

How to give a scientific presentation

Kevin D. Lafferty
US Geological Survey, UC Santa Barbara

ABSTRACT

Outlines

- Use one of three outlines: scientific paper, essay, or plot.
- Have a hook and a slant.
- Tell the audience your motivation for the study.
- Illustrate your Methods & Results as a chronological story.
- Explain graphs carefully.
- Mention alternative explanations.
- Acknowledge your contributors during the talk (not at the end).
- Do not end with acknowledgements or other deviations, or ask for questions.
- Return to the hook near the end.
- Never go over your time slot.
- End with a clincher, immediately followed by “Thank you”.
- Listen carefully to each question, repeat it, and keep your composure.

Slides

- Have a simple graphical theme (e.g., black on white).
- Minimize slides (use blank slides when you speak for more than 30 s.).
- Use 16 pt font.
- Use animation to assemble parts of a slide as you say them, or to circle or point to parts of a figure.
- Never use clip art, comics, or gimmicky animation.
- Simplify the comparisons in your figures (be minimalist).
- Use images instead of diagrams where possible.
- Use color to help make comparisons.

Text

- Minimize text (< 12 words/slide), unless audience speaks a different language.
- Cite authority where appropriate (e.g., when you show a published result).
- Clearly label graph axes.
- Spell out scientific names and jargon on first use.

Style

- Practice.
- Dress well and uniquely.
- Lead your slides.
- Smile, move on stage, speak to the back of the room, don't talk to the screen.
- Don't use a laser pointer.
- Use contrasts and lists of 3.
- Use appropriate personal humor, or anecdotes every 2-5 minutes, or show short relevant videos or images that show action.
- Show confidence and humility.

INTRODUCTION

I, along with everyone else in the audience, want you to inform and entertain us. However, a good talk is not easy to deliver, and it is rare to see a talk that could not be improved. I base my opinions on giving hundreds of talks and listening to thousands of them, some better than others (both given and heard). Some of my thoughts contrast sharply with the typical scientific talk, so do not treat this as a consensus from the scientific community. My advice on scientific presentations applies mostly to talks at scientific meetings, but works equally well for lectures, seminars, thesis defenses, and job talks. In this essay, I go over three types of outlines, comment on the use of slides, and give tips for presentation style.

OUTLINES

The first part of preparing your talk is to determine its thesis. The thesis, is the thing you are trying to convince your audience of. Your thesis should be one to three clear messages. Moreover, all aspects of your talk should revolve around the thesis. Except for the hook, anything not related to the thesis should be eliminated. The goal of a science talk is commonly related to convincing the audience about support for a particular hypothesis. Therefore, for most scientific talks, the main question is the thesis.

An outline will help your talk have structure. One normally uses an outline when writing. However, when putting together a talk on PowerPoint, it is easy to simply move slides around until they feel right. Nevertheless, an outline is as important for a talk as it is for a paper. Not doing so, runs the risk of leaving out a key piece and leaving the talk incomplete. At the end of this essay, I provide three detailed outlines for three types of talks.

The most common outline for a scientific talk is the scientific paper. This is ideal for presenting a single study, and it is a familiar format for your audience. One unusual aspect of a scientific paper is that you should not leave the audience waiting for the main results until the end. Instead, tell them early on what the key result is and then try to convince them that your methods and results justify your claim.

If you are giving a longer talk, a review talk, or a job seminar, the scientific paper outline is not effective. Here, you can revert to the classic 5-paragraph high school essay. This outline also indicates the claim of your thesis early on in the Introduction. It is not meant to be a mystery. An essay outline is relatively easy to structure, and the most important part to think through carefully is the introductory section. The Introduction sets up the thesis of the talk. An essay outline often investigates several hypotheses, so the thesis must lay out a broad organizing principle that links them. In the Introduction, it is not necessary to give the results for each hypothesis. Instead, indicate the various types of evidence you will present that support the thesis. The sections of the talk are akin to body “paragraphs” in that each might represent a study, topic or hypothesis. The audience should know when you move from one body paragraph to another, usually with an introductory slide that acts like a topic sentence. The concluding section returns to the thesis and indicates how the evidence you presented supports it.

If your talk lends itself to a story, and you are ambitious to try something memorable and compelling, you can attempt the Plot outline. A plot is a story, and most plots have a familiar outline. A plot starts with equilibrium, then there is conflict that disrupts the equilibrium, rising tension leads eventually to a resolution of the conflict and a new equilibrium ensues. Usually, dramatic plots also have a protagonist and an antagonist that are in conflict. A plot outline can work if you have made a discovery that changes the way that people think, or a discovery that was particularly challenging to arrive at. The protagonist of the story is usually you. The initial equilibrium might be the prevailing paradigm, and the conflict an observation that does not fit with the paradigm. The rising tension is a series of difficult studies that eventually lead to a new paradigm, which becomes the new equilibrium. Even if you do not give a talk wholly based on the plot outline, it is possible to borrow elements of the plot outline to add interest and drama to your presentation.

A key element of the plot outline that you can adopt for any talk is the role of yourself as a protagonist and the arc of action from one equilibrium to another as illustrated by your methodology. If you describe your methods as actions that you struggled through, your audience will be more compelled by the narrative and interested in the outcome. However, in doing so, you need to be careful not to just focus the spotlight on your wonderful accomplishments.

KEY SECTIONS OF A TALK

Your first slide is a Title Slide that gives your title, spells the first and last names of the authors, lists other contributors and funding sources (e.g., with their icons), and perhaps has a single image that hints at the thesis of the talk.

All outlines should start with a hook/slant. A hook is a literary device used to gain the interest of the reader. A hook can be an anecdote “I first fell in love with branchiopods when..” An interesting fact “Darwin’s least successful book was about earthworms”, a statistic “The largest known ant colony has as many workers as there are people in China”, a quote: Francis Crick once said, “It is notoriously difficult to define the word living.” Alternatively, a question: “What will happen to malaria as the climate warms?” A question is the easiest hook and a good fallback until you can think of something clever. Following the hook is a short sentence or two called the slant. The slant is a bridge between your hook and your thesis. This means it is helpful to have a hook that can somehow be connected to your thesis, if only indirectly. Even though the hook and slant are the first part of your talk, they are often the last part of the talk to be finalized. It is a good idea to run your hook by other people to be sure that it works. Hooks are hard, but a good one will get your audience to listen to you from the start. If at all possible, try to reference your hook near the end of the talk, either before or after the conclusion.

The Introduction tells why you did the study. It is essential that the audience understand your motivation. If you can convey your interest in the topic, the audience will be engaged and share that enthusiasm with you. Moreover, the motivation should be

personal. It is not enough to say that you are addressing a question that is interesting to your field (though this is a good thing to say). You need to say why it is interesting to you personally.

Because this is a scientific talk, it is important that you use the language of formal hypothesis testing. Students are often confused by what hypotheses and predictions mean, so here it is in a nutshell. We start with an observation, pattern, or theoretical expectation. From this, we develop a hypothesis as a potential explanation for the observation. You can make a number of predictions about what might happen if the hypothesis is correct. These predictions are what you will test with your Methods and show statistics for in your Results. Although you should use some formal language, try not to use science jargon. A non-specialist should be able to understand your talk. In many cases, jargon is not avoidable, so you might need to define technical terms.

In most scientific talks, you have the opportunity to describe methodology. This is often the most boring part of a scientific paper, but the most interesting part of a scientific talk. For one, it is the way the audience will evaluate your approach and whether or not they trust your results. The methods should be told as a story, often in chronological order, with you (and your collaborators) as the protagonist. Use the first person to describe what you did. This is also the place to indicate your acknowledgements of collaborators and funding sources. Instead of listing the dreaded collaborators list slide, talk about the people that helped you and what they did. Use their names and affiliations: “John Doe, an undergraduate researcher in our lab”, “My coauthor, Jane Smith”, “My thesis adviser, Betty Black”. Show photos of them in action if possible. In addition to photos of people in action, you will want ample images that describe the lab set up, study sites, species of interest, procedures and measurements, etc. Use anything that is visually appealing, even taking slight detours if there is an opportunity to show something interesting. Do not go into the sorts of details that make Methods sections in scientific papers boring. If someone in the audience needs to know details, they can ask a question or talk to you later. In addition to providing good visuals, the Methods section is often where there is room for a bit of humor. Failed experiments and mishaps are good ways to engage the audience and personalize the story. Always respect your organisms. Never show slides that suggest cruelty or callous disregard for life as an attempt at humor.

The Results are the most scientifically critical part of your talk because they are how the audience will evaluate whether you have supported your thesis. In most cases, results are comparisons or relationships. The more you can simplify these the better. A simple Control vs. Treatment graphic is better than a complicated slide showing procedural controls, and various irrelevant treatments. A scatter plot, showing a positive relationship is another simple way to communicate a finding. If you can, show the results in a photograph, instead of a figure. Because this is a scientific talk, the audience is not expected to take your word about the significance of your comparisons. Accompanying a result should be an indication of sample size and the p-value or confidence limit. If the results are complex, break them down into a series of simple parts. Do not make the mistake of thinking that showing complicated results makes you look smart. Complicated results make you forgettable.

The Conclusion section of your talk should consider how well your results support your thesis. You will want to also be sure to discuss alternative explanations if you have not already done so in your Results section. This is more important than you might think. Your audience is trained to think critically about evidence. If your results are correlational, admit that you cannot infer causation. If something was ambiguous, be sure to indicate if there were methodological problems, or if more studies would be needed. However, do not dwell on these alternatives, your conclusion is really about emphasizing one to three things about what you want your audience to remember. In your Conclusion, try to tie back into your hook. You could say, “going back to my original question”, or, “Perhaps Darwin was right to be fascinated by earthworms”. Returning to the hook reengages the audience and gives the talk symmetry and completeness.

The last moments of your talk are critical, so do not botch them. At the end of you talk you want to have a “clincher” sentence. Like a hook, the clincher is an attention getter. Moreover, it wraps up your thesis or reemphasizes it in a new way, driving it home in a succinct, memorable statement. Immediately after you clincher statement, pause for effect, walk to the center of the stage and simply say “Thank you”. That cues the audience that your talk is over and they can applaud. It is very important to nail the end of your talk. If you stumble over it or are awkward, or make a joke, you will lose the connection between your audience and your clincher sentence. Nothing should come between your clincher and the applause but “Thank you”. This is not the time to list acknowledgements or ask for questions. Acknowledgements go in your methods, or title slide, and the moderator will ask for questions after the applause.

SLIDES

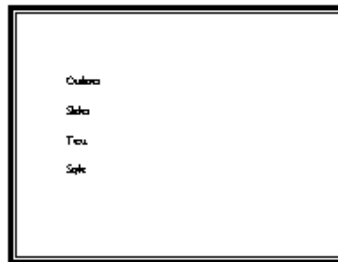
Ideally, give your talk without slides. The speaker drives the lecture, and a powerful speech is one that conveys images inside the minds of the audience, not on the screen. The intimacy between a speaker and an audience can be powerful, but it is also a little uncomfortable, so audiences will take any granted opportunity to look away from the speaker to the screen. When the audience is engaged with the screen, they are no longer listening to you and it is easy to lose control of your message. The screen, therefore, is more your enemy than your ally. However, PowerPoint is such a convenient and accepted form of communication that audiences easily acquiesce to one boring slide show after another. So chances are you are going to have slides. Nevertheless, remember the mantra that less is more.

BAD



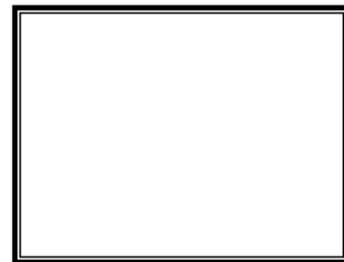
1

NOT SO BAD



2

BEST



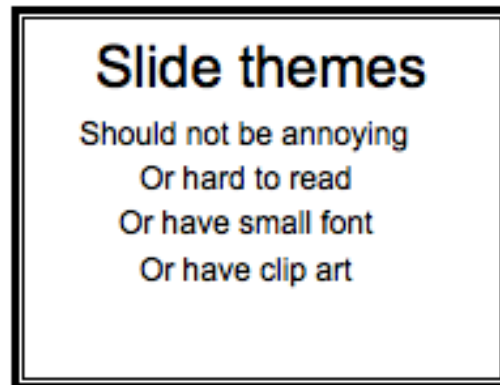
3

A coherent talk often has a graphical theme. This relates to the colors, fonts, backgrounds, graphics styles, etc. Themes are nice and show professionalism that makes the audience think you respect them (hopefully you do). However, be conservative in choosing your color themes and font styles. Keep in mind that PowerPoint is a Microsoft product. Its themes are designed with business presentations in mind. Most of these themes do not translate well to a scientific talk. In particular, minimize color in your themes. You want to save the color for important comparisons and contrasts. In my opinion, the best theme is black text on white background. This is by far the easiest to read and keeps the room well lit so the audience can see you.

BAD



BETTER

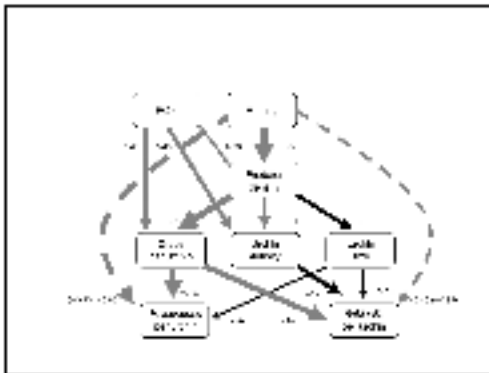


Do not use text as a crutch. It is common to see talks where the presenter scrolls through the outline of the talk on the screen, one agonizing slide after another. These talks are made even more painful if the presenter points at each line with a laser pointer. The number one consideration for slides is that when you project text, the audience instinctively reads it. It is nearly impossible for them to read and listen at the same time. You want the audience to listen to you, so the less text you present them, the better. If you need a visual aid, it is preferable to use an image or a graphic instead of text. Ideally, you would have no text slides, but there are some exceptions. 1) If you use scientific names or any words that the audience might not be familiar with, it is a good idea to have them spelled out once during a talk. 2) If you are speaking to an audience that has a different mother tongue than you, you may want to have more text slides in the language of the audience. If I am speaking in a non-English speaking country, I try to add a little more text and to convert the text in my slides to the language of the audience. That way, the text becomes the subtitles to my talk. Do not use text slides to help you know where you are in your outline. This is a recipe for a boring, pedantic talk, and indicates to a savvy audience that you did not bother to prepare. Judging by the preponderance of text slides in PowerPoint talks, this is not commonly accepted advice. If you must have text slides, keep the text to a maximum of 12 words per slide and use 16-point font so that we older folks in the back of the room can read along.

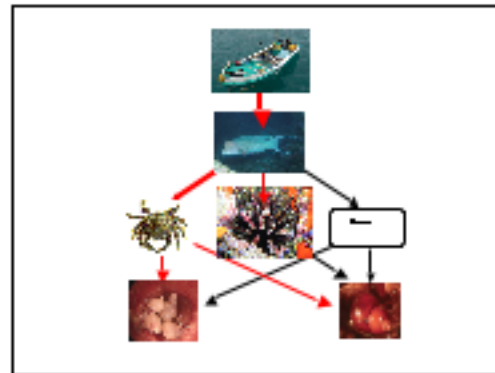
Your graphics should be clean and simple, but there are some bits of detail (and text) that are essential. A figure needs to have clearly labeled axes. You can use graphics to help point to aspects of the figure that you want to discuss in detail (e.g., a red arrow or a

circle). If you use a graph from a published paper, be sure to add the citation in the lower corner of the slide. It may seem tempting to dress up graphics with artsy elements (shadows, 3-D bar graphs, etc.), but this can be distracting. A minimalist approach usually works better. An exception is when you can add illustrations that go along with the figure. For instance, if you are showing a graphic about a fish species, an embedded illustration of the species can help the audience link the abstract graphic to something concrete. Finally, here is where you want to (sparingly) use color to help make comparisons. In short, a graphic should show something that is too difficult to explain in words, or a graphic provides evidence that convinces the listener about a result you found.

BAD

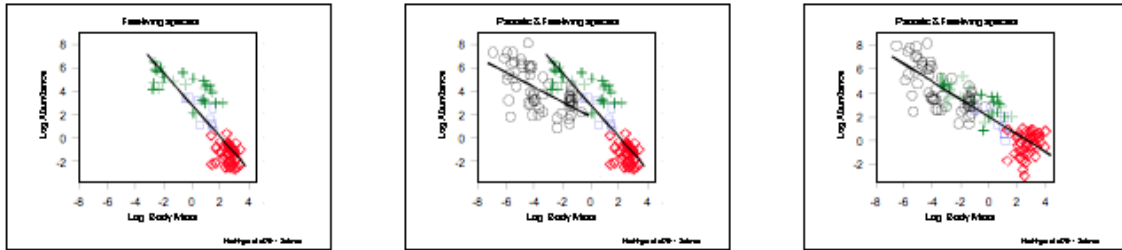


BETTER



Some types of graphics can ruin an otherwise good talk. Never use clipart unless you want to advertise that you have a complete lack of aesthetics. Avoid gimmicky animations or sound effects. Do not show cartoons. Do not show equations unless they are relatively simple, essential to your talk, and you are prepared to go over them in detail. Replace tables, mathematical equations, and complex figures with simple graphics.

To keep the audience on track with what you are saying, do not show multiple comparisons on a slide all at once. Either use separate slides for each minor point, or, to build a complicated argument or figure, use animation to add bits to the slide. For instance, if you have a slide that has three bullet points, do not show all three at once. Animate the bullet points so that they come in one at a time. However, I only recommend animation as a way to break up complex ideas into small pieces. Avoid gimmicky animations and sound effects. Do not animate images to make them dance or fly around to emphasize a point. Just have the new text or images “appear” in a sequence as you build a complex slide from pieces of your narrative. This will make it much easier for your audience to follow your logic and listen to you.



If a figure has multiple comparisons, step through it in sequence (e.g., with animation)

You do not always have to have an image on the screen. If you are going to speak for >30 seconds on a topic that does not need illustration, the audience may stay transfixed on the now irrelevant slide that is lingering from the previous topic. For this reason, you can insert blank slides into places in your talk where you are going to speak without referencing a slide.

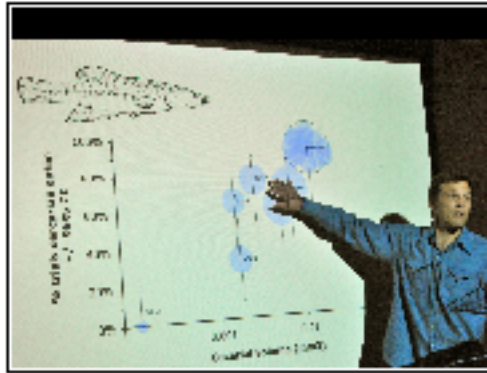
DELIVERY

A scientific talk is a performance. If you are not a natural performer, you should practice your talk several times after you have the final version to your liking. There are two types of practice. The first is to give a trial talk to your lab group, colleagues, or supervisor. They will see the talk from the perspective of the audience. From this type of practice, you will get advice about your slides and outline. But be aware that many experienced speakers have long-held habits, and they may foist bad Powerpoint advice on you. The second type of practice is to familiarize yourself with your delivery. This practice is to help you memorize the main points, know the order of the slides, and work on your delivery. You might need to practice a talk a dozen times before it is ready for an audience. However, practice is not meant to be a way for you to memorize your talk. Your talk should feel like a spontaneous conversation with the audience, not an overly scripted speech.

Your delivery begins when you get dressed. It is a sign of respect that you are dressed as well or better than your audience. This is not hard to accomplish if you are presenting to a scientific audience. This may sound strange, but dress tall. Wear shoes that give you an extra inch or two so that you can stand higher than the podium and be seen from the back of the room. Finally, dress uniquely. A talk should be the beginning of a conversation with your colleagues, and you want people to talk with you afterwards about your science. Unfortunately, after seeing dozens of talk, the audience may not longer remember who gave which talk. A unique outfit will help you be recognized during the coffee break.

In addition to PowerPoint, the modern gadgets in the speaking business are laser pointers and remotes. I suggest that you avoid using a laser pointer. Used correctly, a laser pointer is needed only once or twice a talk. Operating an unfamiliar laser pointer is sometimes difficult to figure out, and laser pointers are easy to over use, particularly if you are nervous. Animation and clever graphics help obviate the need for a laser pointer. If you do need to reference what is on the screen, walk up to it, point with your finger while you

face the audience, and speak toward them. While I do not like laser pointers, a useful gadget to have is a remote slide advance. You can buy a USB version and I suggest using your own and getting used to it because your fumbling with a new remote distracts the audience. The beauty of a remote is that it frees you from the podium. If you can walk the room during your talk, the audience will be much more engaged. This way, you set the pace for your talk.



No laser pointer, speaking to the audience, memorable outfit

Every speaker has been in the audience when another speaker ran over time, yet for some reason, many speakers fail to relate that experience to their own time at the podium. You have a time slot allotted to you and as you exceed it, the audience begins to loathe you. This is ironic, given that the main reason speakers go over time is that they feel obligated to tell the audience the whole story. You can avoid going over time. Know in advance how much time you have. Expect to lose about a minute for being introduced, getting to the stage, and loading the talk. Then, be sure to allocate 3-5 minutes for questions. Build your talk with this in mind, and practice it to be sure you can pull it off in the time you have been allotted. Delete lower priority sections of your talk if you are over your time limit. When you are on the stage, be cognizant of the time. Use your watch or locate a clock. Before your session starts, find out who will be the official timekeeper, and be sure that your watch matches theirs. Pay attention to the signals that will be given at particular time intervals (e.g., the moderator stands five minutes before your time period is up). When giving your talk, be aware that being nervous can sometimes lead you into unscripted tangents that can eat up time. This is especially true for the beginning and ending of your talk. So, have a clear idea about how you will start and finish. This will help you roll straight into the talk you practiced and keep you on time at the end. Finally, if it is clear that you are out of time, do NOT just keep going so you can finish. You are not obligated to show your conclusion slide or just one more graph. Your only obligation is to stop on time, finished or not.

It is important that your audience has confidence in you. This means that you should only talk about a topic that you have confidence in. If you do not really believe in what you are presenting, do not present it. Therefore, it is important not to self deprecate in the area of your capability or intellectual ability. As in a written paper, you can cite authority as a way to gain credibility. This is particularly useful in your discussion where you are setting up your thesis. If someone else came up with the observation or hypothesis, be

sure to cite them (the more personally the better). Your audience will be comfortable accepting a statement accompanied by a citation.

About every 2-5 minutes, do something that breaks up the monotony. Occasional humor is a very good way to keep your audience engaged, but it is not easy to pull off unless you are a naturally funny or charming person. Self-deprecation is fine only if it is about something unrelated to your abilities as a scientist. Do not use self-deprecation to undercut your science, because your audience will lose their confidence in you. It is also best to avoid, cruel, rude, or obscene humor. Even if your natural sense of humor runs this way, it can make the audience uncomfortable. Finally, the humor should be yours. Do not show a comic as a way to break the monotony. Comics are funny, but rarely do anything but detract from a talk. The same goes for cute photos. It is hard to know if humor will work, so be sure to trial it on a friend in advance. There are many other ways to break up the monotony of a talk besides humor. Short (<1 min) video or audio clips are a good example. A quick anecdote or aside can also help, so long as it does not eat up too much time.

A pleasant speaking style makes the talk easier to listen to. Smile at your audience and the person that introduces you. Smiles are contagious and a smiling audience is a friendly one. The most important part of speaking is volume and diction. When the room fills, and the projector turns on, your voice will not carry very far. This means that you need to project your voice as if you were speaking to the person in the back of the room. When speaking to the audience, find individual people and make eye contact with them. Gauge their body language for feedback. Move your gaze around the room, so that the audience feels like you are speaking to everyone. It is best to always face the audience, but at some point, you may need to engage the screen to make a particular point. Unless you have a strong voice, facing the screen will mean that your audience can no longer hear what you are saying.

The talk should not drone on. There should be a mix of intense engagement and thoughtful pauses. Most importantly, do not pack so much material into a talk that you feel you need to rush your speech. Most scientific presentations have technical information that takes time for the audience to process. If you rush, your audience will not be able to digest your most important points. Finally, your speaking style will benefit if you lead your slides. Many speakers do not remember what slide comes next and use the slides to remind themselves of where they are in their outline. It is far more effective to start talking about the next slide BEFORE you advance to it. This way, the audience is forced to listen to your introduction before being distracted by new visual material. This either requires memorizing the order of your slides or using the PresenterTools Option in PowerPoint (under the view menu). PresenterTools shows the current slide plus the next two slides, your notes and a timer. It is also a very good aid for practicing your talk. The advantage of an effective style is that the audience can focus on your science and listen to what you are trying to communicate.

There are several rhetorical strategies for a good talk. Speechwriters and preachers use these extensively. You do not want to sound like either, but you can adopt a couple of

useful points. One is the benefit of a good pause. This takes time to perfect, but it should usually precede and follow an important point. When speaking, look for opportunities to make contrasts: X is Y, but Y is never Z; A goes up at the same time that B goes down. Our brains are wired for contrasts and process them easily. In many cases, you will want to communicate a list. The ideal number of items in a list is three. Less than three is not much of a list and more than three is too much for our brains to process easily. If you have more than three points, try to break things up. Whenever you show a graph, take a little extra time to set it up. First, explain what the two axes are and then explain what the main pattern is. Once you carefully explain a particular figure comparison, you can use repeated versions of the figure without having to repeat the explanation again.

Questions can be the best or worst part of a talk. Unfortunately, while delivering a talk, your mind is not in conversation mode. It is focused on delivery and performance. You can get into a groove, and time takes on a new dimension. Under this altered state, it can be hard to listen. Therefore, it is important, after you say “thank you” and receive your applause, to remind yourself that it is now time to listen. The sign of a good talk is several questions. If your moderator is active, they will select the members of the audience that wish to ask questions. Otherwise, it is up to you. Listen carefully to the question. After the question is asked, thank the speaker, then repeat the question for the audience, especially if you are in a large room. Repeating the question also gives you a second chance to listen to it carefully and think about a response. Feel free to pause before you answer. If the question sounds threatening, do not be upset and take it as an attack. Focus instead on your answer. You always have the option of suggesting that such a question might be better to discuss in person. Some questions will require a simple clarification. Other questions allow you to expand on topics or details you did not have time to think about. The best questions give you new insight into your project. In some cases, you can anticipate what the obvious questions will be. You can either rewrite your talk to account for these questions, or prepare some potential slides (placed after your final slide), that help you address your question.

You should now be better able to inform and entertain us. That’s good because speaking is critical to your success. It is remarkable how many job searches end with statements like, “He was the best candidate on paper, too bad he gave such a lousy talk”. Your talk is much more personal than a scientific paper. If you show other people your enthusiasm for your work, they will be enthusiastic about it too. You should maximize your performance and minimize your reliance on text slides. Respect your audience’s time and listen to their questions. Get feedback from people and try to do a better talk next time. You will listen to far more talks than you will give, so find out what you like and don’t like in other people’s talks and plan your own accordingly.

APPENDICES: 3 TYPES OF OUTLINES.

Title: should contain conclusions, keep short, avoid jargon, be specific, list acknowledgements and funding sources (true for all outlines).

Paper outline

Introduction (use present tense in reference to previous work)

- 1) hook/slant. Then identify the subject, question or problem (thesis)
- 2) Identify your motivation
- 3) state your hypotheses
- 4) give a brief literature review of the subject
- 5) describe pertinent aspects of the biological system
- 6) introduce and justify your methodology
- 7) give the predictions that stem from your hypotheses
- 8) briefly give your principal results

Materials and Methods (use past tense)

organize chronologically or in sections (use sub-headings)

- 1) describe your lab set up or study sites
 - 2) for each section,
 - A) describe experimental or sampling design and exp. subjects
 - C) describe experimental or sampling procedures
 - D) describe the measurements taken
 - 3) give methods of analysis (don't cite ordinary statistical procedures)
- Also: provide enough detail for repeatability
include data that verifies methods

Results (use past tense)

- 1) present by methods subheadings or present order that tests hypothesis
 - A) reiterate brief description of the experiment
 - B) for each comparison, give mean values (controls first), p values or confidence intervals and sample size
- 2) make graphs of correlations and regressions
- 3) keep the results brief

Discussion (use present tense in reference to previous work)

- 1) return to the hook
- 2) indicate whether your results support your predictions
- 3) present the principles, relationships and generalizations of the results
- 4) point out the exceptions to general patterns
- 5) relate your results to the literature
- 6) discuss theoretical implications
- 7) state your conclusions and summarize the evidence for each
- 8) discuss the importance of your results

Essay outline

1) Introductory paragraph

Hook/Orient the reader to the section

Identify the focus/purpose

Background (anything that needs defining or introducing)

Outline the Scope (what are the boundaries of the topic)

State your thesis/expectations

List the evidence you will present for your thesis (the body paragraphs)

2) Body paragraphs (3 is the classic number) in linear order

Topic sentence to introduce this part of the thesis and how they relate

Background

Supporting details

Counter arguments

Concluding sentence supporting the author's point

3) Conclusion paragraph

Return to the hook / Restate thesis

Summarize evidence for the thesis

Clincher sentence (a punch line of sorts) or new idea

Plot outline

With you as the protagonist:

- 1) First equilibrium (e.g. the dominant paradigm or current state of knowledge)
- 2) Conflict (what makes you question the first equilibrium)
- 3) Rising action (what was the process of discovery)
 Could be organized as a series of body paragraphs
- 4) Resolution (the key new findings)
- 5) Second equilibrium (what is the new state of knowledge).