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HOW TO 'SURVIVE' AFTER GRADUATING IN MATERIALS SCIENCE V: Presentations at conferences (oral and poster)

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ABSTRACT

This article describes our views and advice of how to give excellent oral presentations for Materials Science journals (and hopefully for broader audiences). Most of this discussion also applies to physics, chemistry and engineering audiences. Hereafter we will discuss the most usual forms of oral scientific communications, including oral presentations and poster presentations, invited talks and plenary talks at conferences, seminars and colloquia. Besides the 'technical' or 'nuts-and-bolts' aspects of scientific oral communication, we once again emphasize a fundamental concept that we developed in the previous articles, namely: *learn to play from the other side.* We remind the reader that anything that matters in the world of science is peer-reviewed before it is seen by the ultimate readers. Therefore, we once again advise the reader to place him/herself in the mindset of those who are going to evaluate their work to anticipate their reactions and forestall objections. [As a matter of background, we also remind the reader that this is the fifth article of a series. It follows the first (in which we described how the graduate course on 'Survival Skills for Scientists' was created at Institut National de la Recherche Scientifique (INRS) in Varennes (QC))[10], the second (in which we offered basic advice on how to apply the skills and knowledge acquired in graduate school to finding a job and developing a career in the 'real world' of science after graduating), the third (in which we described the Peer Review System and how it is used as a form of quality control in modern science)[7] and the fourth article (in which we gave tips on how to write compelling papers)] [1].

Keywords: communication skills, oral presentations, soft professional skills, mentoring

INTRODUCTION

Having discussed written forms of communication (mostly articles, letters, reviews and conference proceedings) in the previous article of this series[1], we now discuss communications that are delivered orally, either in the form of oral talks or poster presentations. The venues for such communications are conferences, symposia, workshops as well as colloquia and seminars in University departments, Government Laboratories and Industrial Laboratories.

While your publication list will carry more weight in advancing your career than your list of presentations, oral communications will also play a very important role in your professional development. The discussion is still centered on the concept that, in modern science, anything that matters is peer reviewed. It is essential to keep this in mind when preparing your presentation and subsequently delivering it.

ORAL PRESENTATIONS

Much has been written on giving effective presentations in front of an audience using images on a screen with the presenter controlling the timing and the sequence of the images[2,3]. Nonetheless there are a number of points which are not sufficiently emphasized when discussing scientific presentations before audiences of significant size. These points are what we discuss next.

Generally speaking, most of the advice on giving talks focuses on what you should NOT do in a presentation. You should be clearly aware of what the most common pitfalls are. There is some interesting, even funny literature on this subject, as, for example, *"Fifteen ways to get your audience to leave you"* [4]. Notable examples of things to be avoided at all costs are:

- to go over the time slot you have been allotted,
- to fail to tell the audience the objectives of your research, i.e. the overarching "why"
- to use graphics without explaining them, and
- to present slides or transparencies that are unreadable.

Writing an abstract for a conference presentation

If you want to participate in a conference and present your work, there is usually a requirement of submitting an abstract to the conference organizers so that they can determine if your research fits into the conference program and whether to assign you an oral or a poster presentation. The abstract submission deadline typically falls several months prior to the conference dates. While some abstract deadlines are fairly flexible, others are rigid; in general it is best to take such deadlines seriously and make sure you submit in time.

Writing your abstract is an important and useful exercise. Assuming you have interesting results to present, the way you write your abstract is likely to determine whether it is accepted or not; and the more exciting it sounds, the more likely it is that it will be allotted an oral presentation[5]. This means that you should invest a certain amount of effort in writing your abstract rather than throwing together some text and then see how it goes. Your reputation as a scientist is only as good as what you write and what you say, so each one of these contributions should be dealt with professionally. This also means working on the abstract well ahead of the deadline so that you don't end up doing a sloppy last-minute job. Writing the abstract will also help you collect your thoughts about the work you have done so far and what you plan to do next, also in terms of drafting upcoming "*publons*" [6].

Besides determining whether you get to present or not, a good abstract may also make a big difference in terms of the type of audience who will show up at your talk, or poster (Sessions which are in parallel mean that your target audience may well have other presentations to cover at the same time). A sloppy abstract is likely to turn off potential viewers, whereas a well-written, exciting abstract will have the opposite effect. What we argued in the article on the Peer Review System[7] applies here as well: if you are unable to convince and excite those who will evaluate your abstract and listen to your talk, you will diminish your chances of being given the opportunity of presenting at the conference and of giving a successful presentation, respectively. As we have said before about papers, the implicit question your abstract should answer is, "Why should I go to your talk/poster?"

Timing is crucial

The first important issue in an oral presentation is to double-check the allotted time and to make sure never to exceed it. (It is in fact most discourteous to the other speakers (since it implies that your work is more valuable than theirs), to the organizers and to the audience to go over time). You will almost always have to respect severe time constraints when you *perform* at the real conference (small-scale working groups and workshops are often much more relaxed with respect to time, as compared to large conferences that hold multiple parallel sessions, for example). In most meetings nowadays oral presentations are allotted between 10 and 15 minutes, including questions and discussion (with the exception of Invited Talks, which are usually slotted between 20 and 45 minutes, depending on various factors; see discussion below). We have all seen talks interrupted well before their intended end by zealous chairmen who were trying to respect the schedule. Some chairmen do it regretfully, others are most unceremonious[8]. You certainly do not want that to happen to you, both because it is embarrassing and because you would not be able to tell your whole story, which is after all the objective of your talk.

To be able to deliver your talk in the allotted time, it is essential to practice your talk — or your poster presentation — at least once, possibly several times, with a local audience which is *friendly*, yet charged with the task of looking for problems in the presentation (including time). If they are nice to you and grill you hard enough, there is a good chance that you will feel comfortable giving your talk in front of a real audience. This confidence will greatly increase the likelihood of a good performance. Also, this initial trial may even expose the weaknesses and occasionally the pitfalls in your work and how you present it (confusing images, logical gaps etc.), so it likely to help you to make significant improvements in the whole presentation. You do not want to wear out friendships, however, so you should try to get the job done with at most two rehearsal sessions.

Gauge your audience

You should never overestimate your audience. By this is meant do not think that your audience is a made up of enthusiasts like yourself well up on the latest developments in the field and passionate to know more. In a sense you want to take the audience from a place in which they are comfortable at supersonic velocity to your space without actually realizing that they've been through the sound barrier. Like most people, although scientists like to learn new things, they do not like feeling ignorant or stupid (after all, who does?). Therefore it is wise to give a broad but compact introduction (especially when giving a full seminar or comprehensive invited talk), describing in appropriate detail the state of the art in the field, and where your work comes in. You should explain clearly why this field is promising, perhaps what prompted you to pursue this topic, and what type of contribution you are giving. To clarify what is novel and original in your work, you have to begin by placing it in the proper context and describe the state of the art and where you come in. A disproportionate percentage of scientists (including quite a few seasoned ones) makes the *rookie* mistake of describing in detail what they have done, saying very little of *why* it has been done or why anyone (besides them) should be interested.

Tell a story, and keep it simple

In giving your presentation, you should be telling (in some sense, *selling*) a story. This means that your talk should have a clear beginning (in the form of an introduction, which explains why you are doing this work and why it's important), a middle section (the hard or tricky stuff), and an end (in the form of conclusions and, hopefully, perspectives for future work). The concept of telling a story, incidentally, also applies to writing papers and grant proposals, as we have argued elsewhere[6,9,10].

It is often hard to fit all your material, and to tell a good story, in the short time allotted. (A typical time slot is 10 to 15 minutes or so for an

oral presentation, especially at big conferences like the APS, MRS, AVS, ACS, EPS, ECOSS etc.) Nevertheless, the rules are the same for everyone, so you should adhere to them and if possible, take advantage of them. In this sense, particularly because of this very stringent time constraint, our best advice is to try to present just *one* new idea or result[9]. If your audience goes home with a decent understanding of this one concept, you can consider it a very good accomplishment and your participation in the conference will have been worthwhile, both for your audience and for you.

Since time is short, you should make sure you are conveying only the really important concepts, and that you are not providing too many irrelevant details that would clutter your presentation. Do not be afraid to use phrases such as "solving this problem involved some neat aspects which I don't have time to pursue in depth here"; this may give you a nice question to answer. In any case, if your talk is appreciated, someone from the audience may come up to you *later* to ask for more details. (An easy solution is to provide a reference to a source for details, such as your e-mail address, the link to your Web page as well as the usual references to your recent publications on the topic). After all, when you are finished, you definitely want the audience to remember the key points of your work, and not the petty details. If, on the other hand, you submerge your audience with an ocean of technicalities, it is unlikely that anyone will look you up later to find out more about your work.

The elements of your story

In the course of your research you will generate images, graphs and tables (in order of visual appeal) that represent the new science you are discovering. *These are the elements of your story*, similarly to the building blocks of a written paper[1]. You should use simply presented graphs or images as much as possible. Perhaps the worst offenders are theoreticians who often tend to present too many equations. These quickly become a distraction for the audience and tend to attract time-wasting remarks on their nature. The best theoretical talks we have ever heard showed little or no equations at all, and focused almost exclusively on *concepts*. This is something difficult to do when you are young and inexperienced, however this focus on the key points should be your main objective. (Also you will implicitly display your mastery of the field by showing that you don't feel the need to have the equations in front of you in case you forget them.) Of course, if the basis of your talk is a well-known equation with a modification, you are allowed an equation or two to make this clear, but control the urge to go further, except when your audience is in your sub-specialty).

Experimentalists sometimes sin in a similar manner by showing far too much detail in the sections on experimental procedures and methodology. A neat trick in computer presentations that can be used to control the complications is to use the Power Point facility that allows you to bring objects to the screen to show the block diagram, or to zoom in on particular blocks for some necessary detail. (You want to use the selective zoom feature to minimize the temptation that may arise when the whole detailed diagram is up, and so that too many in the audience will be distracted by something that is not what you are talking about.) Of course this strategy can also be used for equations by a theorist.

Graphics and use of color

We advise to be very careful in your use of color[11] as the identifier to distinguish features. Many men are color blind and may well confuse colors which you think are quite distinct. Often the lazy option of colored graphs will provide some colors (such as yellow) which are hard to see particularly if the lines are thin. Also, complicated background color schemes can confuse the perception of foreground objects. The cure for color ambiguity is redundancy. Use colors for eye appeal but also use monochrome codes, e.g., code lines with line styles (dashes, dots dash-dots etc.) areas with textures. This has the advantage that monochrome photocopies will

be unambiguous. These aspects should all be checked carefully in your rehearsal presentation(s). An easy way to check is to make black and white copies and check them for ambiguities.

Ideally, slides should prioritize content by placing the most important concepts in the top third of the picture, with supporting details reported in the lower portions of the slide. This graphical architecture helps to account for variable sight lines in the audience.

Terminology, abbreviations and acronyms, symbols in text or equations and graphics should be defined or explained at the outset.

Finally, last but not least, you should not read extensively from your slides. To avoid this temptation, your slides should contain as little text as possible, ideally just pointers for the discourse you want to expand upon.

Presenting vs. reading

It is extremely important not to read word for word from your images during your presentation, except perhaps for a short section where you are trying to emphasize something particularly important (Remember how irritating it can be as a spectator when the presenter reads from something which you have already read). Most of the time, simply commenting on certain aspects of your image is enough to give an idea of what you mean, since your audience is presumably able to read even while listening to you speak. While it is a very good idea to prepare a guided discourse, you should also not read from your notes! (A classic gaffe in a note is the lawyer who put into his brief document, "Argument weak here. Pound on the table!") You are not in high school any more. You must look and sound professional.

If you do not feel comfortable with giving a talk in English, especially if it is not your mother tongue, you should take care to rehearse enough times so that you build up the necessary confidence. We say this in the hope of not having to sit through more talks during which the speaker is actually *reading* from a script…! (but then again, people who "read" from memory also tend to be quite boring, even if their English is good).

Use of modern technology

If it is possible, and if it makes sense, you should use any help you can from modern technology. Power Point has been pervasive for several years now, although other options (e.g. Adobe Acrobat are also used). Power Point enables you to couple some special effects to the actual contents of your talk. Of course you should not exaggerate – your objective is to sell your science, not to distract from it. By and large, talks that make excessive use of "objects" that fly in and out of the screen are overrated.

If using actual physical transparencies (rather than computer projection), it is often convenient to separate the transparencies by black and white paper copies, to remind you of the contents of the next transparency. These paper interleaves are also ideal for reminding you in writing about something that you want to mention, but which is not on the slides (transparencies are of course extremely rare these days).

On the other hand, if using software like Microsoft Power Point, the 6-frame paper handout summaries of your talk remind you of the conceptual framework of the presentation and allow for the odd note to yourself. These handouts can also be cut into the individual slides which are a very convenient size for hand-sorting into a different order as you are organizing your talk.

It is always wise to bring with you conventional transparencies as a form of backup in case Power Point or the projector system fails, or if they are incompatible (e.g. Mac vs PC) – we have witnessed all such occurrences at several conferences. (Of course that version of the talk would then probably not be able to display the clever dynamic effects available in Power Point, so it is important to keep that in mind when making your emergency conventional

transparencies.) It happens rarely, but if it were to happen to you…. . .

Invited talks

At national and international conferences, invited talks can come in various forms. Usually the list of invited speakers is determined well ahead of the conference by the general chair upon recommendation of a scientific committee although in larger conferences exhibiting multiple parallel sessions the session organizers determine the list of speakers to be invited for their "topical symposium". Invited speakers are usually well established, high profile scientists in the field, although exceptions are made and not infrequently younger scientists are given an opportunity to showcase their work by being "invited". Note that the status of "invited speaker" does not automatically entitle one to receive financial support from the conference organizers. Depending on the conference and its perceived prestige, support ranges from *nothing at all*, to having your registration fee waived, to some reimbursement of accommodation and/or travel expenses, even to receiving complete support. (Maybe you need a Nobel Prize for that!)

The typical duration of an invited talk is about 30 minutes, although it can actually range between 15 minutes all the way to 45 minutes; this is at the complete discretion of the organizers. A small number of invited talks are sometimes renamed as "Keynote", as an indication of higher prestige. These are sometimes allotted a longer time slot in the program. The most prestigious types of invited talks are usually termed "Plenary" (which means that no competing talks are being presented at that time). In larger conferences featuring many parallel symposia there is normally only a handful of plenary talks, assigned to some of the leaders in the field.

As an invited speaker, you are expected to give a comprehensive and "statesmanlike" overview of the field, not just to discuss your own work (although this does not really apply if the scheduled duration is only 15-20 minutes). If context is to be considered important for a generic oral presentation, it is even more important, in fact vital, for an invited talk. Invited talks should also be more "general" than oral presentations. Since they are usually given by more experienced and established scientists, there is an expectation of a broader overview and perspectives, for example. This is even more true with respect to Plenary talks, which should normally be very broad (to capture and hold the attention of an audience with disparate interests) rather than very deep and dense with details. Getting the right balance between breadth and depth is perhaps the greatest challenge that you will face if you are invited to give a talk.

Seminars and Colloquia in University Departments, National Laboratories and Industrial Laboratories.

Most research institutions, whether they are academic, government institutes or industrial laboratories, hold some kind of seminar program in which speakers are asked to give lectures (most speakers are hopefully external, although some internal speakers are also considered). Such lectures usually last 45 minutes, becoming one hour when one includes questions and answers and general discussion. The speaker's visit usually lasts the whole day, with scheduled individual meetings with selected faculty members followed by the lecture. The structure of the visit is similar to that of an interview trip, although there is much less pressure since you are "just" an invited guest, not someone who is looking for employment. The main difference between a seminar and a colloquium is, once again, the perceived general interest; seminars usually cater to a specific interest group (e.g. organic chemistry seminar, condensed matter physics seminar, etc.) as opposed to colloquia which are supposedly of a more wide-ranging nature and therefore intended for a broader audience.

The primary objectives of a seminar or colloquium visit are to advertise your work and make new connections. Sometimes these visits can also lead to new employment opportunities.

POSTER ORGANIZATION AND PRESENTATION

While much has been said and written about oral presentations, not a lot is available in print in terms of advice on presenting *posters*. However, browsing on the Web one finds a fair amount.

An appealing source is one *Advice on designing scientific posters* by Colin Purrington, (Department of Biology, Swarthmore College, Pennsylvania) evidently designed to help poster presentations for scientists (biologists) from Swarthmore: *http://www.swarthmore.edu/ NatSci/cpurrin1/posteradvice.htm*

Among other excellent features there one can find references Refs. 11 and 12) to some two books (only one explicitly on posters) and five papers (Refs. 13 - 17) dealing with posters .

The particular strategies we recommend for the presentation and use of posters will now be discussed in greater detail.

A poster should ***not*** be constructed by going through a talk with something like thirty images and then laying these out (one hopes in numerical order) on a poster surface in a left-to right rows, piled top-to-bottom like a television raster. Unfortunately, this is how most posters are structured in our experience.

This type of presentation in fact ignores the fact that a poster session is really more like a bazaar with many vendors competing simultaneously. Unlike a bazaar, however, (but in the same vein as the two-public model for your targets for texts) there are two different classes of poster (bazaar) customers. They are, roughly, the professionals (those who know quite a lot already about the topic and want to know about the deep or technical stuff) and the amateurs (who know next to nothing). Also poster sessions can be crowded (at least locally), and this means that the lower part of a poster exhibition space may well be blocked by people and can only be seen by those in the front row, right next to the poster (and presumably the most interested). This suggests the following strategy, here dubbed the *Stalactite Strategy*. (The implementation below is based on the use of basic building blocks in the form of the usual 8½ by 11 inch (or the European A4 format) paper images in landscape orientation (better for large print) as building blocks, easily obtained in the form, say, of Power Point slides.)

The basic strategy is similar in concept to that of a shop in a street. One puts the summary and spectacular images in the front of the shop window where they can be easily seen by passers-by. For a poster on the other hand, this means to put this key “front window” stuff just above head height, so passers-by can see it easily (the front of the “shop window”). The top-line story runs from left to right and summarizes what you want to say in something like six simple landscape images. The sign-up sheet for requests and envelope for business cards should be in the farthest right column, say about three down from the top. Each column (four or (perhaps) five images deep) goes into more intricate detail as you go down to the bottom. The left hand stalactite is the technical background, recent references etc., the right hand stalactite is the fallout from the conclusions. Altogether this is the *stalactite* mode of presentation (remembering that stalactites are the ones that hang *down* from the cave ceiling). With a few arrows and a bit of extra text one has a poster which works in a crowd and can be understood even in the absence of the presenter. (When filling requests however, where the bazaar constraints no longer apply, the same images are rearranged for a serial presentation (as given by the image numbers which Power Point readily provides and which you should always use as tags).

Of course, when you prepare your poster, more or less in the same way as you do when you prepare a talk or write a paper, you should make sure that you organize it in such a way that you can tell a simple, effective story when somebody shows up to hear about it. This essentially means running across the tops of the stalactites from left to right. (Surprisingly, some

poster presenters do not have anything prepared beforehand about their poster. This is almost insulting to the clients, somewhat like having ignorant sales clerks in your shop. Not good for sales).

A lot of people will, of course, just glance at your work and then pass on to the next poster. However some, hooked, as it were, by the top line of images, may stop and ask questions, and they are certainly entitled to hear a coherent story. In this sense, presenting a poster (well) is very similar to presenting orally. One difference is that again you should have prepared two levels of talks, one for the experts who want the newest details, methodology and the like, and the other for the tourists who are prepared to be entertained, but not too profoundly.

To make sure that the people who show up at your poster do not forget about you and your work, in addition to the sign-up sheet for requests, you should have with you some reprints (mostly for the experts) of the work you are describing in the poster, together with a considerable number of business cards with your e-mail address on them (among other things). (Business cards are a "must" at any conference and even more important for a job interview these days). If your visitors like your work they may actually end up reading your papers on the subject and either offering to collaborate or at least citing your results in their own work.

CONCLUSIONS

If you become a good speaker, and do good science, you will be invited to talk many times. Besides the positive effect this will have on your ego, it will also help you further your career.

We hope that the foregoing will be a useful addition to your stock of knowledge on presentations. Another point of view is expressed by David Mermin's *alter ego* Bill Mozart in a Reference Frame piece by Mermin in the *Physics Today* issue of November (1992) on pp. 9, 11, commenting to some extent on Garland's remarks[3] on talks. Among other thought-provoking remarks there was one which was particularly striking. "Give yourself a week. If you still can find no reason why anyone not directly involved in the work should find it anything but tediously obscure, then you should find something else to talk about. Indeed you might seriously consider finding another area of research." (Although this little fragment had been planned as a *diversion* here, it seemed that it might be too sensible to characterize it as such).

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impression that even you are bored with your work. How do you expect your audience to be excited if even you sound bored about your work!?".

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