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Advice on designing scientific posters

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A one-sentence overview of the poster concept

A scientific poster is a large document that can communicate your research at a scientific meeting, and is composed of a short title, an introduction to your burning question, an overview of your trendy experimental approach, your amazing results, some insightful discussion of aforementioned results, a listing of previously published articles that are important to your research, and some brief acknowledgement of the tremendous assistance and financial support conned from others—if all text is kept to a minimum, a person could fully read your poster in under 10 minutes.



PHOTO BY ELEFTHERIOS KOSTANS/SWARTHMORE COLLEGE



PHOTO BY BRUCE MAXWELL/SWARTHMORE COLLEGE

Students explaining their posters at the [Sigma Xi Poster Session](#) (Swarthmore College, 2004)

Why a poster is usually better than a talk

Although you could communicate all of the above via a 15-minute talk at the same meeting, presenting a poster allows you to more personally interact with the people who are interested in your research, and can reach people who might not be in your specific field of research. Posters are more efficient than a talk because they can be viewed even while you are off napping, and especially desirable if you are terrible at giving talks. And once you have produced a poster, you can easily take it to other conferences such as the more general scientific conferences sponsored by [Sigma Xi](#), the [Council on Undergraduate Research](#), the [American Association for the Advancement of Science](#) (AAAS, or "Triple A-S" to most), the [Federation of American Societies for Experimental Biology](#), and the [Society for Integrative Biology](#). If you don't like to travel far, or are broke, many college and university science departments sponsor poster sessions that welcome students from nearby institutions. For all of the above, session organizers typically have a "Best Undergraduate Poster Prize Committee," which awards fame and often cold hard cash to deserving posters. And when you're ready to retire your poster from duty, you can hang the poster in your dorm room to impress your friends, or you can display it in your departmental hallway so that faculty can show off your

Motivational advice

The best general advice I can give a first-time poster constructor is to describe the circumstances in which a poster will eventually be viewed: a hot, congested room filled with people who are there primarily to socialize, not to look at posters. Because poster sessions are often concurrent with the (free) "wine and beer" session, chaos is further increased by hundreds of uninhibited graduate students staggering around hitting on each other. The scene below captures the cramped feel of most poster sessions, but lacks the typical density of viewers:



Photograph of a poster session
PHOTO BY CARLOS A. ALVAREZ ZARIKIAN /USGS, MIAMI, FL

Meeting organizers will invariably sandwich your poster between two posters that are infinitely more entertaining, such as "Teaching house cats to perform cold fusion" and "Mating preferences in extraordinarily adorable red pandas." In such a situation, your poster must be interesting *and* visually slick if you hope to attract viewers.

The trick to producing a great poster is to embrace the rough draft process. Rough drafts are especially crucial in deciding whether you need to cut/add text or resize figures or fonts, decisions that can entail many hours of fussing. You should produce a rough draft *at least* one month before it is due, and then bribe six people (friends, strangers, etc.) to look at it when you are *not* present--ask them to leave their suggestions on small Post-Its that you provide for them (approximate results shown below). Ask them to comment on word count, prose style, flow, figures, font size, spelling, etc. Note that you can print a miniature version of your poster on letter-sized paper to get a very rough sense of impending layout challenges, but this shrunken version is extremely hard to critique and you will lose friends if you ask them to do so.

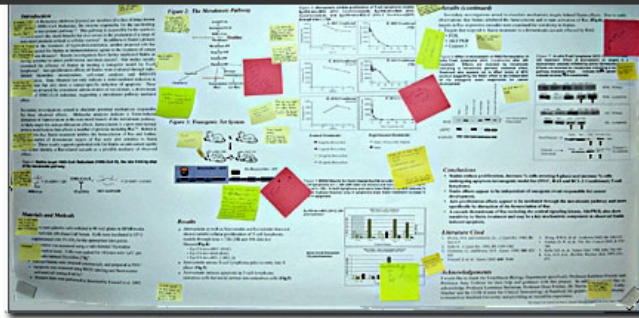
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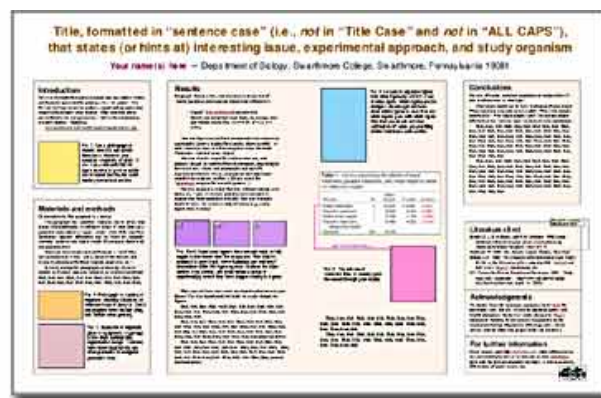
Rough draft of poster with Post-It suggestions
PHOTO BY COLIN PURRINGTON

Deciding between “arts and crafts” and software-generated posters

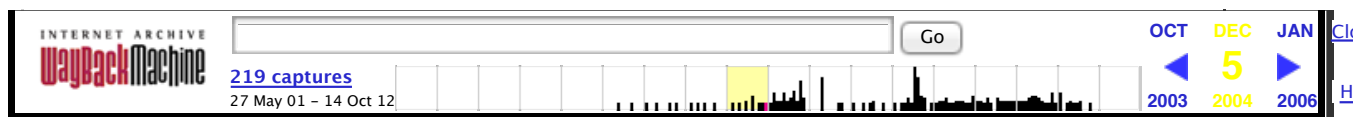
Unless you possess artistic ability *and* don't have anything else to do with your time, you should not attempt to build a poster by cutting and pasting content onto panels colored matte board, the default method for the most of the last century. Such “arts and crafts” posters, when *properly* executed, are far, far superior to anything that you could make with a poster printer, but it is not advisable for the busy and artistically challenged. Many programs can create large-format posters: Microsoft Powerpoint, Microsoft Word, LaTeX, Adobe Pagemaker (my favorite), Adobe Illustrator, Adobe InDesign, etc.

Using a template

Template files for scientific posters can be found on the internet by conducting a search in Google for “poster template” and then adding the application name (e.g., Powerpoint). The Powerpoint template below ([download it](#), if you like it) is designed for a 36 x 56" poster, but it can be easily modified for other sizes. To get started, just replace the "dummy" text and graphics with real content, if you have it. In this template, page dimensions, column number, column width, and font size are all preformatted to produce a poster that is readable from 6' away. I have also designed this template to possess a good amount of white space, which is critical for a readable poster. Try to resist the inevitable directives from your mentor to use this white space to cram in more background information or to include every single experiment you did. To encourage responsible use, the template invokes a Powerpoint hardware macro that will deliver a mild, usually non-lethal shock via your keyboard when white space is decreased below 35%.



Powerpoint poster template (click on image to download)



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would like to see some examples of how other people have modified this template, [check Google](#). Try to keep your word count as low as possible to maximize the chance that viewers will actually read your poster: shoot for 1000 words. This will be painfully difficult if you are attempting to fully document everything you have done, but posters with too many words will cause viewers to just read your figures or, more likely, to avoid your poster altogether.

What sections to include and what to put in them

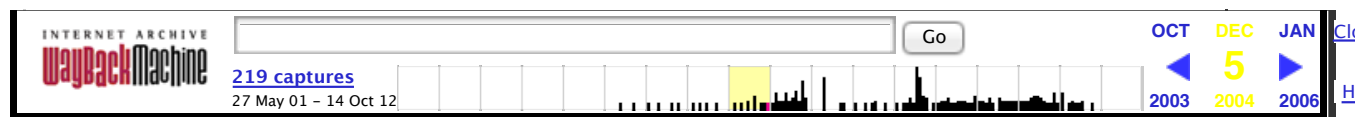
Title: Should convey the "issue," the approach, and the system (organism); needs to be catchy in order to "reel in" intoxicated passersby. [Maximum length: 1-2 lines.]

Abstract: Do not include an abstract on a poster! If you are presenting your poster at a meeting, you will probably be asked to *submit* an abstract; this abstract is for inclusion in the "meeting catalog," and should not be viewed as a hint from meeting organizers that you should include this section *on* your poster. If for some reason you are *forced* to include an Abstract section on your poster, please certainly abide by those rules, but consider asking the meeting organizer why on earth their society's guidelines are so backwards and silly. At the very least, don't make your abstract long: aim for 50 words or less.

Introduction: Get your viewer *interested* about the issue or question while using the absolute minimum of background information and definitions (such things put a reader to sleep); quickly place your issue in the context of published, primary literature; provide description and justification of general experimental approach and hint at why your study organism is ideal for such research; give clear statement of hypothesis. Please note that "X has never been studied before" is a classic but classically *lame* reason for doing something. It is good to use a photograph in this section if it can get your viewers oriented on your organism or study question quickly (note that you would never do this in a normal laboratory write-up). [Maximum length: approximately 200 words.]

Materials and methods: Briefly describe experimental equipment and methods, but not with the detail used for a manuscript; use figures and tables to illustrate experimental design if possible; use flow charts (the type with text and drawings within boxes) to summarize reaction steps or timing of experimental procedures; include photograph or labeled drawing of organism; mention statistical analyses that were used and how they allowed you to address hypothesis. [Maximum length: approximately 200 words.]

Results: First, mention whether experiment worked (e.g., "90% of the birds survived the brainectomy"); in same paragraph, briefly describe qualitative and descriptive results (e.g., "surviving birds appeared to be lethargic and had difficulty locating seeds"); in second paragraph, begin presentation of data analysis that more specifically addresses the hypothesis; refer to supporting charts or images; provide extremely engaging figure legends that could stand on their own (i.e., could convey



viewers to sleep). This is always the largest section. [Maximum length: approximately 200 words, not counting figure legends.]

Conclusions: Remind (without *sounding* like you are reminding) the reader of hypothesis and result, and quickly state whether your hypothesis was supported; discuss why your results are conclusive and interesting (attempt to *convince* reader of these points); relevance of your findings to other published work; relevance to real organisms in the real world; future directions. [Maximum length: approximately 300 words.]

Literature cited: Follow standard biology format *exactly* (don't wing this!); web sites and rumors you heard at Starbuck's are equally undesirable sources: find a *journal* article that supports your needed fact. Also, if you haven't read a journal article completely (e.g., you could only view the abstract online) you may *not* cite it! [Maximum length: approximately 10 citations.]

Acknowledgments: Thank individuals for *specific* contributions to project (equipment donation, statistical advice, laboratory assistance, comments on earlier versions of the poster); mention who has provided funding; be sincere but do not lapse too much into informality in this section; do not list people's titles. [Maximum length: approximately 40 words.]

Further information: There will be people, hopefully, who want to know more about your research, and you can use this section to provide your e-mail address, your web site address, and perhaps a URL where they can download a PDF version of the poster (edit so that URL is *not* blued and underlined). [Maximum length: approximately 20 words.]

Avoiding common mistakes

- The number one mistake is to make your poster too long. Densely packed, high word-count posters are basically manuscripts pasted onto a wall, and attract only those viewers who are for some reason excited by manuscripts pasted onto walls. Posters with 1000 words are ideal. To view your word count in Powerpoint, go to the File menu and select Properties. For those who feel that their experiment somehow warrants an exception to this brevity advice (i.e., "everyone"), find a friend to help you edit, asking them, "What text, figure, or table could I possibly delete or modify?"
- Titles with colons: they are clunky. Coloned titles are sometimes devised in order to inject humor into an otherwise mind-numbing poster topic (e.g., "Mind-numbingly boring: brain MRIs of bored and versus anesthetized adolescents," or, "Attack of the Crohn's: contribution of chromosome 16 allelic variants to inflammatory bowel disease progression"). The other motivation for using colons is to provide greater detail about the general topic introduced by the first clause, which is purposefully vague so as to interest a wider viewership (e.g., "Causes of obesity: additive effects of inactivity and *ad libitum* feeding on yearly weight gain in *Homo sapiens*"). Although humor and clarity are great, it is better to achieve them without a grammatical crutch. If you absolutely must have a coloned title, just be sure that it's not overly silly and that it doesn't force

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- Format the title in "sentence case" (e.g., "Font abuse in inbred versus outbred populations of *Homo sapiens*"). Do not use "title case" (e.g., "Font Abuse in Inbred Versus Outbred Populations of *Homo Sapiens*") or "all caps" (e.g., "FONT ABUSE IN INBRED VERSUS OUTBRED POPULATIONS OF *HOMO SAPIENS*"), which both ignore or destroy naming conventions (e.g., Latin binomials, genes, alleles) that depend on font style. Another reason is that sentences formatted in these ways have been shown (by science!) to require a few extra milliseconds for brains to interpret, and those milliseconds can add up to be annoying. (It is true, of course, that most posters and journal titles *used* to be set in either "title case" or "all caps," and thus many older scientists will invariably defend these styles To The Death, or TO THE DEATH.)
- Use a non-serif font (e.g., Helvetica) for title and headings and a serif font (e.g., Palatino) for body text (serif-style fonts are much easier to read at smaller font sizes).
- Do not "bullet" or otherwise punctuate section headers. The use of a larger font size for headers, coupled with a simple "bolded" format, is sufficient for demarcating sections.
- The width of text boxes should be approximately 40 characters (on average: 11 words per line).
- Avoid blocks of text longer than 10 sentences.
- Whenever possible, use lists of sentences rather than blocks of text.
- Use *italics* instead of underlining.
- When using acronyms and numbers (e.g., ATP, 666) within the body of text, scale down the font size by a couple of points so that their sizes don't overpower the lowercase text, which they would do if you left them at the default size. Use of "small caps" will sometimes do the trick, but this effect varies with different software.
- Set line spacing of all text to be *exactly* 1, in case you have used super- or subscripted text. Note, with sadness and cursing, that you cannot control line spacing within Powerpoint.
- Do not trust the "tab" feature to insert the correct amount of space when you are indenting a paragraph (the default is usually too big). Set the tab amount manually, with the ruler.
- Correct any errors in spacing within and between words, especially before and after *italicized* text. Note that you can use a single space between sentences (the "double space" convention was needed for typewriters, and we are slow to lose the habit). (Use software to globally "replace" all double spaces with single spaces, and to locate locations where too many spaces occur between words.)
- Because approximately 8% of males and 0.5% of females have some degree of color-vision deficiency, they see the world very differently than do wild type genotypes ([example](#)). Because there are so many different kinds of deficiencies, it is sometimes

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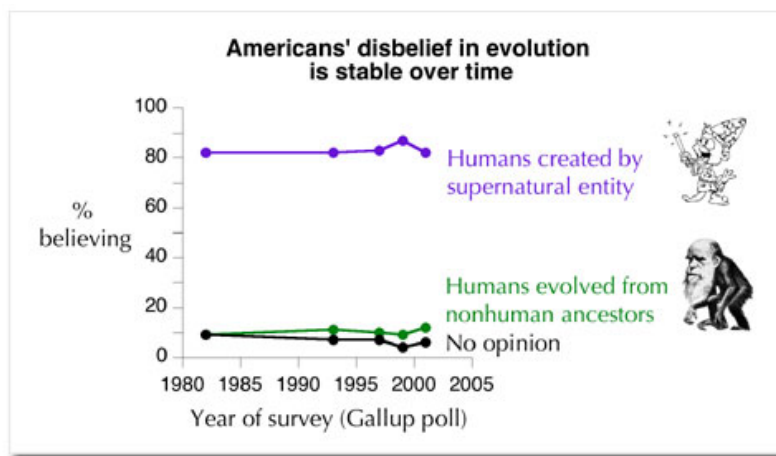
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the internet (as a PDF or JPG) and run it through the free [Vischeck](#) service, or you can download their Photoshop plugin that does the same thing: in both cases you will see your poster as color-deficients see it. In general, avoid using red and green together, and opt to use symbols and patterns instead of colors whenever possible. If you want to delve into the details of a particular color, refer to the Internet Technical Groups's interactive [Java program](#) or their [color table](#). See the Rigden article, below, for an excellent overview of color deficiency conditions and how to design for them.

- Similarly, if you have a color sensitivity mutation and don't know it, you might inadvertently design posters that are difficult for wild types to interpret. If you're curious, you can [test your color perception online](#) and get your pulse elevated for free. For the litigious and fun-averse, please [use the tepid version](#), instead. White males of European descent are especially encouraged to test themselves--they are disproportionately color deficient (see Keegan and Bannister 2004, below, for a likely consequence).
- If you are creating images on the computer, note that screen color (RGB mode) is different than printed, mixed-ink mode (CYMK). If you want your image to print as you see it, avoid RGB (i.e., change the mode to CYMK in Photoshop).
- Complete the entire poster on a single platform. Switching from PC to Mac and Mac to PC invites disaster, usually in the form of lost image files or garbled graph axes. Microsoft assures people that the program is cross compatible, but I can assure you they are lying or at least painfully uninformed.
- Graph titles are not appropriate for laboratory write-ups and manuscripts, but they are great for posters. Having short, informative titles helps to lead the viewer more effortlessly through your poster.



Example graph (data from the [Gallup Organization](#))

- If you can ever add miniature illustrations to your graphs (e.g., as above), do it! Visual additions help attract and inform viewers much more effectively than text alone. Tables benefit from this trick as well.
- Most graphing applications automatically give your graph an extremely annoying key

The image shows the top of a web browser window displaying the Internet Archive Wayback Machine. On the left, the "Internet Archive" logo is visible, followed by the "Wayback Machine" text. A search bar contains the text "219 captures" and "27 May 01 - 14 Oct 12". To the right of the search bar is a "Go" button. Further right, there is a calendar interface showing the month of October (OCT) with the date 5 highlighted. Below the calendar, the years 2003, 2004, and 2006 are visible, along with navigation arrows. The interface is designed to allow users to view archived versions of a website.

power to make your graphs easy on the brain.

- Acronyms and other shorthands for genotypes, strains, and the like are great when talking to yourself but are terrible for communicating with others. On your graphs, use "english" and then add the strain in parenthesis (e.g., "Control genotype (Col-0)").
- Y-axis labels aligned horizontally are much, much easier to read, and should be used whenever space allows. Viewers with fused neck musculature will be especially appreciative.
- All graphs should have axis labels formatted in "sentence case" (not in "Title Case" and not in "ALL CAPS").
- Never give your graphs colored backgrounds, gridlines, or boxes. If your graphing program gives them to you automatically, *get rid of them*.
- Never display two-dimensional data in three-dimensional graphs. 3-D graphs look adorable but obscure true difference among bar heights.
- Make sure that details on graphs and photographs can be *comfortably* viewed from 6 feet away. A common mistake is to assume that figure axis numbers, labels, figure legend) are somehow exempt from font-size guidelines. On the contrary, most of viewers will read *only* your figures!
- Powerpoint does not allow "wrapping" of text around inserted figures, so if you want this option for a particular section, you need to construct the section as a separate Microsoft Word file (which *does* allow text to wrap), and then insert this Word file into your Powerpoint poster by the menu command, Insert:Object (select the "create from file" option). When you want to change anything, you merely double-click the section and the Microsoft Word file will be called up, magically, for you to edit.
- Never, ever incorporate "web" graphics without extreme caution. Most web images have 72 dots per inch of resolution, but *printing* at that resolution looks absolutely terrible, and the figure will be a huge turn-off to prospective viewers. And never, ever assume that your mentor has, or can *find*, a high-quality image to give you (mentors usually only have low-resolution, poorly-composed images that they stole from the internet site of their colleagues). If you have access to a digital camera, use it to get a high quality photograph of your study setup or organism (e.g., your *Drosophila* mutant, a close-up of your *Arabidopsis* in flower). Memory space is cheap on a digital camera, so take 100 photographs to ensure that at least one has crisp detail, good composition, non-distracting background, etc. Sometimes to get the perfect shot you will need to seek out a microscope that has a camera attached to it. Run your best image through Photoshop to adjust contrast, image size, and sharpening. It should look professional when printed; if it's not, start over.
- If you include a photograph, add a thin gray or black border to make it more visually appealing. Just remember not to overpower the image with an overly thick line. Choose a line color that is subtly pleasing but barely noticeable to the viewer.

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Photograph with and without an added border
PHOTOGRAPH BY COLIN PURRINGTON

- Institutional logos are great on departmental letterhead and college athletic caps, but are somewhat obnoxious on posters. If you are unable to control yourself, minimize the degree of pretension by hiding the logo (a *small* version) at the bottom of the poster in the Acknowledgements. An exception to this advice is when meeting organizers require the inclusion of a "meeting" or "society" logo at the top of the poster; this should *not* be viewed as an invitation to put your logo there, too.



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on image for high res. version)

- If you are gluing higher resolution (e.g., 1200 dpi) images or photographs onto your 300-dpi poster, choose matte finishes for illustrations whenever possible to minimize glare (some of your viewers will be standing off to the side of your posters at crowded poster sessions).
- If your topic is related to bird song ([example](#)), whale communication ([example](#)), herring burps ([example](#)), or other audio subject, do not pass up the opportunity to have a button-activated sample of your study sound situated on your poster. Record your sample sound and then affix this device ([see a "dual sound" version](#)) to an empty area in the appropriate section. Fill the picture frame with a figure legend on how to activate sound, or fill with a picture of the sound generating organ. You can get these anywhere (e.g., Radio Shack or Targé) for about \$10. You'll have the most gimmicky, well-visited poster in the whole session! If you don't do research on amusing noises, but still want a gimmicky, well-visited poster, consider lodging one of these gizmos in your Introduction area (perhaps, "Press this button for a 10 second overview of my poster," for when you are away from your poster).
- If your topic is related to olfaction, make sure that one of your figures is a scratch-n-sniff. If your topic is related to a vile odor, perhaps put the odor into a plastic bag next to an invitation to "open the bag, if you dare."
- If your topic is related to texture (e.g., thorns), make sure that you glue onto your poster an actual object, rather than a photograph.
- If you have three dimensional data, complex molecular structures, or photographs, there are software programs that can print stereoscopic images. . . just be sure to provide your audience with 3-D glasses. If you want to be especially nice to all viewers, have the stereoscopic figure hidden under a hinged panel on which the normal figure is printed. Have a pouch near the figure so that viewers can help themselves to glasses even when

- Format your *Literature cited* contents according to the inflexible rules that the Council of Biology Editors (CBE) has set forth. References formatted according to guidelines of other disciplines, or references that are only haphazardly formatted at the last second, mark a poster as painfully unprofessional. When asking somebody to proof your poster, specifically ask them to be super-critical of your citation style. If your reference list becomes unusually long, you can sometimes shrink the font 3-4 points and then make a "2 column" citation list (but keep the section's header sized to match rest of poster).

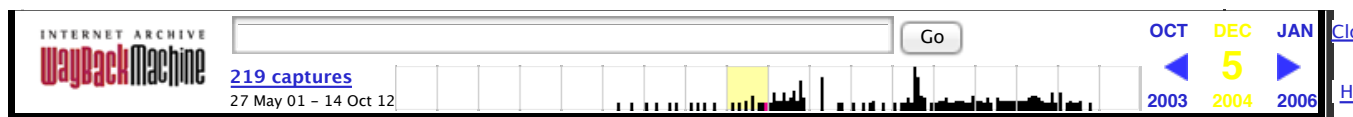
Presenting your poster

- If you are obsessive compulsive and have a large wardrobe, try to choose your clothes to match your poster color. Research (see Keegan and Bannister 2003 in "Useful literature") has shown that your poster will be avoided, a bit, when you clash. If you are color blind or fashion-impaired, please ask somebody to help you dress (a lame pick-up line, but give it a try if you're desperate).



Examples of good and bad poster/wardrobe coordination
PHOTO FROM KEEGAN AND BANNISTER 2003

- Do not wear a hat. Do not wear a muscle shirt. Etc.
- Wear a name tag, if possible, so that viewers know that the poster belongs to you.
- Do not chew gum or tobacco.
- Keep your hands out of your pockets, especially if you are a key or coin jangler. Fill your pockets with pushpins if you think you won't be able to resist.
- Do not refer to notes when explaining your poster.
- Speak to your *viewers* as you explain your poster.
- Point to specific parts of your poster whenever possible so that viewers are aware of your progression.
- Carefully walk your viewer through your figures. Avoid vagueness such as "this figure shows our main result."
- Keep a black pen and correction fluid in your pocket in case a viewer discovers an embarrassing typo.

The image shows the top of a web browser window displaying the Internet Archive Wayback Machine. The Wayback Machine logo is on the left. In the center, there is a search bar with the text "219 captures" and a date range "27 May 01 - 14 Oct 12". To the right of the search bar is a "Go" button. Further right is a calendar interface showing the months "OCT", "DEC", and "JAN". The year "2003" is selected, and the date "5" is highlighted. There are also links for "2004" and "2006".

- When in doubt about how to act at your poster, imagine that a viewer will be considering your application for a job ten years into the future, or will be considering your graduate school application next week.
- Bring a small manila envelope of business cards to attach to your poster (via pushpins, or via a binder clip). Students: you can print up a small stack of business cards for the event (use Powerpoint, or download a dedicated card-design application if you're a real geek). Glue one of the cards to the outside so that viewers know the contents, and write, "please take one," or something equally inviting. (Note: your institutional logo will be on your cards, so having this item will reduce the compulsion to place a logo on the actual poster.)
- If you must leave your poster, affix a note alerting any viewers to your expected time of return or telling them where you can be found (e.g., which bar).
- Have on hand, but do not aggressively peddle, manuscripts and reprints of your work.
- Also have on hand full-color, "shrunk" versions of your poster on 8.5 x 11" paper. If you have resisted the urge to shrink your font size, the shrunk text will be legible!
- *Thank* your viewers for visiting. If they have stayed more than 4 minutes, you have succeeded. If they say, "This is really interesting--I'll definitely come back later," you have failed.

Useful links

- <http://ublib.buffalo.edu/libraries/asl/guides/bio/posters.html>
- <http://www.neuro.utah.edu/resources/multimedia/tips.php?ID=1>
- <http://student.dcu.ie/~mcmahon4/posteradvice.html>
- http://www.drizzle.com/~afox/writings/Posters_HOWTO.htm
- http://www.umdj.edu/meg/career_presentations.htm
- <http://www.training.nih.gov/careers/careercenter/publish.html>
- <http://www.depauw.edu/partspagiarizedfromswarthmorepostersite.htm>
- <http://lorien.ncl.ac.uk/ming/Dept/Tips/present/posters.htm>
- <http://www.ncsu.edu/project/posters/>
- http://www.kumc.edu/SAH/OTEd/jradel/Poster_Presentations/PstrStart.html
- <http://www.biology.eku.edu/RITCHISO/posterpres.html>
- http://www.dartmouth.edu/~wisp/PosterShow/poster_pg2.html
- <http://www.physics.uiuc.edu/People/Celia/BTEP/Presentations/Posters.pdf>
- <http://www.survival.pitt.edu/library/documents/attending%20Professional%20Mgt.pdf>

Useful literature

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 Wolcott, T.G. 1997. Mortal sins in poster presentations or, How to give the poster no one remembers. *Newsletter of the Society for Integrative and Comparative Biology* Fall:10-11.

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When you're ready to print

To print your poster in the Swarthmore College Biology Department, see directions at <http://www.swarthmore.edu/NatSci/cpurrrin1/posterprint.htm> and then meet with Matt Powell (mpowell1), the Department's Business and Technology Manager. A larger, higher-resolution printer is located in the Faculty Resource Room, in Beardsley. Please do not expect your poster to print flawlessly the first time, or to print at all: Powerpoint needs to be *tricked* into printing, and sometimes requires an entire week of frustration, sacrifice of baby goat(s), etc. Start early, and remember to bring Matt Powell cookies if he has saved your skin.

Note for the lazy

If you are well funded, you can always skip this long-winded advice by simply e-mailing your text and graphics (as attachments) to a company that will arrange, format, and print your poster to your specifications. They will then mail it (with pushpins if you need them!) to Swarthmore or directly to your meeting location. Search "scientific posters site:com" on Google to get the names of some of these companies, or contact your conference organizers to see whether your society has a discount for a particular company.

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