

How to improve scientific presentations

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This document describes a few ideas on how scientific presentation can be improved. It is certainly by no means complete but rather is a collection of ideas which capture common sense. Also, it's biased towards astronomy, but adapting it to other sciences should be easy.

Don't expect to do everything right (so don't I), but think about your presentation from the audience's point before you give it. Chances are high that you discover some flaw or weakness that you wouldn't want to see in somebody else's presentation.

A general rule is: try to reduce the effort it takes the audience to understand and comprehend your talk. Every bit of attention somebody has to spend on understanding your talk is lost to comprehend the message that you want to bring across. Try to make it as easy as possible for everyone to grasp your ideas and results. People usually don't want to be challenged in a talk but rather sit back with a cuppa and enjoy a break from everyday's work while listening to something possibly interesting.

Also be aware that in general nobody will comment on your talk unless you ask them to do so. You can repeat the same mistake again and again without somebody coming up to you and pointing that mistake out.

You'll probably never again meet the vast majority of the audience, so this talk is the one and only chance you have to make an impression. Don't mess it up! In the worst case, they will remember you as the one who gave that particularly bad talk. In the mediocre case, you'll not leave a trace in their brains, and in the best case, they will remember you and your subject and what kind of work you've done.

1 What a presentation is for

Presentations (or talks, these terms are being used synonymously here) have one and only one purpose. You want to inform about your work and ideas and your contribution to the science in your field. Now that you've done all this work, you're convinced it's correct and valuable, it would be a sad thing to spoil it with a bad presentation! Everything in a talk has to support this one purpose.

The level of the talk should be as low as possibly reasonable. Assume many people have not a very good idea of what you're working on, so you have to remind them about something which they have possibly only heard about long ago or learnt in university an even longer time ago.

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When you give a colloquium, expect people from all over the institute to attend, so only few, if any, will be experts in your field. If students attend, they will particularly appreciate when you start at what you may consider a very low level. Nevertheless, they are usually capable of keeping up even when you explain your topic at a high pace.

If you are attending a conference, you may be surrounded by specialists and the level at which your talk starts can be considerably higher.

Also remember that a presentation only supports what you say. The main reason you are there in front of all these people is to talk to them, not to push the button on your laptop for the next slide. Could you give the talk using chalk on a blackboard with only a minimum of sketches and key words?

2 Structure of a presentation

It is difficult to give general advice on how a presentation should be structured. Just from contemplating about my own attention span, I'd suggest the following (assuming you are giving a talk of 20 min or more in length). A general guideline is that you have to start with something interesting - an astrophysical puzzle, a problem which has been around for some time and is well-known, or the like. Try to get over boring stuff quickly in the middle of the talk, then strive to climax at the end.

1. Introduce yourself, say what you are working on and where, whether you are working on a PhD etc. If a chairperson introduces you, she/he will probably introduce you and there is no need to repeat it.
2. In the first few minutes, people are open and curious. This is the time to grab their attention by showing them what a beautiful, unsolved problem is out there waiting to be solved... by you!
3. In the next few minutes, go a little deeper and explain the physics. If you managed to hook them in the first minutes, the audience will be motivated to follow your explanations - and proud if they understand it (at least I am).
4. Now is the time to present your observations or simulations. Most people are observers and like to observe, and this part can be quite relaxing. Don't dwell too much on the data reduction. That part in general is known and not particularly interesting.
5. Show how you extracted the information you're after. This part should match the explanations given in the beginning of the talk. Don't come up now with something entirely new (unless its easy). That requires mental gymnastics at a point where people's attention is in danger of running out.
6. Converge on your final message by summarising the results and explaining them, possibly repeating the important things. This, after all, is what you have come for!
7. Thank the audience and the chairperson for their attention and take a deep breath - you made it.

I reckon one of the most important things in a presentation is the motivation. Put your work into a general astronomical framework, show what unsolved problems are connected to your work and how the work you are doing can contribute to the field. It is very unlikely that you'll ever give a talk about actually having solved a problem. However, tell them why your work is important.

Keep a logical flow in your presentation. In an idealized world, the audience should expect what you are showing on the next slide, rather than being surprised (although this can be useful to get back people's attention when it has drifted away).

At each point, the audience should have a picture of what you want to explain, i.e., make sure they always have your scientific motivation at the back of their heads. Refer to the motivation every now and then to refresh their memories.

Avoid to go back in your presentation because it carries the flavour that you missed to explain something sufficiently well for the audience to follow your upcoming slides. However, when you notice during a talk that you forgot to explain something, explain it, that's much better than trying to hide it.

If you think you need the same graph twice, then include it twice rather than going back. In presentation software, that's done at the blink of an eye.

People will spend much time on reading while you speak on. Most men can't listen and read simultaneously, women mostly can (to some degree). So when you explain some issue whilst showing considerable amounts of text, chances are high that some of the audience misses either of them (unless they're all female).

3 Technical issues

3.1 Layout

Don't waste too much space on borders and frames, although a little bit here and there helps to guide the eye and add some depth to the projection. Use a template layout for your slides. That will make it easier if you decide to adjust the background, and you won't need to do it for each slide separately.

I'm not sure about this one, but I'd prefer not to have a name, location and date on every slide (on cover slide it's ok). People usually know your name, the date and where they are. Also, it carries the flavour that you are so busy giving talks that you have to remind you for which occasion you made this particular one.

Non-native speakers tend to write long sentences to remind them of phrases etc. and to read them off the projection. Don't do that, although it is tempting. Either will you look towards the laptop or towards the projection, but not towards the audience.

3.2 Colours

This is essential: choose good contrast, e.g., bright fonts on dark background or vice versa. **DO NOT USE YELLOW/LIGHT GREEN/LIGHT BLUE/CYAN ON A WHITE BACKGROUND!** You may be able to read it on your screen at armlength's distance, but not on a projection. This is also true for graphs -

unfortunately, many plotting programs (Gnuplot, Xmgr[ace]) use light green as the first or second non-black colour for plots. Don't keep that.

Avoid to combine red-green or red-blue combinations, they're a nuisance. Also 9% of men and 0.8% of women can't tell red from green very well.

Stick with your colours and keep them consistent throughout the presentation. For example, choose a dark background, yellow for headlines, white for text and possibly orange for very important results you want to point out (although you can possibly do that with a pointer).

However, it can be helpful to use different colours for the text to separate one issue from the other. This could be done using alternating light blue and white for pieces of text. It generates an optical hint that the next point has a different content.

If you use a structured background, for example a photograph or graphics, then make sure all colours are well readable on top of it. Too much background structure will interfere with the letters when text is written across it, making reading difficult. I strongly suggest to use a predominantly empty background for where you want to put your text.

Black (or very dark) backgrounds are good, you may want to add a simple structure in a corner to generate some depth to the projection. It looks very "flat" otherwise.

3.3 Fonts

Choose fonts that are clear and easy to read, Sans Serif fonts look better than Serif fonts (this is my personal taste). Choose a minimum font size of 20 and a little larger for headlines. That will also be readable for the short-sighted and those who forgot their glasses.

Choose font types that come with the OS you run the presentation software on. If the font you use doesn't exist on the other computer, the OS will try to find a substitute which will spoil the layout and make your talk look ugly.

3.4 Graphs

ALL LABELS MUST BE BIG ENOUGH TO READ. If you have to apologize that "you unfortunately can't read the scales on this diagram" then you didn't care/think in advance. What's the use in showing something that nobody will recognize anyway? If the labels are long and complicated (e.g., "SFR [$10^{-3} M_{\odot} \text{Mpc}^{-3} \text{yr}^{-1}$]" on y and "JD-2450000" on x) then you may want to add simplified labels in the presentation, like "Star formation rate" and "time". Add arrows to point out in which direction something increases. Include bars in maps to indicate the actual size of an object. People can't guess from a contour plot whether an object is 1 pc or 1 kpc long! Also, don't forget to include a sketch of the resolution of an instrument. This is particularly important for instruments whose resolution is easily changed, like radio interferometers. When showing a new type of graph, explain what is shown.

Many of your plots will come as Postscript which you need to convert to a bitmap for your presentation software. Be aware that Postscript figures may contain lines which are only one pixel wide. When scaling these figures down after conversion to GIF/PNG conversion, you may lose thin lines in that process because adjacent pixels are averaged together. Convert the figure into

a bitmap using the correct size from the beginning, use thicker lines in the Postscript plots (most programs will allow you to choose a line width) and use anti-aliasing when reading the figure into, e.g., GIMP. This will create smoother transitions between background and figure/text.

Don't write across graphs with "naked" text. Use a filled box to block out a graph in background when you want text to appear across a figure.

Again, plotting software has a habit to use light green on white background as a colour for graphs. Change it!

3.5 Animations

Animations¹ are bad. They grab attention which you desperately need for the audience to understand what you're talking about. If you feel you need to use one, keep one type, preferably "appear". Don't let text and arrows fly around in your presentation. The worst thing are animations that repeat themselves in loops.

Also, triggering animations will keep you busy with your laptop (unless you have a remote control and are very experienced in presenting), but you're there to talk to the audience. And animations are embarrassing when you go back in case someone asks a question referring to a past slide, or in the post-talk discussion.²

One tends to forget about animations. Then, when you press a button to switch to the next slide, they interrupt the flow of your talk. However, this can be avoided by practising your talk.

Stick with one simple kind of slide transition, don't choose a different one ("random") for each.

Again, try to avoid animations. They always give the impression that the presentation and the software are more important than the content.

4 How to prepare for and present the presentation

Learn to use your software and hardware, ask, search the web! It's very embarrassing when you encounter a problem during your presentation (or briefly before it starts) and it's obvious that you don't know your tools. Create a shortcut to your presentation on the desktop on which you click to start the presentation. That's easier and much faster than loading your presentation using "Start / Programs / PresentationSoftware / File / Open / (search document)"

If you bring your own laptop to the presentation venue, then check with the lecture hall projector well in advance. Only recently have software and hardware become reliable in connecting, and I have seen much hassle with laptops and projector not talking to each other. This also requires that you have a basic familiarity with your hardware. Some people don't even know how to direct their

¹Here, "animations" refers to visual effects which let elements of text, graphics or arrows fly into the slide or move around at the push of a button. It does not mean elements like movies or animated graphics which are used to illustrate results of an experiment or other facts.

²However, in PowerPoint you can type a slide number and press enter to hop directly to the specified slide without the need to browse backwards through all the slides.

laptop's screen output to the projector. That's embarrassing and avoidable, so learn how to do it. If you don't know how to operate it, chances are nobody else will.

Make yourself feel comfortable in the room. If it's too bright in the room and the projection is difficult to see, lower the blinds (if there aren't any blinds, it's good you chose high-contrast colours, isn't it?). If it is noisy outside, close the window or ask someone to do so, even during the talk. It's better to interrupt your talk for half a minute to get rid of some annoyance rather than to ignore it and live with it for the rest of your talk. Chances are high that the audience will also be annoyed by it.

When practising your talk, make notes on slides. They'll help to remind you if you recycle the talk months or years later and are always glued to the presentation. Paper tends to go astray.

Bring backup slides for important talks like conferences, job applications and PhD talks. OSes freeze and hard drives die (yes they do!). If that happens to you, you're lost. It shows a high degree of professionalism to have backup slides and to continue your talk seamlessly on transparencies if your computer dies.

When travelling, keep two copies of your talk in each your carry-on bag and your main suitcase, this saves you if something is delayed or lost. Have your talk on various media: CDROM, USB memory sticks and floppy disks are widely available, with the latter slowly fading in availability. Check in advance which of these media can be read by your host's computer. Also have a copy on your homepage for an emergency download (know how to do that!).

If you have to quit the presentation to show a movie: start the movie application, load the movie and leave it in the background. This will save your time and show you're well-prepared.

Buy your own expandable ball-pen-type pointer and carry it with you. Don't count on the venue having a pointer. If you bring a laser pointer, use it sparsely. Laser pointers are extremely attractive to the eye, so don't point on everything on your presentation unless necessary.

Finally, dress well. You do not need to wear a suit and a tie, but decent clothing signals that you appreciate the audience's time. You will also be identified with your home institute, so take care. Take a shirt, a neat pair of trousers with a belt and closed shoes. In general, astronomers tend not to pay attention to these things (unlike in industry, for example) but - hey, you never know! There may be people in the audience who appreciate thorough preparation and who are on the committee that decides over your next job application.

5 The presentation

Don't modulate your voice too much, it's tiring for the audience to listen to. Speak normally like if you were explaining something to a colleague on the corridor.

Native speakers should pay attention not to speak too fast. It's likely that a fraction of the audience are non-native speakers who will spend considerable brain time on deciphering what you say (unless they're very trained). If you speak too fast, they may hear what you say but not understand the astrophysics which you're talking about.

Non-native speakers should practise their English. Chances are high that native speakers can understand you, but other non-native speakers, especially from different language families, can have considerable problems. Be aware of that when you practise your talk, because you may have a strong German accent, which none of the German test audience will notice as a disadvantage.

If you have a low-volume voice then organize a microphone. While speaking, keep the distance to the microphone constant, and don't continue speaking when moving away and pointing out something on the projection. If you can't get a microphone: bad luck! Try to get close to the audience and practise to speak up.

Keep your time! Not to do so is a nuisance for chairpersons and the audience. It also indicates you can't tell important from unimportant things for the time you were given. Also, audience's attention span usually is ≈ 30 min. Practise! When you're given 45 min and stop after ≈ 60 min, then you have to shorten your talk.

Don't fiddle with your laptop too much, don't speak to the laptop and don't point to the laptop when you want to point out something.

Stand relaxed, breathe regularly and focus a few people during the talk. That will let you connect to the audience and reduce the felt distance.

Don't cling to your pointer or try to hide behind it. Hold it in one hand and use it only when you want to point something out. Don't read text to the audience using a pointer (they can read it without your assistance). Laser pointers amplify the shiver of your hands if you're nervous. Use a pointer instead. Don't use the pointer to produce a shadow on the screen which is meant to point at your aim. Put the pointer firmly against the screen. This is unambiguous and nobody will notice that you're nervous.

Avoid to start each slide with saying "ahem" or "ok". It's ok to have short (a few seconds) breaks after a slide transition. The audience must orient themselves anyway and need a few seconds to grasp what's on the new slide.

Somebody *will* fall asleep – ignore it.