Strategies for Designing and Delivering a Scientific Talk

Matt Carter, Department of Biology, Williams College

The following is intended to be brief, practical advice for designing and delivering a scientific talk. Science talks come in different forms (50-min seminars, 10-min seminars, class presentations, journal article presentations, lab meetings, etc.) and different flavors (biology, chemistry, math, etc.), but there are general principles that can make any talk a success.

TOP PIECE OF ADVICE: KNOW YOUR AUDIENCE. The quality of a presentation is measured by its ability to impact an audience, and the best presenters design a talk with their audience in mind. Before planning any other aspect of a presentation, you should clearly define:

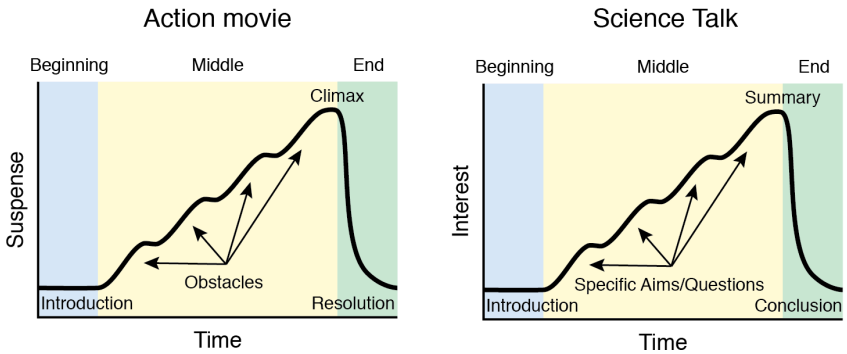
- **Who is your target audience?** What do they already know about your topic? What will they need to know to understand your talk?
- **How do you want to impact your audience?** What information do you want to communicate? What do you want your audience to remember when your talk is over?
- **What will you need to do to help your audience understand and appreciate your talk?** What information is necessary to include in the background? What terminology, methods, and techniques will you need to explain in detail? How can you optimize visual aids (e.g. graphs, slides) so they are clear, simple, and easily understood?

If you anticipate your audience's needs and intentionally design a presentation on their behalf, you will be well on your way to designing a good presentation. Put yourself in your audience's shoes and design the talk you would want to see yourself.

In general, there are three elements of a scientific talk: (1) Your structure/narrative, (2) Your visual aids (slides), and (3) Your delivery. Below are some general guidelines for each, along with some "before and after" examples of good presentation design. Keep in mind that putting together a scientific talk takes work, but it should also be fun. If you enjoy yourself, your audience is likely to enjoy your talk as well!

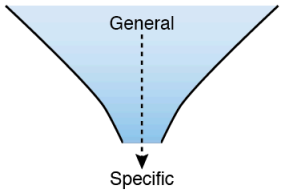
Design a good, logical structure/narrative

Make your scientific talk a scientific story with a beginning, middle, and end.



A typical plot diagram for a thriller is similar to the narrative structure of a scientific presentation. Just as a protagonist overcomes obstacles through a series of action scenes, a scientist pursues scientific objectives through a series of experiments.

Start and end your talk with the big picture.



A good science talk starts with a general question and becomes progressively more and more specific until the speaker asks a unique scientific question.

General
Specific

How is the Earth's climate affected by global warming?

As the earth warms, some regions demonstrate anomalous cooling.

Is the decrease in Arctic sea ice in autumn linked to increases Northern Hemisphere snow in the winter?

General
Specific

What are the molecular mechanisms behind the aging process?

In sexual animals that don't self-replicate, telomere shortening correlates with cell senescence.

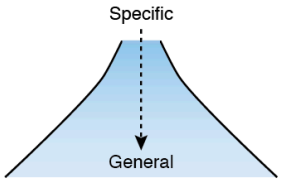
Is telomere maintenance different in sexual animals and asexual animals that do self-replicate?

General
Specific

How do chemicals cycle through the environment?

Isotopes of iodine play significant environmental roles.

How does ^{131}I cycle throughout terrestrial ecosystems?



A good science talk ends by progressing from specific conclusions to more and more general statements, placing results in a broader context.

Specific
General

We showed how ATP binding triggers activation of a P2X receptor.

This mechanism explains many experimental findings and provides insight for the future design of antagonists.

Our methods can be universally applied to other ion channels involved in various physiological processes.

Specific
General

We determined the three-dimensional structure of the IRES subdomain IIa in complex with a benzimidazole translation inhibitor.

Our findings will be a valuable starting point for structure-based designs of HCV inhibitors.

Such drugs may lead to the development of anti-HCV drugs for infected individuals worldwide.

Specific
General

We showed that hatchery pink salmon were larger and grew faster than wild pink salmon during the first summer at sea.

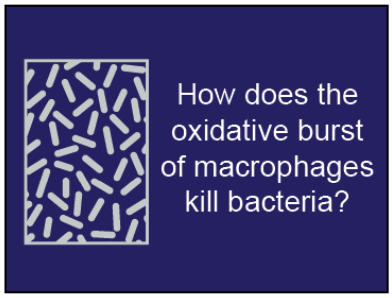
Differences in growth rate may indicate variable growing conditions or food consumption.

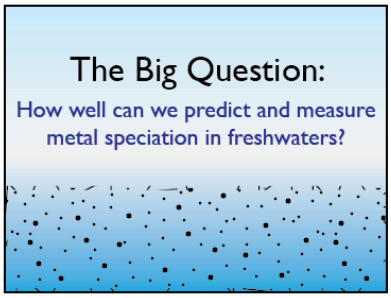
Evidence of competition could indicate that carrying capacity has been reached for the ecosystem.

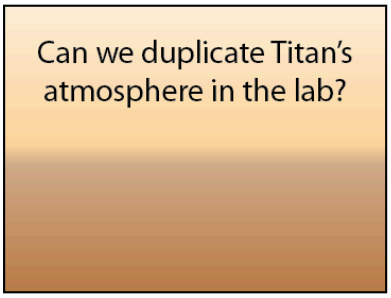
Inform your audience why they should care about your subject.

One of the worst questions your audience can ask about your presentation is: "Why is this interesting?" Your audience might think you are smart and hard working, but if they don't see any value in what you have accomplished or propose to accomplish scientifically, they will think you wasted your time (and theirs). Instead, explain how your research may inform the treatment or etiology of a medical disorder. Describe how your research topic fascinated you as a kid and now you continue to feel like a kid because you get to study this topic as an adult. Convey the applicability of your research to real-world challenges. Explain that an aspect of the universe seems strange and mysterious, but the work you are describing is revealing a newfound understanding. No matter what, ask yourself why you are interested in the subject in the first place and convey this passion to others.

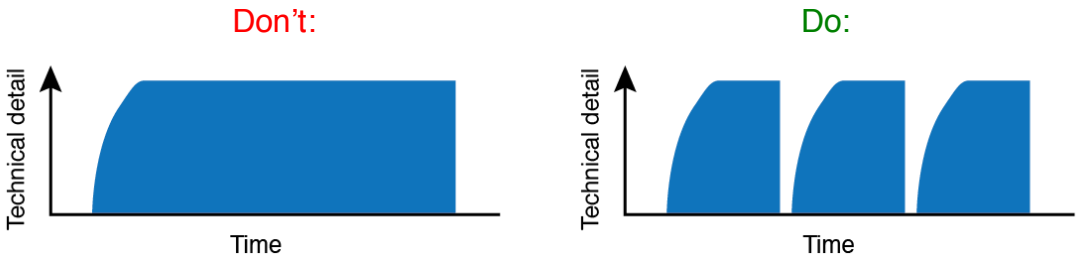
Somewhere near the beginning of your talk, clearly state your scientific research question and goal/hypothesis. Don't hide this information at the bottom of a slide or on a slide with a lot of other text—call attention to it and make sure your audience knows it is a highly important aspect of your talk.



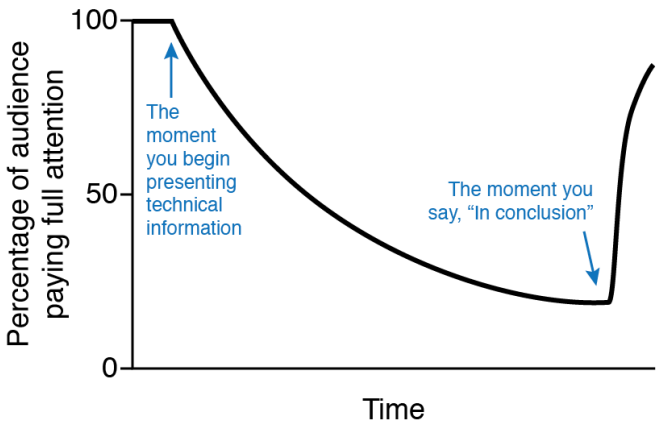




For longer talks (30-60 min), break up detailed information by occasionally "coming up for air," summarizing what you have said and introducing new concepts.

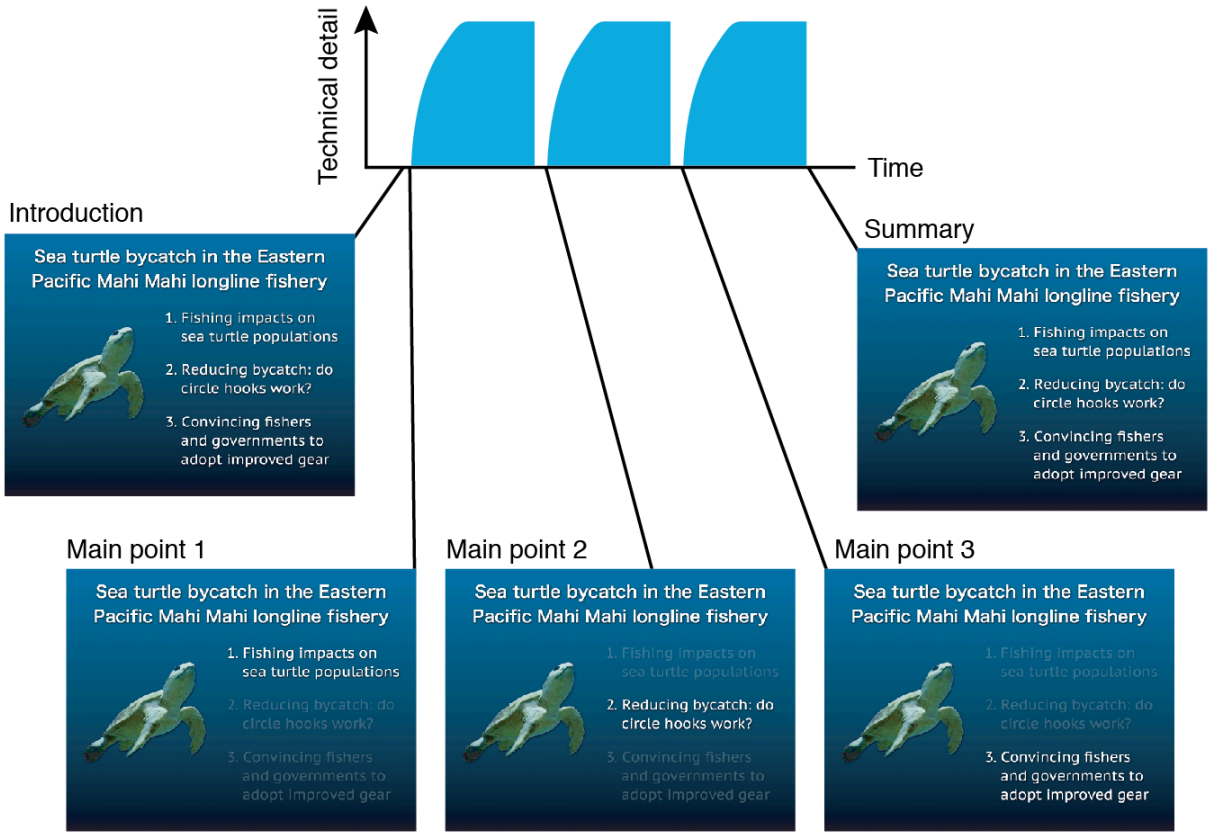


For longer talks, prepare for inevitable shifts in audience attention. Predict the moments during which people are likely to break concentration and deliberately structure your presentation so that you employ methods, such as inserting a joke or movie, to maintain and regain attention.



Unite sections of a 30-60 minute talk using a "home slide." When dividing a presentation into manageable segments, it can be helpful to your audience to provide an outline that follows the structure of your talk and tracks your progress throughout. A good home slide contains an outline of the different sections of your talk with a picture or unifying diagram that represents the big picture.

Show this slide before you present your first segment of data and at the end of every section until the conclusion of your talk.

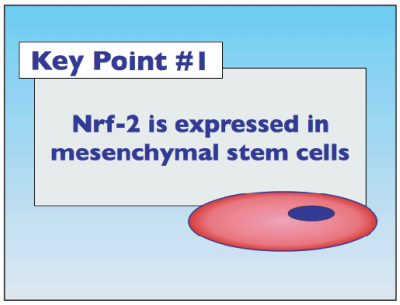


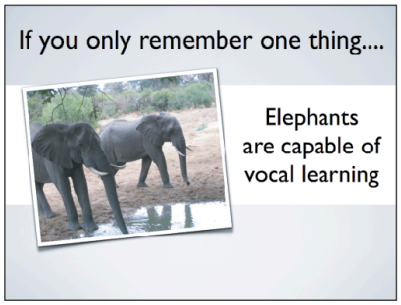
For every result (e.g. graph, table, chart), present a brief rationale, statement of methods, explanation, and conclusion. Don't assume the audience instinctively knows what you are doing or which methods you are using. Every data graphic should be like it's own mini-science talk, with beginning, middle, and end.

> "Next, we wondered whether FOXO3 directly binds to the NPY promoter. To test this hypothesis, we used a chromatin immunoprecipitation assay. This assay involves using an antibody to bind to and purify a protein of interest (in this case, FOXO3), then uses PCR techniques to amplify any DNA that is bound to the protein. We found that the NPY promoter was indeed bound to FOXO3, supporting our hypothesis that FOXO3 binds and interacts with the NPY promoter."

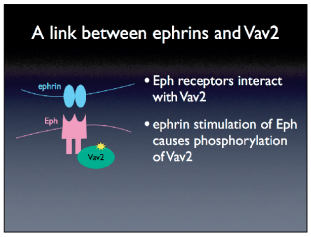
> "Now that we know that FOXO3 binds to the NPY promoter, we wanted to determine whether FOXO3 could directly activate transcription of the NPY gene. To test this hypothesis, we used a luciferase assay. This assay is used to determine whether a transcription factor (in this case, FOXO3), activates transcription of a gene by using a bright yellow luciferase gene reporter. We found an increase in luciferase expression in conditions when FOXO3 was present compared to conditions when FOXO3 was absent, supporting our hypothesis that FOXO3 directly activates NPY transcription."

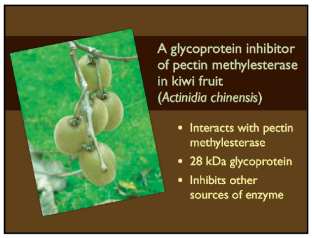
Deliberately emphasize one to three take-home messages. Telling your audience what is important to you will make those items resonate long after your talk is over.

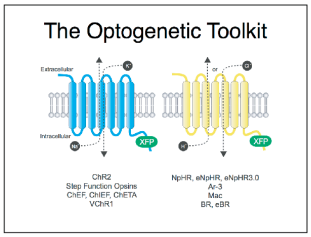


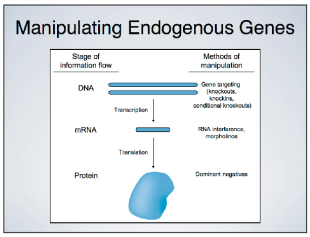


End your talk while showing a summary diagram. Most talks end with a brief question-and-answer period. During this time, consider displaying a slide that contains a simple summary of your talk. This slide will help make your talk more memorable and also help your audience ask good questions because all the relevant information will be in front of them.





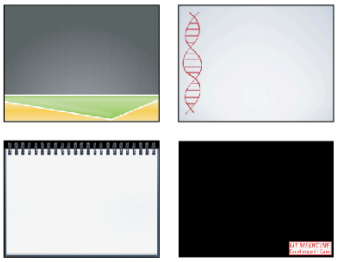




Design visually appealing slides that easily communicate information

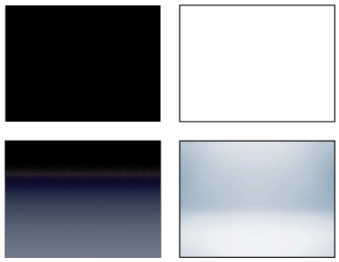
The best backgrounds are simply that: backgrounds that, by themselves, lack visual content. Some human psychophysics studies show that it may be best to use a white slide background in a relatively small room (such as a small classroom) and use a black slide background in a relatively large room (such as a large lecture room or presentation hall).

Before



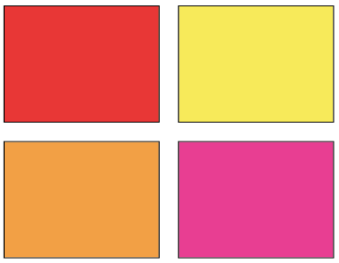
Slides with busy backgrounds reduce the amount of space you have for your own visual elements.

After



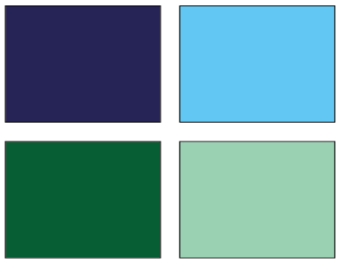
Slides with clear backgrounds allow you to fill the entire space with your own content.

Before



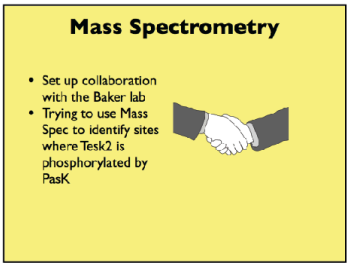
Backgrounds composed of warm, bright colors can be too intense on the eye.

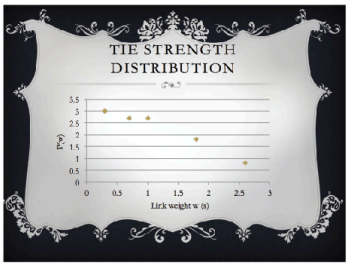
After



Backgrounds composed of cool tints or shades are comfortable to look at for long time periods.

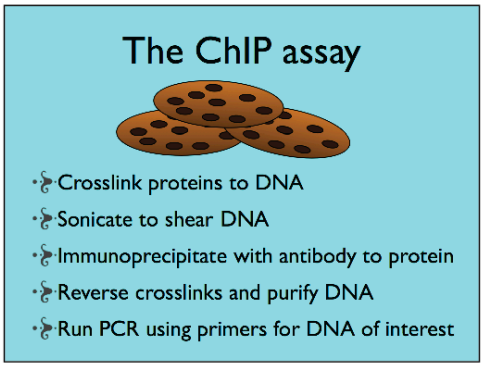
Add design instead of decoration. Don't fill a slide with useless backgrounds or gimmicky clip art.



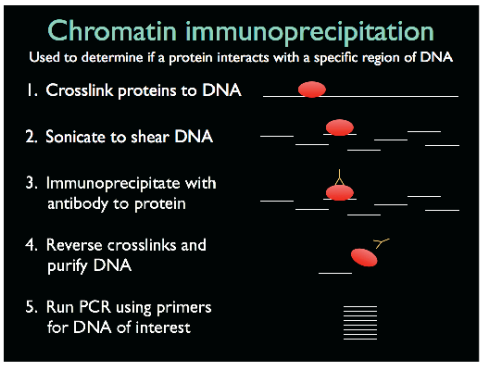


Cute pictures may help fill a slide with "stuff," but designing a slide to communicate with your audience adds meaning, value, and utility.

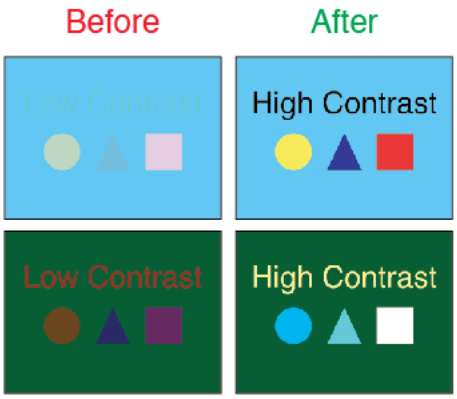
Before



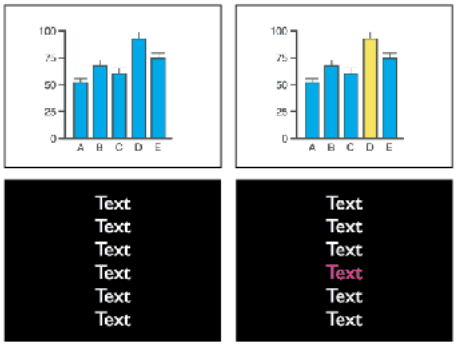
After



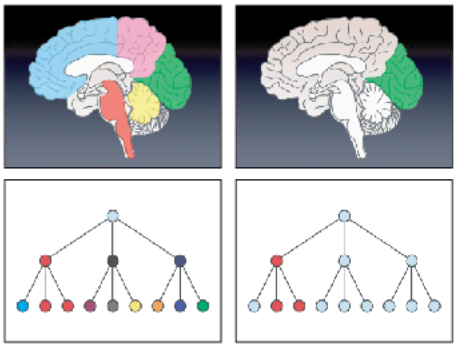
Use color wisely. Ensure that everything on your slide is easy and comfortable to see. Instead of using color to decorate, use color to emphasize what is most important.



Ensure there is high contrast between your foreground and background colors.



Use color to emphasize important information.



Use color sparingly so the audience knows what to look at.

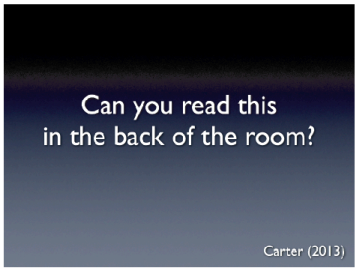
Serif

Use a sans serif font. Serif fonts have slight projections that finish off the stroke of a letter. This can be helpful in a written document or a book, but a sans serif font is easier to read on a slide projected onto the screen. Commonly used sans serif fonts include:

Calibri
Century Gothic
Gill Sans
Helvetica
Myriad Pro
Tahoma
Verdana

Ensure that all text is easy for the audience to read.

The font size should be large enough to be seen in the back of the presentation room. This is typically at least 20-36 pts., depending on the font. It is okay to use a relatively smaller font size for citations and footnotes, which can be placed in an inconspicuous location on the bottom of the slide. However, these references should still be legible in the back row.



On a slide, it is harder to read underlined words or words in ALL CAPS

If you want to emphasize a word, use **bold letters** or *italics*

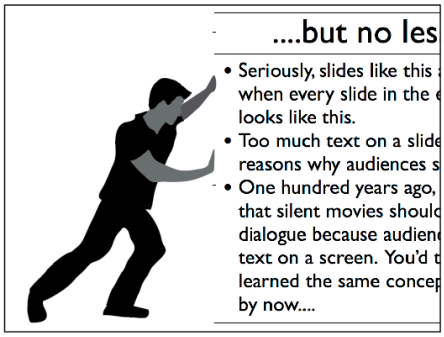
Keep text on a slide to an absolute minimum. Probably the most common design problem in most slide presentations is too much text on one slide. If you find yourself filling up an entire slide with text, realize that you are not really creating a slide—you are creating a document. Try to limit yourself to only two lines of text for any single title, bullet point, or statement on a slide. And limit the total amount of text to only about one-fourth the total area of the slide. If you can, give yourself the goal of including at least one image in every slide.

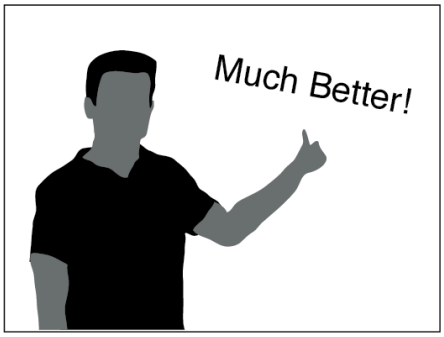
A common mistake....

- How many times have you seen a slide like this? Probably too often.
- The use of too much text on one slide is so common that many of us don't even think to question it.
- If presenters are going to write out everything they are going to say during their delivery, then what is the point of attending their presentations? They might as well send their slides to us over email and we can read them whenever we want.

....but no less annoying.

- Seriously, slides like this are awful. Especially when every slide in the entire presentation looks like this.
- Too much text on a slide is one of the top reasons why audiences stop paying attention.
- One hundred years ago, movie studios realized that silent movies shouldn't contain too much dialogue because audiences didn't enjoy reading text on a screen. You'd think we would have learned the same concept in slide presentations by now....





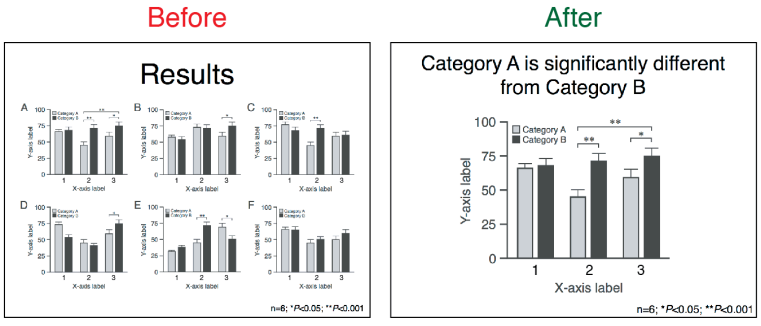
Use slide titles to make a point. Don't use slide titles for no reason—use them to emphasize a point or convey a message.

Use a title to make a point, such as when presenting results, background information, ideas, etc.

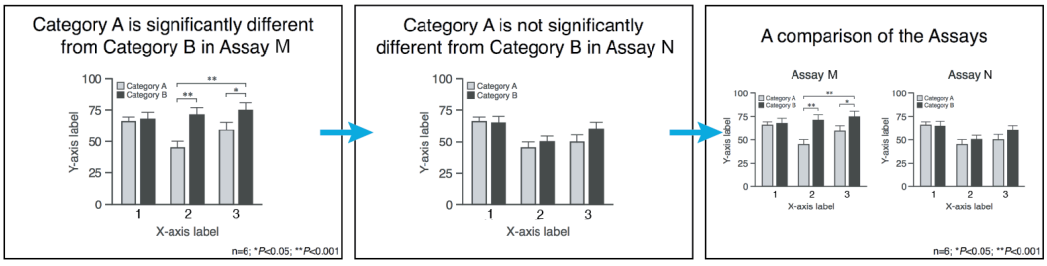
Don't use generic words or phrases like "Background," "Results," or "Conclusion." Instead, try to be specific about the larger point you want to emphasize.

Don't use a title when the contents of a slide are obvious and you don't need to emphasize a point.

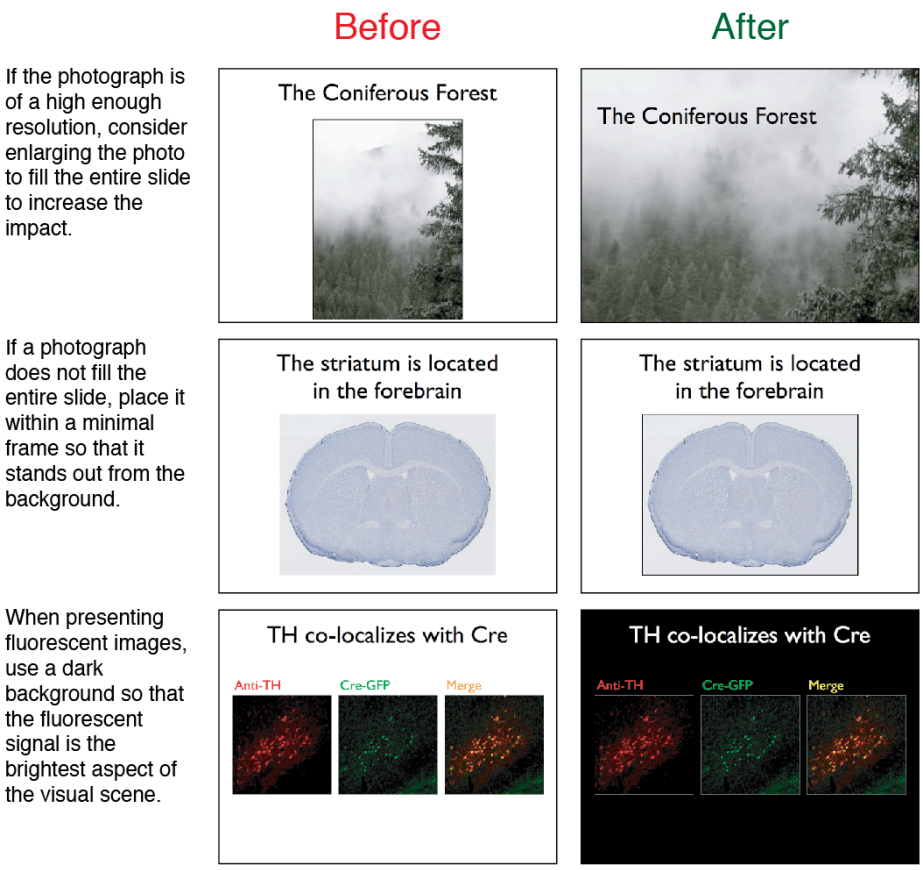
Try to make only one point per slide. Audiences can only reflect meaningfully on one piece of information at a time. Therefore, try to only show one chart or figure per slide unless you have a good reason not to do so.



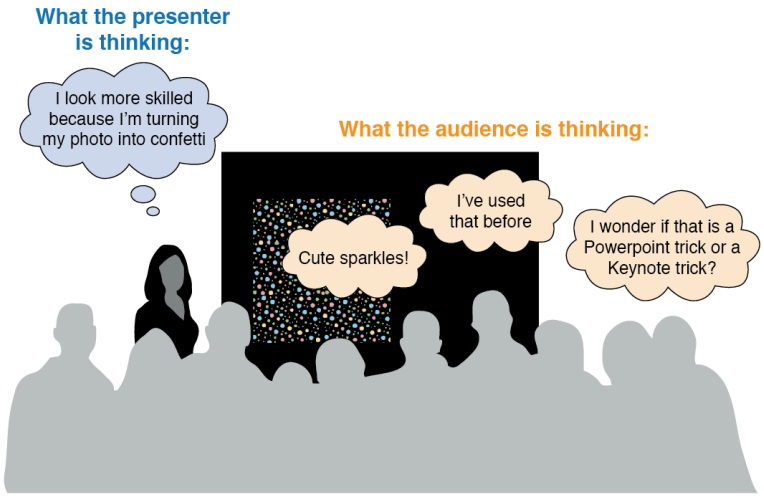
If you want to present two or more figures side by side for comparison or discussion, consider presenting them individually at first and then grouping them together afterwards.



Use the best photos/images for talks. Photos are excellent for showing data and enhancing atmosphere and tone. Don't feel compelled to make a photo a tiny aspect of a slide—make it as big and beautiful as your resolution allows.



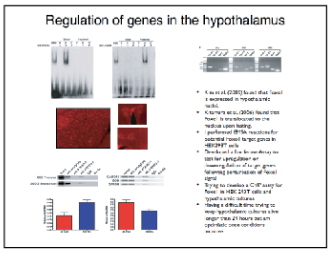
Use animation/slide transitions wisely. Good design never calls attention to itself. Presentation effects should always be used in service of your science and not in service of the cool things you know how to do with your computer.



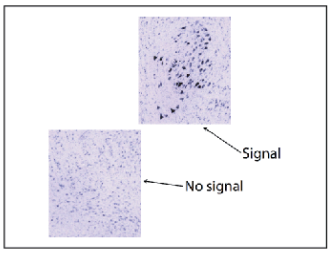
What the audience is *not* thinking about: **your message**

Strive for a simple slide layout that instantly communicates information. Arranging visual elements on a slide is much more consequential than simply making a slide "look nice." Slide layout is about adding meaning to your content, controlling the flow of information to your audience, and emphasizing what is most important.

Slides that could use a good layout tune-up:



Too busy and overwhelming

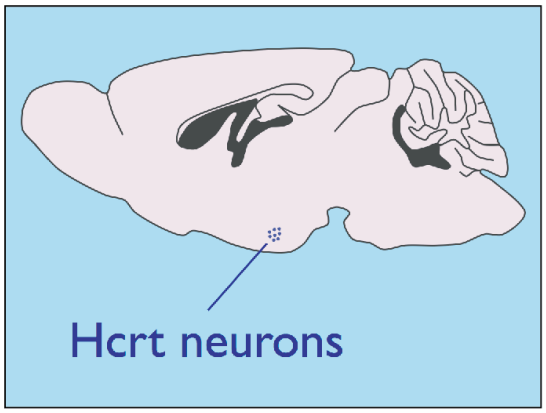


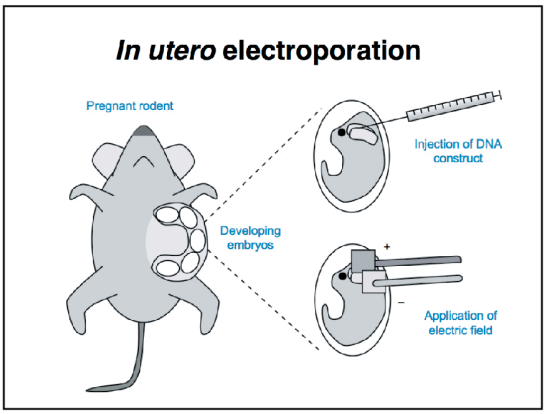
Too random and chaotic

- Is it possible to crystallize the ADC-3 protein?

Too sparse and assymetric (and a terrible use of a bullet!)

Try to produce the most simple, easy-to-read slides possible. People new to making slide presentations often feel the need to fill their slides with too many visual elements. In reality, the old maxim "less is more" truly holds for slides. Putting less content on a slide adds greater impact to the information that you choose to show, increasing the clarity of your message and simplicity of your delivery.



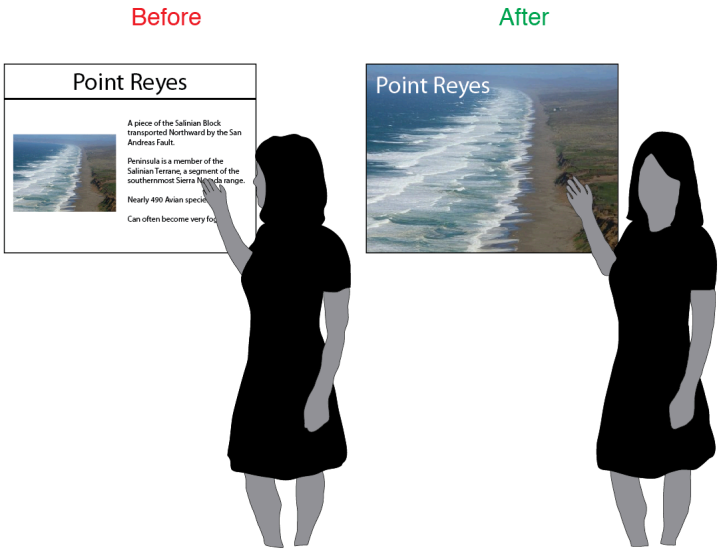


Rehearse and practice for a good delivery

Rehearse as much as possible. There is no such thing as a "natural" presenter. What distinguishes "naturals" from others is the degree to which they design and rehearse talks until they can communicate their message as effectively as possible.

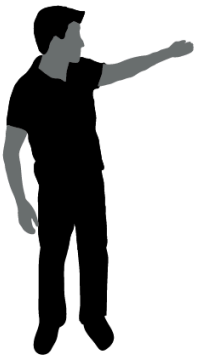
Rehearsing means different things to different people. Some like to rehearse by actually delivering a mock presentation to an empty room while projecting slides on a screen. Others like to rehearse mentally: at their desks, while riding their bicycles, or in the shower. Rehearse however you feel most comfortable, just try to rehearse so that you know exactly what you will say and, importantly, how long it will take you to say it.

Don't use slides as presentation notes. Slides are for the audience, not the speaker. The problem with using slides as presentation notes is that (1) you design boring slides; (2) you look at the slides rather than maintaining eye contact with your audience; (3) you reduce your ability to be present and attentive to the real-time needs of your audience.



Try to "be present" as much as possible. Being present as a speaker means having a clear understanding of yourself, your audience, and your environment during your real-time delivery. This takes practice, and you can always ask for feedback at the end of a talk to learn about how you came across to others.

Be aware of....



Yourself:

Are you talking too slow, too fast, too quiet, too loud, or too monotonous?

How is your posture?

Is anxiety causing you to perform a nervous, repetitive movement?

Your audience:

Is your audience showing signs of confusion, boredom, or impatience?

Where is your audience maintaining eye contact?

Is your audience distracted by something else in the room?

Your environment:

Is the lighting optimal for viewing slides and keeping the audience awake?

Is the temperature too hot or cold?

Are there visual or audible distractions?

Prepare for inevitable nerves and anxiety. Know that there is no correlation between how nervous a speaker is before or during a talk and how well he or she delivers a presentation. What distinguishes presenters who don't seem nervous from presenters who let anxiety overcome their delivery is often practice and preparation. Some tricks:

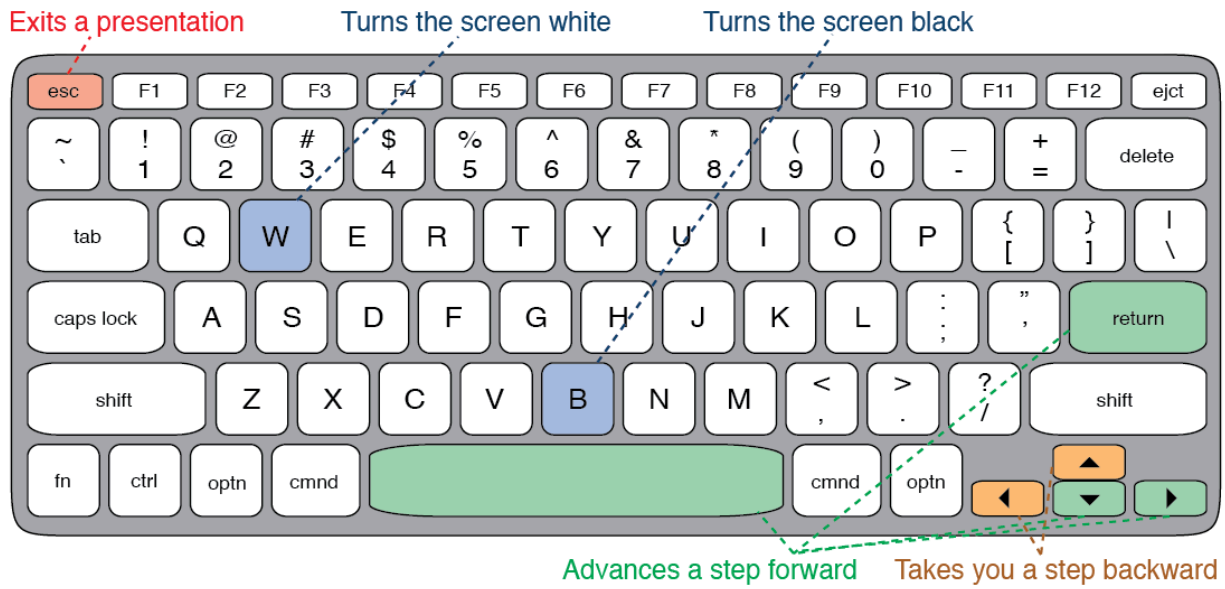
- **Rehearse for the 5 minutes before your presentation begins.** Speakers usually become most nervous just before their talks start, yet few scientists actively prepare for this period. Anticipate the sights and sounds of the minutes before the start of your talk, especially the sounds of the gathering audience.

- **Memorize and rehearse the first 1-2 minutes of your talk most of all.** Most speakers agree that once they get through the first minute of their presentation, anxiety begins to fade.

- **Walk around your presentation space.** Although it's tempting to hide behind a presentation lectern, slowly walking around your available presentation space will not only help your audience pay attention to what you are saying but will also help to calm your nerves and give you the perception that you are having a conversation with colleagues.

- **Bring a water bottle.** Presentation anxiety can easily cause a dry mouth. A quick drink of water during your talk can help you feel better physically.

Don't forget to practice using technology. Know how to use your computer to control your presentation. Know all of the keyboard shortcuts.



If your laptop requires its own power and/or projection cords (especially for Macs), make sure to bring them. If you anticipate needing to dim or turn off the lights, figure out how to do this *before* the talk begins. Finally, make sure you have a way to keep track of time during the presentation so you can monitor how long your talk is taking.

Practice using a laser pointer. Use a laser pointer sparingly. Just like any highlighting tool, the more you use it, the less your highlighted material stands out. Don't turn on the laser pointer until it is aimed at the screen, and never aim a laser pointer in the direction of the audience. Don't highlight text, and try to leave your pointer on for only a few seconds at most. If you are nervous and you find your hand shaking, rest the hand holding the laser pointer on your other hand—this support will prevent your laser dot from nervously shaking around the screen.

Soliciting and answering audience questions. After your talk is over, your final job is to solicit questions from the audience. After receiving a question, consider rephrasing the question in your own words before providing an answer. Doing so ensures that you correctly interpret the specific question that was asked, as well as making sure that everyone in the audience hears and understands the questions.

Prepare for the possibility that you may face difficult questions from the audience, not necessarily because the questions are hard to answer, but because of the nature of the questioners. No matter what, try to remain calm and project confidence. It is okay to say "I don't know" while speculating on an answer. It is also okay to offer to talk with the questioner after the Q&A session is over.

Remember to have fun!

One of the most fun aspects about designing and delivering science presentations is that your skills, attitude, and vision continuously evolve. Remember that designing science talks is an art form, and there is no such thing as "the perfect talk." The audience is on your side and wants you to do a great job. Each presentation you give is another evolution in your development as a presenter, and another experience to learn from for the future.

Further reading:

Designing Science Presentations: A Visual Guide to Figures, Papers, Slides, Posters, and More, by Matt Carter

The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid, by Michael Alley

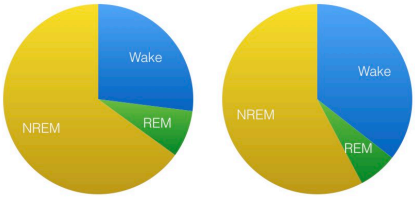
Presentation Zen: Simple Ideas on Presentation Design and Delivery, by Garr Reynolds

Show me the Numbers: Designing Figures and Graphs to Enlighten, by Stephen Few

Slide:ology: The Art and Science of Creating Great Presentations, by Nancy Duarte

How could you improve the design of these slides?

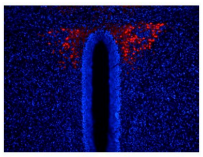
Caffeine increases wakefulness and decreases REM sleep



No Caffeine Caffeine

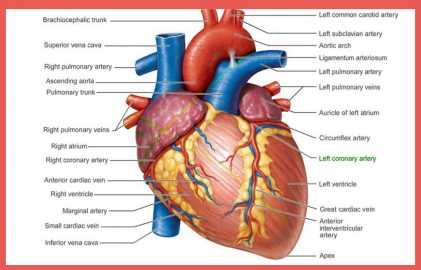
TRH Neurons

- Regulate body temperature and metabolism in mammals



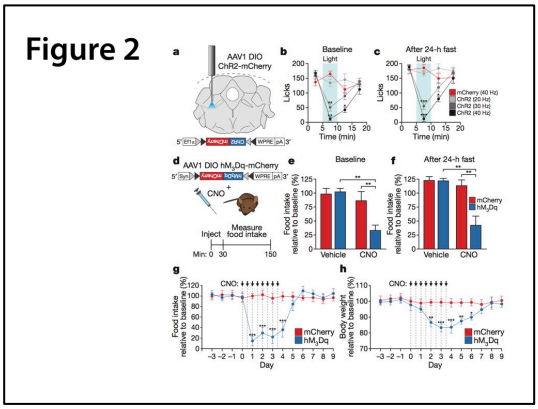
We tested the hypothesis that ablation of TRH neurons in mice would decrease body temperature

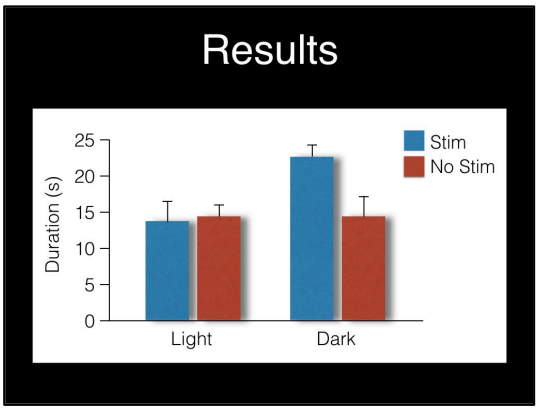
The right atrium receives deoxygenated blood



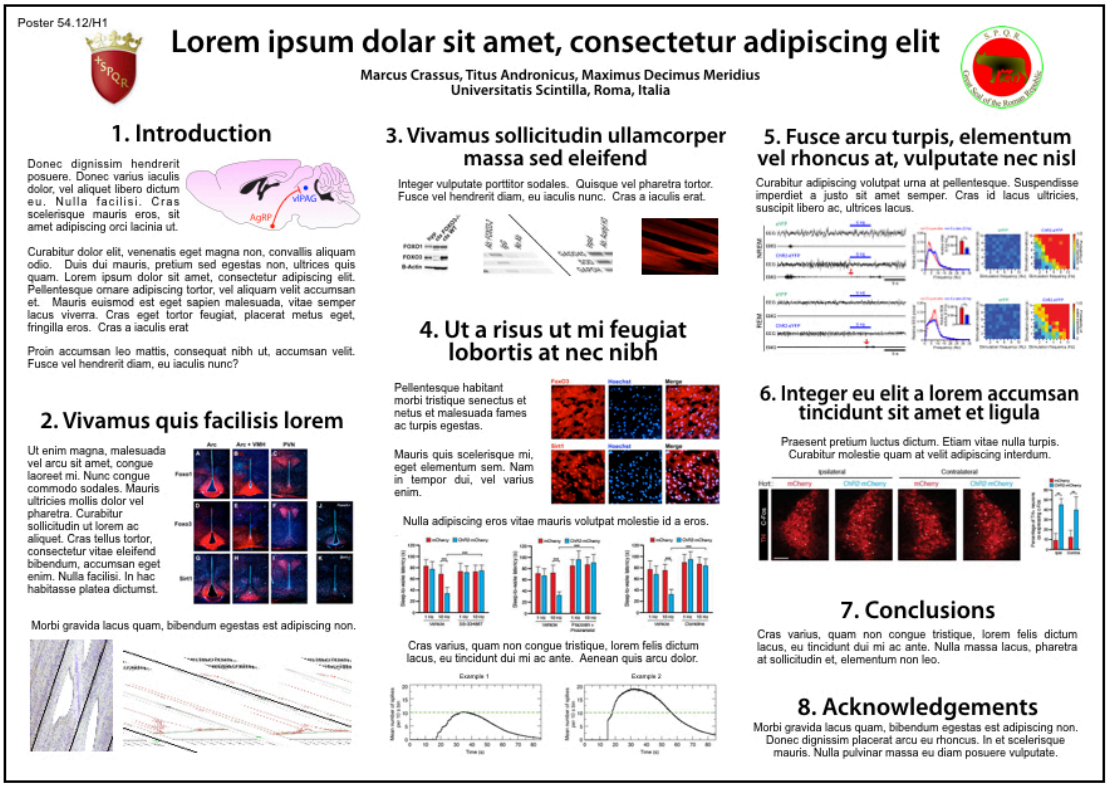
Hunting and Eating

- Lions prey on large mammals
- Lions hunt in coordinated groups
- Cooperative hunting increases the likelihood of a successful hunt
- Teamwork also enables lions to defend their kills more easily against other predators

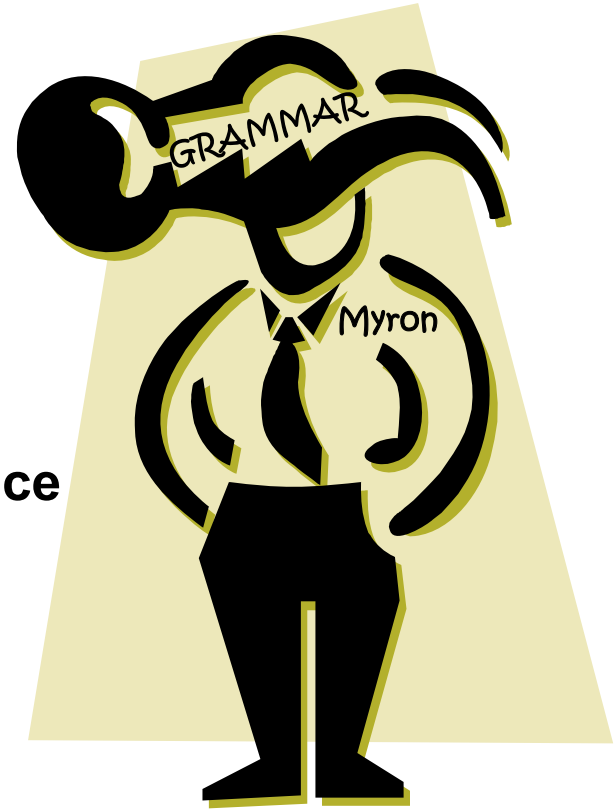




How could you improve the design of this scientific poster?



The "Grammar Hammer": Common Mistakes in Scientific Writing



Myron L. Toews, Ph.D., Professor
Pharmacology and Experimental Neuroscience
University of Nebraska Medical Center

for ASPET Colloquium
April 22, 2017

Scientific writing

- Many aspects of writing a good paper
  - Science: data, quality, controls, rationale, thoroughness
  - Significance: why should we care, was it worth doing
  - Sexiness: exciting, attention-getting, memorable, broad interest
  - Style: organization, consistency, clarity
    - what belongs where--Methods, Results, Figures, Discussion
    - effective figures, graphs, tables
    - proper referencing and bibliography styles
- Same for writing grants, posters, seminar slides, lectures

- GRAMMAR MATTERS TOO!
  - Same "grammar" applies to all
  - There are "rules"
  - We are "academics" and "scholars"-- WE should "write it right"!

Grammar Matters!

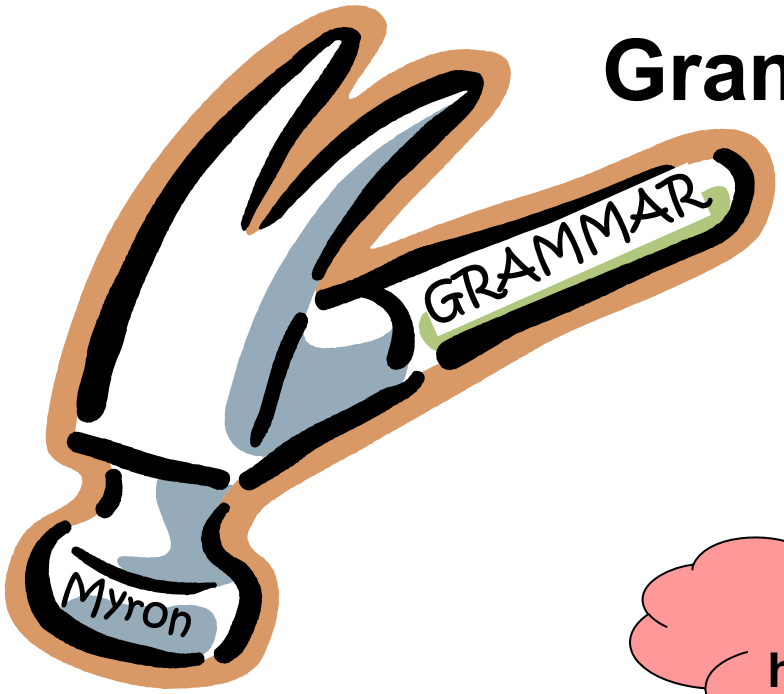
An English professor wrote the words:
“A woman without her man is nothing”
on the board and asked the class
to punctuate it correctly.

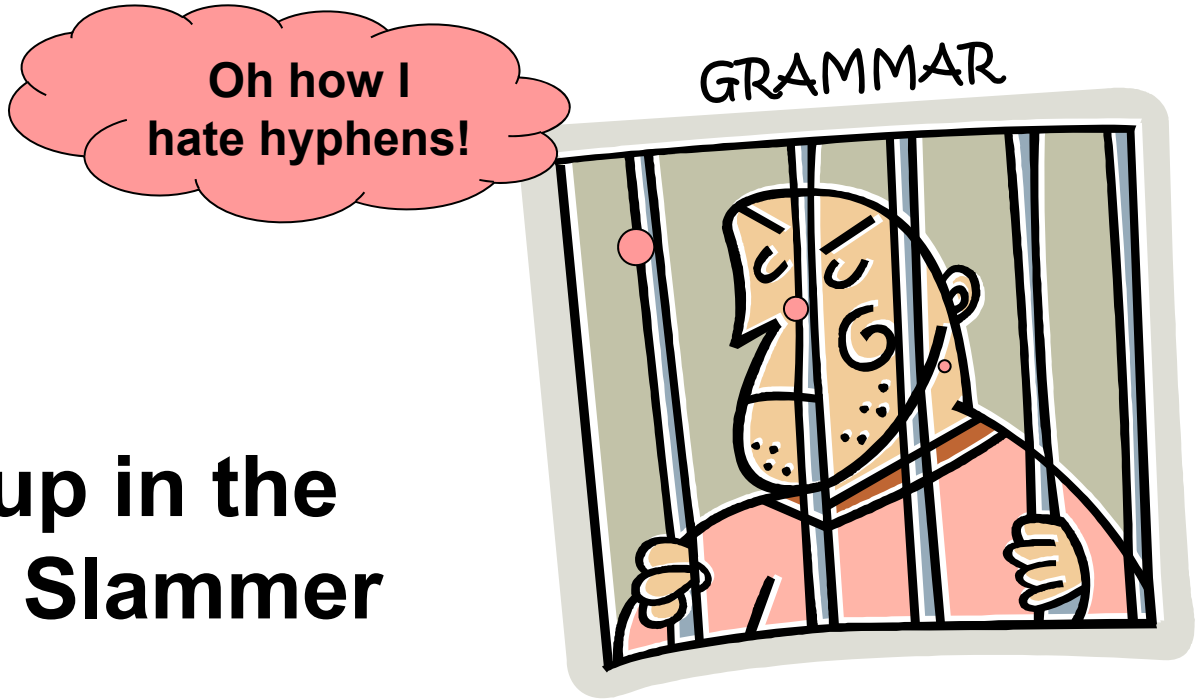
All of the **males** in the class wrote:
“A woman, without her man, is nothing.”

All of the **females** in the class wrote:
“A woman: without her, man is nothing.”

Punctuation is powerful! Get it right.

Pounded by the Grammar Hammer





Locked up in the Grammar Slammer

#1. Don't "space out" with numbers and units.

- **Rule: A number and its units cannot be written as one word**
- Simple and obvious
  - you would not write "10students" as one word.
  - don't write 10ml or 30min as one word either!

- **Rule: Use a space if the number and its units are a simple adjective and noun combination**
- Example: The reaction was started by adding **10 µL** of substrate.

In the Boyden chamber assay, 10^5 cells were seeded on 6.5mm diameter Transwell filter cups (8µm pore; Costar Corp., Cambridge, MA) with 100µl of serum-free DMEM, and incubated at 37°C for 6h in the presence and absence of 1µM LPA in the well (i.e.,

#2. Don't “dash out" your writing either.

- **Rule: Use a hyphen if a number and its units are used as an adjective to modify another noun.**

- Example: Cells were grown on a **60-mm** dish.
  - here 60-mm is an adjective modifying the noun dish

- Double example: A **12-well** plate has **12 wells** on each plate.
  - 12-well (with hyphen) is an adjective modifying plate
  - 12 wells (no hyphen) is the object of the verb; not an adjective

- **Rule: The same rule applies for numbers written as numerals or as words.**
  - a 24-well plate
  - a two-site competition binding curve

- **Rule: There are not spaces either before or after the hyphen**
  - it is written as if it was one word

- **Temperatures need spaces, between number and units again**
  - between value and degree sign: 37 ˚C, not 37˚ C or 37˚C
- **Other "places for spaces"**
  - around equals sign: n = 3, not n=3
  - around plus/minus: 29 ± 7, not 29±7
- **Percentages are <u>not hyphenated</u> and there is <u>NOT a space</u>**
  - they are a ratio and are unit-less
  - 5% serum, 0.01% bromphenol blue
- **Concentrations are <u>not hyphenated</u> but there <u>IS a space</u>**
  - perhaps because they are also ratios, not simple units?
  - 50 mM is really 50 mmoles/liter

- **Rule: Most other "quantity-related" words are also hyphenated when used as a compound adjective**
- Examples
  - semi-transparent plastic tubes
  - bi-directional reaction
  - multi-component signaling complex
  - a mono-phasic true solution
  - "Her half-finished manuscript stayed in her briefcase all weekend".

- Some can be written as one word – personal or journal style
  - bidirectional, monophasic
  - useful to hyphenate if comparing: mono-phasic *vs.* bi-phasic

- **One rule does apply: BE CONSISTENT!**
  - don't say unidirectional *vs.* bi-directional regulation, for example
  - don't hyphenate auto-immune disease sometimes, not others

#3. Hyphens in compound words

- **Rule: A noun-verb combination used as an adjective is always hyphenated!!**

- Example: "The drug induced side effects"
  - Is this a sentence by itself?
    - "The drug induced side effects. These included headache, nausea, gas, …"
  - Or is this only the subject of a sentence?
    - "The drug-induced side effects ….of aspirin include GI distress."

- It is the hyphen that lets me know, without having to read the whole sentence first!

- **This includes most forms of the verb: ed, ing, ent**
- **But only when used as an adjective**

- Common examples
  - receptor-mediated
    - Beta receptor-mediated responses are blocked by propranolol.
      - ✓ used as an adjective to modify "responses"
    - The beta receptor mediated the response, because the response was blocked by propranolol.
      - ✓ the subject and predicate of the sentence
  - concentration-dependent effects; ligand-independent transactivation
  - drug-metabolizing enzyme; rate-limiting step
  - RNA-dependent DNA synthesis, exercise-induced asthma
  - site-directed mutagenesis, FDA-approved drug

- What terms do you use in your work? Hyphenate them correctly!!

- **"Adjective-verb" combinations used as adjectives are hyphenated**
  - “blue-labeled tubes”
    - if the labels on the tubes are blue
  - but "blue labeled tubes"
    - if the tubes are blue and also labeled
    - but perhaps labeled in red?
    - **the red-labeled blue tubes** = the blue tubes with red labels
- **"Adverb-verb" combinations used as adjectives are NOT hyphenated; adverbs often end in “y” or “ly”**
  - a newly identified enzyme
  - a very limited supply

#4. Proper plurals

Learn rules or memorize….

…. which is singular and which is plural….

…and then use the correctly matched verb form!!

Singular	Plural
cell	cells
hypothesis	hypotheses

The hypothesis (singular) that PKC is (singular) involved was only one of several equally likely hypotheses (plural) that were (plural) tested.

Separate hypotheses are proposed for each specific aim.

A separate hypothesis is proposed for each specific aim.

Singular	Plural
drug	drugs
datum	data

"Data" is always plural -- THE MOST FREQUENT MISTAKE!

- with plural article (these data, never this data)
- and plural verb forms: data are, data show; never data is, data shows

Correct:

"Data presented are the averages of at least three experiments".

Incorrect:

"The data is clinically important because it shows a difference between the two groups of patients."

Correct:

"The datum at 5 min, but only that specific data point, is statistically significant."

Singular	Plural
drug	drugs
medium	media

- Even though growth medium has multiple components, it is a single growth medium

- "Two different media (plural) were used in our studies: Dulbecco's modified Eagle's medium (singular) for mammalian cells and Weymouth's medium (singular) for insect cells."

- "Media were obtained from GibcoBRL" only if you used more than one type of medium, perhaps DMEM, RPMI, and F12

Singular	Plural
criterion	criteria
phenomenon	phenomena
mitochondrion	mitochondria
equilibrium	equilibria
medium	media
bacterium	bacteria
optimum	optima
minimum, maximum	minima, maxima
symposium	symposia
datum	data
hypothesis	hypotheses
thesis	theses
axis	axes
stimulus	**stimuli**
fungus	fungi
nucleus	nuclei
focus. locus	foci, loci
alumnus	alumni

Singular forms all end in consonants

Plural forms (almost) all end in vowels

"Most graphs have two axes—one x-axis and one y-axis."

"When given a stimulus, cells responded. Responses were different for different stimuli.

"There are three loci for drug intervention: the most common locus is the cell surface receptor, a second important locus is the intracellular signaling pathway, and the newest locus is targeting the nucleus with gene therapy."

❑ The ADJECTIVE forms end in "al"

Singular noun	Plural noun	ADJECTIVE
maximum	maxima	maximal
minimum	minima	minimal
focus	foci	focal
locus	loci	local

To determine EC_{50}, you first find the maximum and minimum on the curve.

- these are NOUNS

The maximal value is called the E_{max} and the minimal value is E_{min}.

- these are ADJECTIVES modifying the noun "value"

#5. Comma'n mistakes
5a. in parenthetical statements

- "Parenthetical" loosely means that it could also be put in parentheses, or that it is an "aside" or an "addition"; the sentence would be complete without it.

- **Commas always come in pairs when in the middle of a sentence!**
  - The inhibitor genistein, known to be selective for tyrosine kinases, unexpectedly inhibited this serine kinase-mediated response also.
    - Many times this second comma is missing; it is mandatory
    - Just like open and close parentheses (…) always in pairs

- **One comma is OK only if the parenthetical statement begins or ends the sentence.**
  - The reaction was inhibited by C3 toxin, a selective blocker of Rho.

- **"and", "but", "or" go <u>outside</u> the commas**

  - **WRONG** (but COMMON!):
  - The control cells showed modest internalization, but contrary to our hypothesis, drug-treated cells showed even less internalization.
    - *This is the way you might SAY it in a seminar, but it is NOT correct GRAMMAR for writing!*

  - **CORRECT**: The control cells showed modest internalization but, contrary to our hypothesis, drug-treated cells showed even <u>less</u> internalization.
    - *The sentence must read correctly WITHOUT the parenthetical statement!*

#5. Comma'n mistakes
5b. in compound sentences

- **No "… , and …" unless the clauses on both sides of the ", and" are independent**
  - meaning both a subject (noun) and predicate (verb) on both sides

- **"and" without a comma does not need a second subject**

  - **Incorrect:** The cells were pretreated with pertussis toxin for 24 hr, and lysed by scraping in a hypotonic buffer.
    - no subject in the part after the comma
    - here best to just leave out the comma
  - **Incorrect:** Taxol is a drug that prevents cancer cells from dividing, and is often used to treat patients with rapidly proliferating tumors.
    - here best to say "… dividing, and IT is often used…"
    - or split into two sentences

#5. Comma'n mistakes
5c. the Oxford comma

- Rule: In scientific writing, it is accepted and preferred by most to use commas between all items in a list, including the last item before "and"
- This is called the "Oxford comma"

  - "The inhibitors tested were LY290082 for PI3K, calphostin C for PKC**, and** Y27632 for Rho kinase."

The Oxford Comma

WithOUT the Oxford Comma? -- totally wrong meaning!!

- People at David Letterman's birthday party included two strippers, Michelle Obama and Hillary Clinton.
- Guests on The Tonight Show were Merle Haggard's two ex-wives, Kris Kristofferson and Robert Duvall.
- This dissertation is dedicated to my parents, Ayn Rand and God.

#6. Avoiding First Person

- **There is a strong preference in writing scientific manuscripts to avoid (minimize) the use of first person**
  - First person nominative - I, we
    - "We treated the cells with …. "
  - First person possessive - my, our …
    - "Our data show that ……"
  - Third person - it, they, them, their (or "things", other nouns, e.g. cells)
    - "The cells were treated with …… "
    - "Cells treated with drug exhibited ……"
    - "The data presented here show that …."
  - Switching from first person to third person is easy
    - it makes writing more professional
    - it can retain the "active voice", which many prefer

- **Pros And Cons of First Person**
  - First person can sound like bragging about all that you did
    - Scientific writing should be about the science, not who did it
  - Using NO first person can make your writing seem "impersonal"
    - You can still tell a good "story" without first person!
- **If first person is used, almost always use "we/our" rather than "I/my"**
- **Places where first person IS important**
  - **Trainees should use "I/my" to identify their own work in seminars and slides**
    - "My studies focused on the first part of this project."
  - **Grants are written in first person**
    - We will also test animal models."

- **Acceptable places to use first person in manuscripts**

  - Introduction
    - "We hypothesized that …. "
  - Discussion
    - "We speculate that ….." or "We propose that ,,,,,, "
  - Your hypothesis and speculation are quite "personal", not "facts"

  - LIMITED USE of first person **possessive** is not as "bad"
    - "Our previous studies showed that ….. "
    - "Our data differ from those previously reported …."

- **Places "I" STRONGLY DISLIKE first person**
  - Methods
    - "We obtained inhibitors from …. "
    - "We grew cells in DMEM ……. "
  - Results
    - "We found that AngII decreased renal blood flow …. "
    - "We next tested whether ……. "
- **And "I" HATE "personal thoughts"**
  - We wondered whether Enzyme X might be involved.
  - We sought to establish which enzyme was involved.
  - We decided to test inhibitors of both enzymes.

#7. Which, That, Who?

- **Rule: "That"** is used to **"restrict"** the meaning or to **"identify"** a specific entity
- **"Which"** does not restrict but rather **"elaborates"** or **"describes"**

- Rule of thumb #1:
  - If the phrase **can be taken out** without losing the meaning of the overall sentence, use **"which"**
  - If the phrase **is vital** to the point of the sentence, use **"that"**

- Rule of thumb #2:
  - **"Which"** statements are almost always set off with commas
    - If commas seem needed or natural, use **"which"**
  - **"That"** statements should NOT be set off with commas
    - If commas are NOT needed or seem awkward, use **"that"**

- Non-science examples for simplicity
  - The car that I drive is a red Toyota Prius.
  - My car, which is a Toyota Prius, gets 50 miles per gallon.
  - The car that I drive, which is a red Toyota Prius, gets 50 miles per gallon.

- **Rule: "which" or "that"** for things;
  "who" or **"whom"** for people
  - Joe is the person **who** sold me the car **that** I drive.

#8. When the “whether” becomes “iffy”

- **Science writers often use “if” when “whether” is needed**
  - “if” is only for "if, then” situations
  - “whether” addresses “whether or not”
    - We will first test whether (or not) our compound is effective on kidney cells in culture.
    - If these studies are successful, (then) we will also test our compound in animal models.

#9. Inappropriate use of "time words"

- **Ideally, don't use "while", "since" or "as" EXCEPT to indicate the relationship of events in time.**

- **"While" means two things happening at the same time**
  - if not, use "although" or "whereas", not "while"
  - Wrong use: "While it is known that …."

- **"As" also means two things happening at the same time**
  - if not, use "because", not "as"
  - Wrong use: "As this inhibitor is selective for catalase …."

- **"Since" means one thing happening after another has happened**
  - if not, use "because", not "since"
  - Wrong use: "Since it is known that …."

#10. Using "a" or "an" with abbreviations

- **Use "a" *vs.* "an" with abbreviations based on the sound of the spoken first letter**
  - "a UNMC faculty member"
    - not an, even though UNMC begins with a vowel
    - the sound (YouEnEmSee) begins with a consonant (Y)
    - "U" and "eu" are the only vowels that use "a"
  - "an MCP-mediated effect on IL8 release"
    - not a, even though MCP begins with a consonant
    - the sound (EmSeePee) begins with a vowel (E)
    - many consonant sounds begin with a vowel!!
      - "an SDS gel", "an LTP-inducing agent"

- **The same "U/eu" policy applies to whole words**
  - "a ubiquitination inhibitor", not "an"
  - "a eukaryotic cell", not "an"

"A number of" additional things

- **Avoid the expression "a number of"**
  - It is meaningless, because **one and zero are numbers also!!**
  - "The experiment was repeated a number of times with similar results ."
    - This can be true even if you have done the experiment only once!
    - The number of repeats is zero
  - There are "a number of" better terms to use
    - a few, several, many, numerous

"A number of" things to AVOID

- **Using too many significant figures**
- **Using "&", "etc", "as well as", "like"**
- **Starting sentences with numbers**
  - "100 mM drug was added" must be "One-hundred millimolar …"
- **Contractions and possessives**
  - "didn't cause any change in the gene's expression level"
- **Using multiple "qualifiers"**
  - "Maybe it is possible that the drug might also have side effects"

Useful resources (I hope)!

- Many more rules/tips at my Grammar Hammer web site
  - unmc.edu/pharmacology/faculty/primary-faculty/toews
  - copy and paste address; this is not a hot-link
  - over 100 slides!
  - I hope to improve this site over the summer

- My email is mtoews@unmc.edu
  - feel free to contact me with specific questions or issues
  - but NOT to re-write your entire manuscript or grant!


Interview Skills
Scott Morgan
202.669.0611
scott@morgangp.com
THE MORGAN GROUP

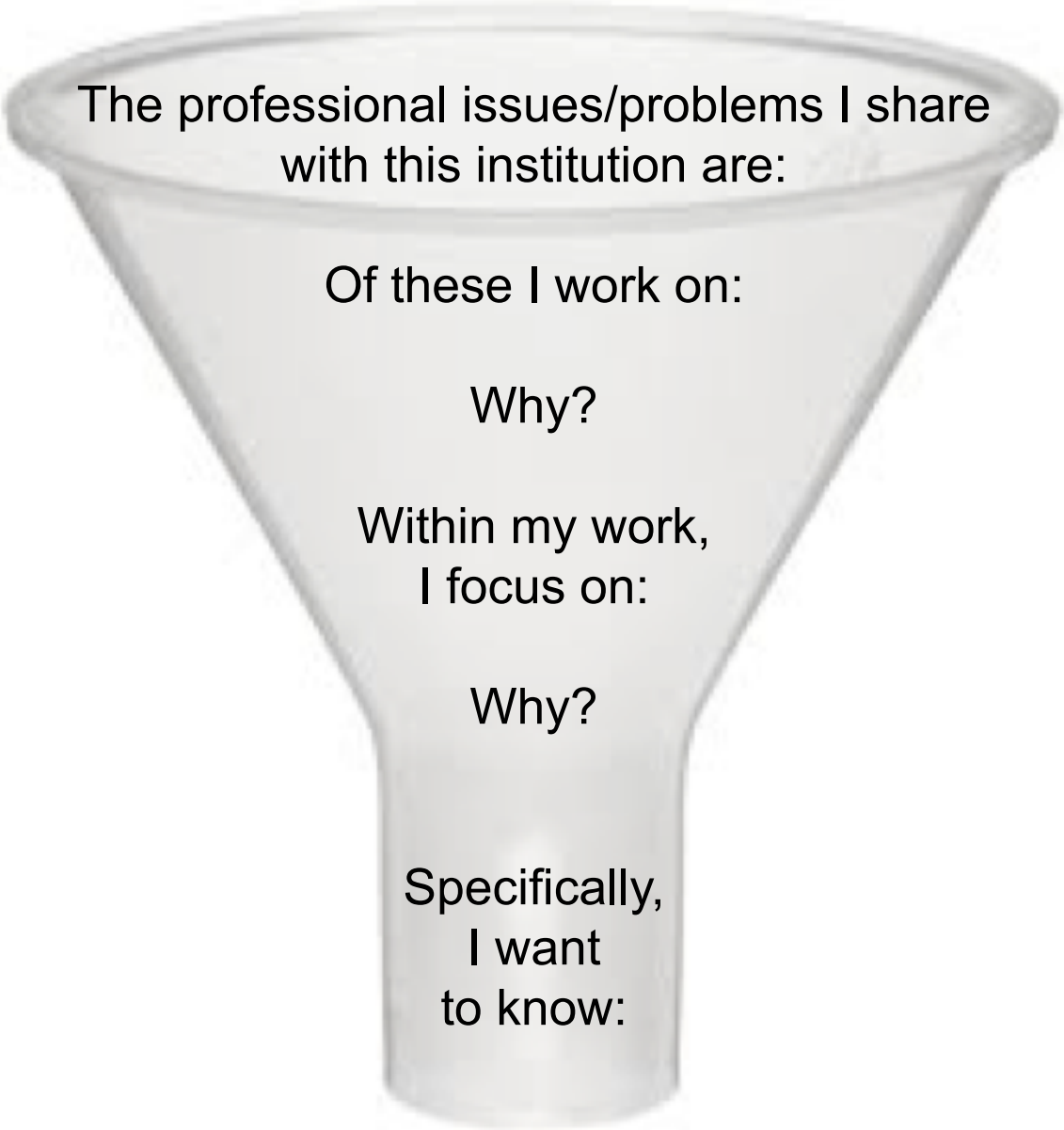
Ten Most Common Questions

- Personal Background
- Academic Background
- Early Motivation
- Specific Field Motivation
- 5-year Plan
- Strong Point
- Weak Point
- Why You?
- Current Work

- Hypothetical Questions

Remove self-adjectives

Aggressive	Knowledgeable
Ambitious	Logical
Competent	Motivated
Creative	Meticulous
Detail-oriented	People person
Determined	Professional
Efficient	Reliable
Experienced	Resourceful
Flexible	Self-motivated
Goal-oriented	Successful
Hard-working	Team player
Independent	Well-organized
Innovative	



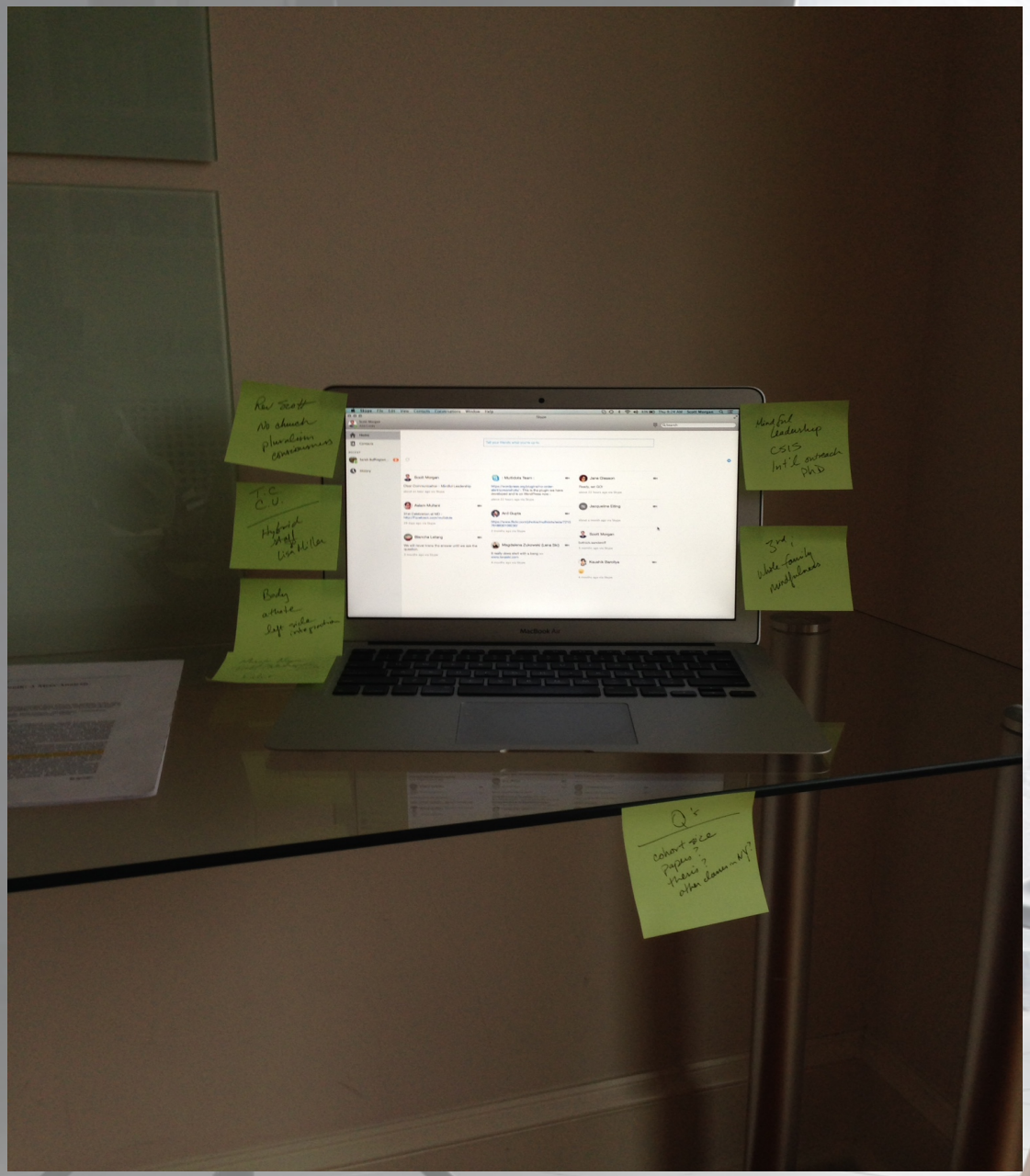
Current Work

Current Work

Elevator Speech, Job Talk Introduction, Common Ground

1. The professional issues I share with this institution are:
2. Of these, I work on:
3. Because:
3. The most promising solutions/candidates are:
4. Because:
5. Specifically, I want to know:

Skype Interviews

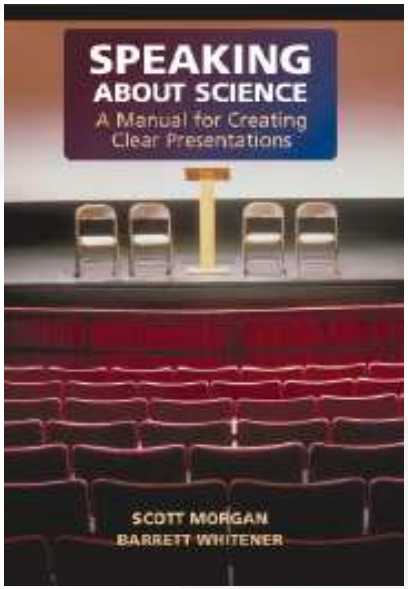


Skype Interviews

- Notice the background
- Side lighting
- Speaker phone
- Delay tactics

Future Directions

- Organizing Ideas
- Trigger Words
- One-page resume
- Common Ground Funnel
- scott@morgangp.com
- *3rdi* - mindfulness app
- sciencesketches.org



MORGAN THE GROUP

Interview Skills

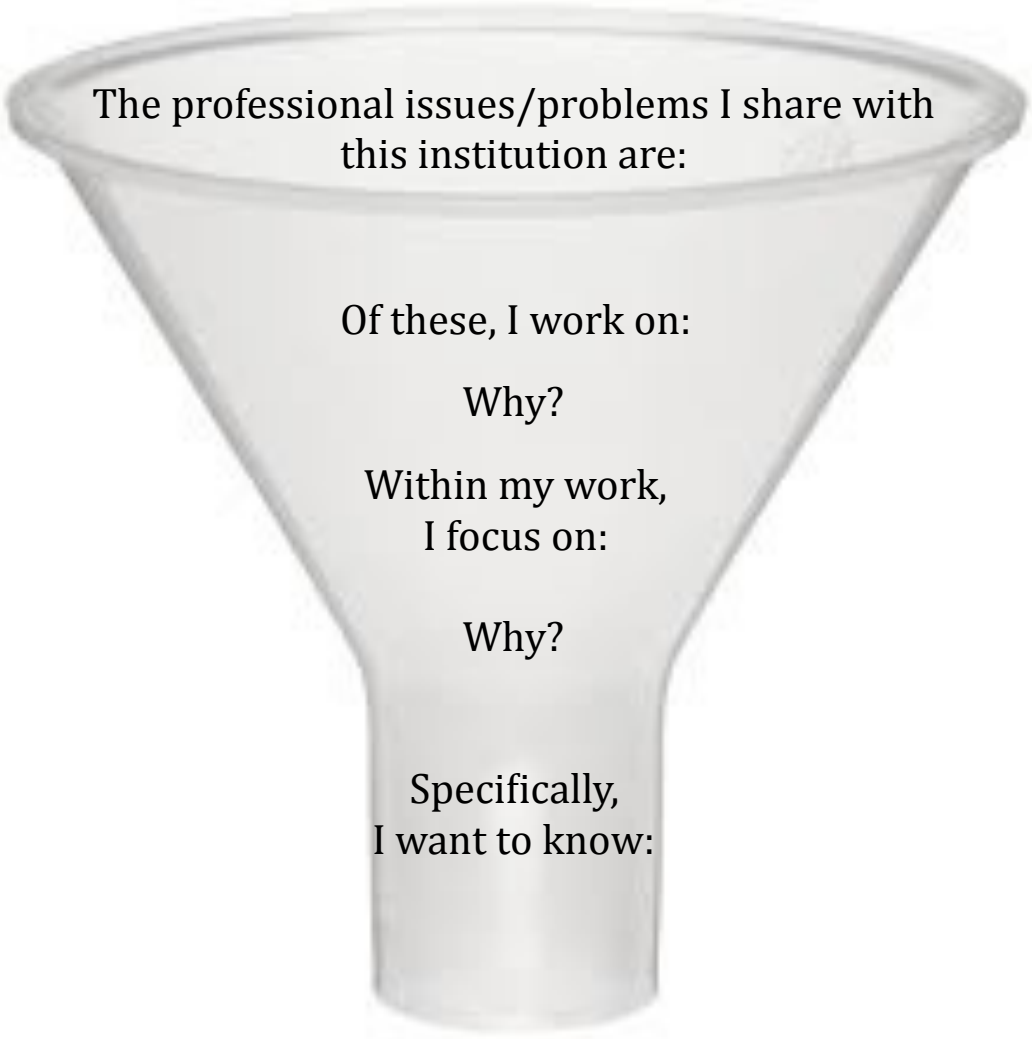
Scott Morgan
www.MorganGp.com
scott@morgangp.com

THE TEN MOST COMMON QUESTIONS

1. Personal Background
2. Academic Background
3. Early Scientific Motivation
4. Specific Field Motivation
5. 5-Year Plan
6. Strong Point
7. Weak Point
8. Why you?
9. Current Work
10. Hypothetical Questions

Photos/Images/Trigger Words

1.
2.
3.
4.
5.
6.
7.
8.
9.



COMMON GROUND

(current work, job talk introductions and elevator speeches)

The professional issues/problems I share with this institution are: _____.

Of these, I work on _____,

because _____.

Within my work, I focus on _____.

because _____.

More specifically, I want to know _____.