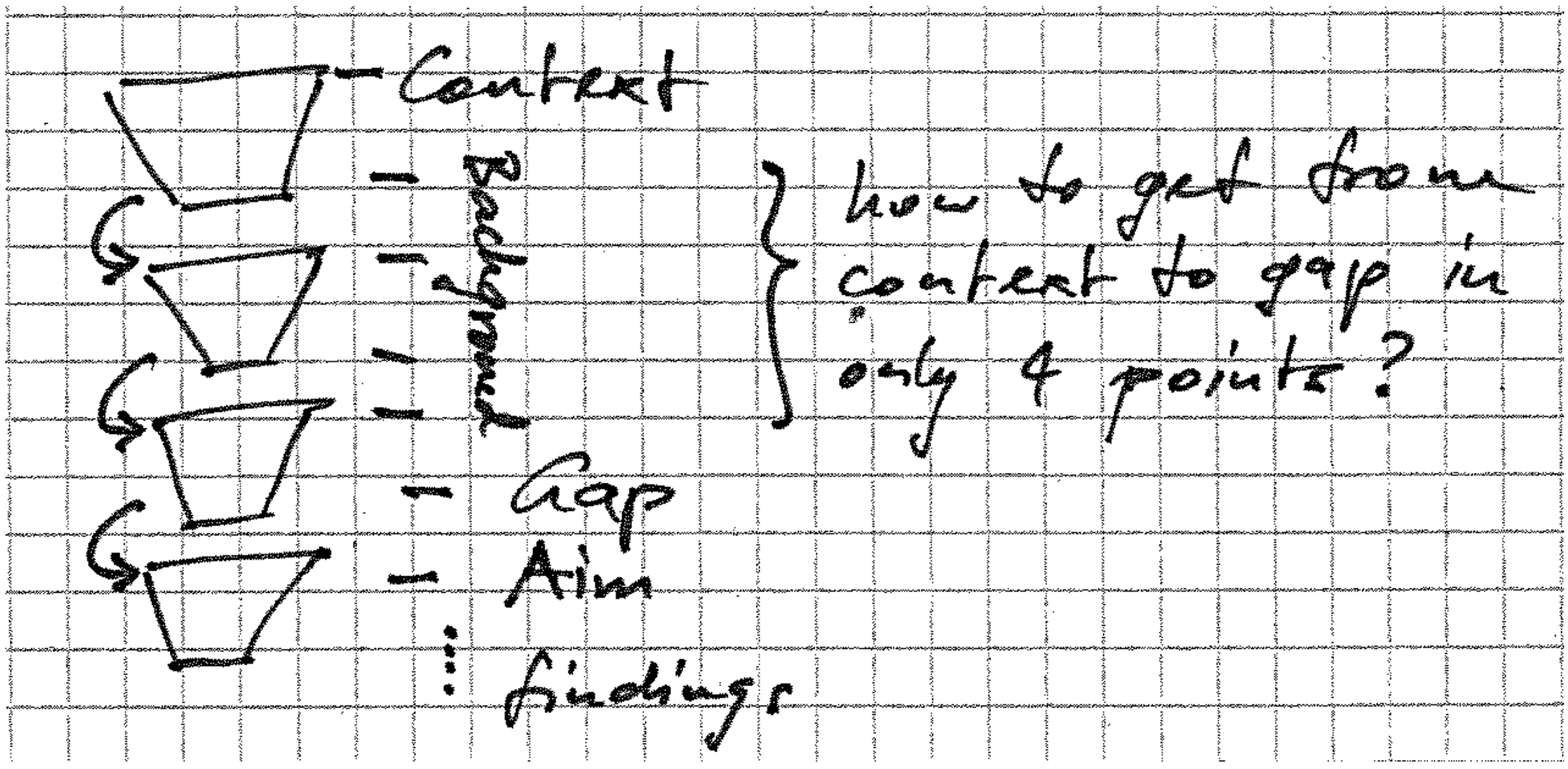
Clear message on multiple levels.

Repeating the core message at least three times in different contexts: intro, results, conclusions.

Anatomy of Introduction

- Context: In what area is the problem situated? Why is it important?
- Background: What do we need to know in order to understand the problem and the solution proposed?
- Gap: What have others done and what remains open?
- Aim: How are we trying to address the remaining gap?

Anatomy of Introduction



This defines the first and last sentence of each paragraph.
Go ahead and jot them down.

Anatomy of Introduction

- Establishing Territory by either:
  - Claiming centrality
    “Overcoming the memory wall is going to be key for the progress of high-performance computing.”
  - Making a topic generalization
    “Most stochastic simulation algorithms can be understood as Markov Chains.”
  - Reviewing previous literature
    “Gibbs [1] has provided an unbiased algorithm for sampling from normalized distributions.”

Anatomy of Introduction

- Establishing your Niche within the territory by either:
  - Counter-claiming
    “However, we believe that this is not true.”
  - Pointing out a gap
    “No efficient algorithm is known for un-normalized distributions, though.”
  - Raising a question
    “How can nonlinear stability analysis be computed on collocated data?”
  - Continuing a tradition
    “It is custom in our community to benchmark new optimization algorithms on the CEC2005 test set.”

Anatomy of Introduction

- Occupying the Niche by either:
  - Indicating a gap
    “To date, no such algorithm is known.”
  - Announcing the main results to be presented
    “Here, we present an efficient numerical method for nonlinear stability analysis.”
  - Formulating a hypothesis
    “We hypothesize that Lie algebra can be used to construct nonlinear stability metrics.”
  - Giving an overview of the paper
    “In section 2 we present such a method, before benchmarking it in section 3.”

Caveats

- Do not introduce and explain every concept you are later going to use in the paper (you can do that later, when you actually use them), but focus those necessary to understand the storyline.
- Make sure the first sentence of the introduction connect to the title (ideally, by literally repeating the subject).
- Structure sentences (“as introduced above”, “in this section we will”, …) are an alarm signal. The indicate that the text itself has no structure; otherwise such phrases are not needed.
- Do not confuse feedback with criticism.

Abstract

The abstract is given by the first and last sentences of the paragraphs of the introduction (of course, suitably edited).

In-Between: Results

- Discuss the results right in the place where the message they support is spelled out.
- Be objective, analytical, comparative (avoid subjective words like “good”, “simple”, “very”, …)
- Just having a bullet list of things is not a plan. It lacks logic and will be boring to read.
- Linear presentation from sub-message to sub-message.
- Links usually via questions (“knowing the convergence rate now, the natural thing to ask is how large the pre-factor is.” — next section: “Error pre-factor”).

Anatomy of Conclusions

- What has been shown? Give a short summary of the main results (usu. in perfect tense).
- Are these results surprising or expected? Why?
- What works of others confirm/contradict the findings here?
- What are the limitations? When does the method/results break down?
- What implicit assumptions were used, and where?
- How could some of these assumptions or limitations be relaxed in future work?
- What does it mean? How important is it? Where might it be useful? This is the only place where you are allowed to judge, be subjective, and speculate.

Caveats

- Conclusions and discussions are usually badly written.
- They are, however, the most important part of your talk/paper.
- Make sure every paragraph has a clear message, explicitly spelled out in its last sentence.
- Make sure paragraphs are logically linked.
- Zoom out from special (your results) to general (meaning, importance) — inverse of introduction.
- Do not use filler paragraphs just because you don’t know what to write.
- Do not praise yourself, but be self-critical. Think what criticism a reader could have and defuse it.

Final polishing

- Three rounds of editorial revisions (you or an editor)
- Is reading the first and last sentence of each paragraph enough to get the story? (without the supporting data)
- Is there anything that can be left out (filler words, unnecessary sentences, unnecessary paragraphs). If in doubt, delete!
- Revise for language in the very end: spell-checking, grammar, style (White + Strunk, “The Elements of Style”)
- Prefer active voice over passive voice (“we show that…” instead of “it is shown that…”)
- Make short sentences with few commas.
- Prefer present tense wherever possible.

Managing Expectations

- Do not assume the audience knows what it's all about or what you mean.
- Explicitly spell out the obvious if it is important.
- Guide the audience's attention and set up expectations.
- Then, fulfill them.
- Tell the reader what the question is, then answer it.
- Tell the reader what your thoughts were (why did you make certain decisions? what alternatives are there?).

Talking to Audiences

- The same story can be told in different ways.
- Use the plan to work out alternatives.
- Think about what the target audience finds most exciting, what knowledge they already have, or what you may assume about them.
- Place emphasis accordingly.
- Adhere to community conventions (e.g., in structure, style, notation)

Practicalities for Talks

- Face the audience (not the screen!)
- Make eye contact
- Make good use of pointing devices (use them to set highlights, do not wobble all over the place)
- Pay attention to body language
- Stress and emphasize in your speech (do not talk monotonously)
- Talk clearly and slowly. Form your sentences.
- Use silence to place emphasis. Do not use filler sounds.
- Connect with your audience (e.g., tell a personal anecdote in the beginning)
- Do not patronize or glorify yourself. Be self-critical.
- Show some humor