AST 542 Effective Scientific Presentations

Josh Winn

Session 1. Present Unto Others

Introductory slides

By choosing to become a professional scientist, you have also chosen to become a professional presenter. Take time to develop your presentation skills alongside your skills in research, computing, observing, teaching, and writing. Consider Powerpoint and Keynote to be tools you need to master, just as you might master a new Python package or computing cluster.

Designing and delivering effective presentations requires a lot of work and attention to detail. It is not easy and does not come naturally to many people. Nevertheless, presentation skills are important for sharing the results of your work and enhancing its impact. Effective presentations also help you stand out from the competition.

The first commandment of effective presentations, in the words of professional presentation consultant Nathan Haims, is:

Present to others as you would have them present unto you.

Become conscious of presentations you enjoy. Figure out why they are good. If you like something, add it to your own bag of tricks. Likewise, be aware of when a presentation starts to become boring or unintelligible, and figure out why. Bring a notebook to colloquia and seminars and take notes on both the science and the effectiveness of the presentation.

There is an ethical component to this commandment. Our time is a precious and non-renewable resource. A boring or ineffective seminar wastes an hour for each of dozens or more attendees, and discourages people from attending future seminars (which, in turn, diminishes the vibrancy of the department).

Each week in this seminar, I will make some remarks about one aspect of effective presentations. We will hear two 10-minute presentations by students, and critique them immediately afterward. The students will have rehearsed with me privately on the previous Tuesday. Our critical remarks should be honest, but also friendly, and given in the spirit of "no matter how good you are, there is always room for improvement."

The second commandment of effective presentations is: ***Stay within thine allotted time, no matter what happens during thy presentation.***

Session 2. Rehearsing

Demosthenes was a contemporary of Plato and Aristotle. When he was young, his father's trustees spent his inheritance, and he wanted to sue to recover the money. In Athens at that time, there were no lawyers: you had to make your own case. But Demosthenes had a stutter and a nervous disposition. He dedicated himself to self-improvement. He found a mentor who was an actor, and practiced as though his life depended on it. He rehearsed in front of a mirror, rehearsed with pebbles in his mouth to improve his control over his facial muscles, rehearsed while running and out of breath. To eliminate distractions from social events, he shaved half of his head, making himself unpresentable.

His first public speech was a failure. But instead of shattering him, this experience caused him to redouble his effort. He went on to become a professional speech writer and the most respected orator of his day: the gold standard of classical rhetoric.

The third commandment of effective presentations is: ***Rehearse***.

It is the one thing you can do that I guarantee will make a big difference. Few people in our field rehearse their presentations properly. From Demosthenes, we learn that rehearsal can help you overcome just about any obstacle: if you have a stutter, get excessively nervous, have a quiet voice, or lack a strong command of English.

Why don't most people rehearse? I think there is a widespread attitude that real scientists don't give canned talks, or "TED-like" talks that are pretty and polished. Real scientists should know their subjects so thoroughly that they can speak naturally and spontaneously. This is not a helpful attitude. While I agree that natural-sounding speech is better for comprehension — our brains are designed to participate in that type of communication — this does not excuse us from rehearsing. It means we need to rehearse until we are able to make a carefully crafted presentation *sound* spontaneous.

To count as a rehearsal, the performance must be

- Timed
- Out loud
- Standing up
- Using your body as well as your voice
- Carried through to completion without interruption, even if you mess up or become tongue-tied ("the show must go on")
- Followed up immediately by taking notes and making improvements

You can improve by rehearsing yourself, but it's better to have a live audience. The audience will tell you which parts of your talk are great, and if they are good friends or colleagues who care about you, they will also be able to tell you:

- Your explanation of X was unclear.
- Why are you bothering to explain X?
- You have a verbal tic or nervous habit you didn't know about.
- Your slides are ugly or hard to read.
- This is too silly / too serious for the intended audience.
- Your joke didn't work, but if you change X to Y, it will be funny.
- Etc.

Another reason people avoid rehearsing properly is that rehearsing is psychologically difficult. It is uncomfortable and can be embarrassing. It is hard to absorb criticism and avoid becoming defensive. You might try to soothe yourself by thinking: "Well, that didn't go well, but I'll do better during the actual talk." In my experience, this is incorrect. It will almost always be worse, unless you take specific actions to repair whatever was wrong.

How many times should you rehearse? Twice is a good idea, while you are new at this. Consider: how many other occasions are there in our professional lives when a few hours of extra work will make a *factor-of-two* (or more) improvement in an important outcome? A better answer to this question is: the more rehearsals, the better. You will improve each time, no matter how good you are, as long as you maintain focus, relinquish your emotional attachments to whichever parts of the talk aren't working, and accept criticism as valid information, even when you disagree.

Consider writing the whole talk and memorizing it. Every word. If that sounds crazy, just try it as an experiment for a short talk, or a high-stakes talk. You can edit the script after each rehearsal, making your tricky explanations more concise and convincing. You can read it and improve it on the train or during your flight to the conference. You may find you memorize it "by accident." At least, consider memorizing the introductory and concluding material, which need to be especially strong. Do not count on having "presenter notes" visible to you at the podium.

Session 3. Organization

When it is time to write a talk, do not launch Keynote or Powerpoint. Instead, open up a text file or get a piece of paper. It is not time to *make slides*; it is time to *organize*. Decide on the main points you want to convey. Make an outline, including a time budget for each portion. Think of slide ideas and make "storyboard" sketches. Do not begin making slides until you have iterated on your outline, developed a realistic time budget, and decided on the key visual elements of most of the slides. This is good practice not only because good organization is important for effective presentations, but also because you will not waste as much time making fancy slides that you do not end up using.

Here are things I sometimes discover when I am iterating on an outline:

- I'm not so clear on the point of this talk. I need to find out more about the audience or the context.
- I don't have enough time to talk about all this stuff. I should just drop X, and concentrate on Y.
- A lot of this stuff is *pro forma* — traditional things that everyone says in this kind of talk. I should come up with a fresh approach or leave this stuff out.
- This part is essential but boring. I either need to make it more interesting, or at least make sure the audience knows why it is essential.
- This explanation needs to be more visual.
- I can't make as convincing a case as I thought. I need to do a little more research, or check the literature.
- Hey, I just thought of a new way to explain or visualize this concept that even helps *me* understand it better!
- (rarely) Wow, this stuff hangs together better than I thought!

There are many possible structures/themes for a talk:

- The historical approach. This sometimes helps with understanding, especially in fields that have become very complex over time.
- Make it a story. But be careful not to overdo it (see below).
- Here is a mysterious observation. Which theory is correct?
- Here is an interesting problem in the field, and here's why we are stuck. Here's the new thing I am doing to make some progress.
- There is a small corner of a field that you have never thought about, and which you might think would be boring, but which turns out to be subtle and fascinating. ("To see a world in a grain of sand.")
- There is a really huge question everyone is trying to answer. Here's our group's approach. My role is X. Recently I have gotten excited about Y. The fine details are Z. (The "inverted pyramid.")

Some structures that should probably be avoided:

- Let me tell you about the last 5 papers I wrote on assorted subjects.
- This is the story of the discovery of X in too much detail, including the roles of all my collaborators with their pictures and screenshots of their emails and Slack comments.
- This is going to be a standard talk you have heard many times in different forms. I have obtained a few more data points that I will put on the Standard Plot in the Field.

Often, the way you organize the talk will be different from the way you came to understand the subject or the order in which you did the work. This is because you need to:

- Remember what it was like *not to know* the topic. What was not obvious to you at first?
- Remember what *you would have cared about* when you didn't know the topic. How did you come to find the subject interesting?
- Remember that just because you spent a lot of time *working* on X does not mean you should spend a lot of time *talking* about X. The time budget should be based on what is needed to *explain* the work, not *perform* the work.
- Avoid excessive jargon.

You may also need to (or at least should feel free to):

- Change the motivation. The way you motivate your audience need not be the same as your original motivation.
- Ignore chronological order. Present in the way that makes the most sense.
- Omit descriptions of work that turned out to lead to a dead end, unless it is somehow interesting or illustrative.
- Make different plots than the ones you're used to: simplified, using different units, stripped down to the essentials, or otherwise more relevant and easier to understand.
- Glide quickly through things that everyone has already heard many times before.

What does the audience need to know about your method of organization? Very little. The most important thing the audience needs is a smooth and logical flow from one slide to the next. This is why "telling a story" is often a successful strategy. The audience is stuck *in the present*. They can't be expected to remember everything you said at the beginning of your talk, or your outline. Among the implications are:

- There is usually no need for "signposting" — outline slides, running titles on every slide, headers and footers with slide numbers and other things that add visual clutter.
- Transition slides are OK, though. But try to make one part flow naturally from the previous part. Pay special attention to what you say at transitions.
- A conclusion slide is also OK. But try to make your concluding material strong and engaging, not just "Here is my summary, I will now take questions."

Sessions 4 and 5. Keynote Clinic

Some non-obvious features of Keynote that I find useful:

1. Magic Move — for "morphing" one slide into the next.
2. Instant Alpha — for rendering transparent a certain color range of an image (usually to eliminate the background color of an image grabbed from an outside source).

In the Keynote Clinic Slides you will find examples of how I like to

1. Handle equations. Keynote allows Latex input. Equations should be large and annotated. Steps in a derivation can be animated or appear sequentially.
2. Handle text. Text should be kept to a minimum, usually just phrases or a small subset of the words you will speak.
3. Build plots sequentially, starting from simple to complex. This makes things easier to absorb in a short time.
4. Crop and simplify plots. Usually, published figures require some "surgery" before they are suitable for a presentation.

Session 6. Presenting during Pandemics

It is challenging to retain the audience's interest and engagement even when the audience cannot see you, and when they are also staring at a machine that presents an infinitude of Internet and email distractions. Some tips:

- Learn all the features of your web-conferencing tool.
- Avoid visual stasis. Use animations and sequential builds, although don't count on the animations appearing smooth on the other end.
- Tend toward putting less information on a larger number of slides, as opposed to dwelling for a long time on densely packed slides.
- Your voice is even more important than usual. Radiate energy. Speak enthusiastically, with more inflection and with natural pauses. Listen carefully to your favorite radio journalists or podcast hosts — what are they doing with their voices? Ham it up while you are rehearsing. It might feel unnatural at first, but in fact, what is really unnatural is monotone and run-on speech.
- See if you can share your screen to show your slides, while still also keeping your webcam active so they can see your face within a smaller window.
- Make sure the shared view is the view of the slides, not the "Presenter's View".
- Use the cursor to point things out. With Keynote, press "C" to activate the cursor. You can also arrange for the cursor to be visible all the time; see Preferences.
- You can also enlarge the cursor through one of the "Accessibility" settings. (Lachlan mentioned that there are third-party apps that allow you to change the cursor into a bright dot or other shapes. I think the cursor is also displayed as a laser-like pointer spot when you use your iPhone or iPad as a remote.)
- Edit slides interactively; circle things, add emphasis.
- Use the "whiteboard" feature or a tablet to write things or draw pictures in real time.
- Make sure the host forces "mute" on everyone else besides the speaker, until it's time for questions and discussion.
- You might want to make sure that no crucial information is near the margins of your slides, in case the viewer's screens are truncated or covered by control windows and other stuff.

- Consider standing up during your presentation; it may appear more natural, and allow you to make more natural hand gestures. At least, avoid having the camera present a view of your face from below.
- Consider taking the opportunity to record yourself (or have the host record you), so you can see much more clearly what went well and what needs improvement.

Bonus advice from Nathan Haims (from whom I learned a lot)

Some general advice:

1. Don't read from the slides. The text on the slides should usually be briefer than what you are going to say. Use your voice to expand and expound on what is written on the slides.
2. Instead of bullet points, consider a fresher approach. Use icons or other ways to create "visual chunks" instead of boring lists.
3. Take the "three word challenge" — can you take what you wrote on the slide and boil it down to three words? Or, at least, as few words as possible?
4. Don't use generic headers like "Results" or "Conclusion". If you are going to use headers, make them into assertions, e.g. "Force is proportional to mass". Then, the slide shows the evidence supporting the assertion.
5. When you have a nice image, have it fill the entire screen.
6. Some good sources of clip art and stock images are iStock, Shutterstock, Unsplash, Pexels, Pickit, and TheNounProject.com. There's also Adobe Stock art.
7. Try to vary your voice and intonation from sentence to sentence. Take a nice long pause when an idea needs to sink in, or when you are changing gears. Learn to avoid "ums", "likes" and "upspeak" — a rise in pitch as you approach the end of a sentence.

Some problems specific to online presentations are:

1. You can't read the room. No laughter, no nodding heads, no body language.
2. The viewers have constant distractions.
3. Animations, videos, and small text might not work well if your viewer has a bad connection or is viewing on a phone.

Setting Up

Turn off all alarms and notifications on your computer before sharing your screen.

Position the camera slightly above eye level. Try to look right at it. In the camera's field of view that is shown to the other participants, your eyes should be about ⅔ of the way to the top.

Sit forward in your chair to prevent lethargy and compression of your vocal tract. Stand, if you like. Use your hands as you usually would, maybe even more so — even if your hands cannot be

seen, this produces a psychological effect that will improve your voice. If you get tired or slouchy, call for a 3-minute "bathroom break" and walk around the house.

Nathan's polls in various groups suggest that a large majority of people prefer Real Backgrounds instead of Virtual Backgrounds. Keep your background very simple, if possible — maybe even a blank wall. Lighting should be from both the front *and* both sides; it usually takes some trial and error to get it to look nice. The camera should be slightly above eye level, and you should do your best to look right at the camera. Move the Presenter Notes box to right below the camera, and you will have a teleprompter. Or, move the Gallery view box right below the camera.

During Your Presentation

Set expectations before the presentation. Will you be recording? Would you prefer people to have their video on? Would you like them to interrupt you or use the Chat feature? Remind them of how to mute and unmute themselves easily (by depressing the space bar, using Zoom).

People are *more attentive* to slides on Zoom than they are in person, and they often have a better view (although at lower resolution). To keep the audience engaged, do not let your slides be static for too long (more than a couple of minutes?) and it's also unwise to make things happen faster than 15 to 30 seconds, in case someone is briefly distracted. Consider backgrounds with bright and interesting colors. Consider mixing things up occasionally by pausing for questions, doing an online poll, etc.

Try to think of ways to take advantage of the online format. Share a beautiful image with everyone via Google Drive or by uploading files to the Chat box, the attendees can enjoy it at full resolution. Make a 1-page summary that you can share via Chat. Take advantage of the fact that you can see everyone's names in the Participant List to call on people or ask them questions. Maybe someone else in your household can be an assistant, to alert you to any technical problems and keep an eye on the Q&A or Chat boxes.

Miscellaneous

If it is a collaboration or brainstorming meeting, everyone can be editing the same Google Doc while the meeting progresses.

The newest version of Powerpoint has some interesting features, including "Zoom" (which creates a visual table of contents for your presentation), "Design Ideas" which takes a few elements and text and offers dozens of design ideas, and "Subtitles" including an option for live translation into other languages.

Possible topics for future discussion

Knowing your audience

Avoid too many pop culture references
Psychological factors and imposter syndrome
Voice, posture, body language
Avoiding jargon, bureaucratese, and cliche (an ideal laboratory for X, science use case, …)
Humor
Visual design of figures and slides (no rainbow!)
Effective Q&A
Choosing a title and abstract — questions, assertions, friendly but not cute

Example of cliches from Marcel Pawlowski:

“These building blocks constitute unique laboratories that push the frontier of the field towards a better understanding of fundamental processes. Our research identifies them as a paradigm-shifting smoking gun, turning them into a Rosetta Stone with countless future applications.”