Technical Presentations

By Richard Gaughan

Basic rules for success

You’ve aligned and re-aligned your optics so many times you can’t remember. You’ve nurtured your data acquisition software through many a long night. You’ve analyzed gigabytes of data until, Yes! You’ve got something. A real breakthrough. The reward for all your effort? You get thrown to the wolves; that’s right, it’s time to present your work.

At some point in our careers we’re all required to give presentations. If you’re like most people, this prospect bothers, irritates, even frightens you more than nearly anything else. Surveys consistently show we are more frightened of public speaking than we are of dying. Well, why not be frightened? After all, your reputation, your self-image, even your career may be on the line every time you get up to speak. But if you face this challenge like you face every other challenge in your career, you’ll see it for the opportunity it is.

How do you face technical challenges? If you’re trying to measure two-photon transitions you wouldn’t go in the lab, grab a laser off the shelf, throw an optical system in front, and start counting photons by eye. You’d understand the physics, you’d plan the experiments, and you’d prepare to make your measurements. For your technical presentations you need to follow those same steps: understand, plan, prepare. This and the following articles in this series are intended to help you face the challenge of preparing and delivering effective presentations.

Rule One: the audience wants you to succeed

If “stage fright” is a problem for you, it’s probably because you view the audience as a pack of wolves, circling, ready to leap at the first sign of weakness. But out there in the audience are people just like you! When’s the last time you sat through a presentation thinking, “I hope he mumbles and stands in front of the viewfoil machine,” or “I want her to be stuck staring at the ground trying to remember what she has to say.”? Never. Even if your business competitors are speaking you don’t want them to screw up, because you want to know what they’re up to, and you won’t learn if they can’t tell you. When you’re sitting in an audience, unable to hear the speaker, incapable of reading the crowded viewfoils, you aren’t happy. You want the speaker to communicate well.

To speak well you must accept this statement unquestioningly: the audience wants me to succeed.

Rule Two: know what your message is

Your audience is only going to remember about 10 percent of your speech. That may be sad (especially when your work is so important), but it’s true. It’s up to you to ensure they remember the right ten percent.

If you’re reporting on the high electro-optic coefficient of your new spray-on optical film, and you spend the first ninety percent of your talk describing the laser sources you used in your laboratory you now only have a few minutes left to describe your new material and its fascinating properties. The audience has now filled their minds with details of your lab setup and your important information is just crammed in with the trivial details (trivial relative to the overwhelming importance of your discovery).

You have something to say? Say it. Right up front. Don’t worry about stealing your own thunder. If they’re interested in your breakthrough they’ll sit up and pay real attention. If they’re not, better they learn at the beginning than waste through the detailed description of your experimental effort and find the payoff at the far shore was not worth the effort.

Professional speakers all follow some form of this rule:

- Tell them what you’re going to tell them
- Tell them
- Then tell them what you told them.

Remember the 10 percent retention rule: you, as a speaker, must give the audience enough clues to help them realize what’s important about your presentation. This does not mean you save the best for your very last sentence. It means you let them know up front what you’ve got.

Message and purpose

Your message is the information you are directly presenting; your purpose is to elicit some sort of action on the part of your listeners. Sometimes your message and purpose are the same, but not always.

Say you are requesting additional funding for your high-laser-damage-threshold coating research. Your purpose is to get money. You might think your message is “look how well this material can withstand high energy densities.” It is not. Your message is “give us $3 million in additional funding and we’ll give you an optical coating that will withstand anything you can throw at it.” You then support that message with a report of what you’ve done already.

Now, if you are at a technical conference describing the extremely low aberration zoom lens you produced with only three elements, your purpose may be to get word out to the optics community that you are one heck of a hot-shot designer and production house and everyone should buy your optical systems from you. But in that forum, that direct a sales pitch may not go over well. In that case, stick to your message (you’ve got a great zoom lens), but evaluate your presentation in terms of your purpose. Will what you say leave that hot-shot impression on your listeners?

A start

Your tunable diode laser now covers down to 510 nanometers. If the company can only be convinced to fund you for another year you’re sure you can push that another 50 nm. You walk down the hall to the conference room. Before you open the door you already know these folks want to know what you’ve done, what your plan is, how it will help the company; you know they want you to succeed. You grab the brass handle and swing the heavy door on its smooth hinges. You know your purpose and you know the message that will achieve that purpose.

You’re ready to begin. Once you would have viewed your audience as a pack of snarling wolves; today, they’re just puppy dogs.
Entertain and impress

Given your career choice as an electro-optical professional, it is unlikely that you would like to be known as a great entertainer or a person who's always out to impress. But if you are to effectively present your work, you must both entertain and impress. Wait! Before you polish your comedy routine or buy those impressive $300 Italian leather shoes, let’s examine what those words really mean. As a technical presenter, you must focus on the more appropriate meanings of these words.

Webster’s Unabridged defines “entertain” as “to cause the time to pass pleasantly for someone.” The same source defines “impress” as to “arouse the strong interest or admiration of another.” So a presenter who entertains and impresses stimulates curiosity in such a way that members of the audience enjoy themselves. Conversely, the presenter who ignores those two key verbs bores the audience and ensures a forgettably unpleasant experience.

You say you just want to inform? You can’t inform if your audience isn’t attentive. The key: engage the attention of your audience.

Starting early

If a colleague walks into your office with his head down, hands in his pockets, mumbling under his breath, you may think the coffee machine is broken, but it’s unlikely you’d guess he’s discovered a 72 percent efficient amorphous silicon solar cell. In fact, if you were on the phone when he came into your office, you’d probably mentally assess his body language and make certain assumptions about why he came to see you—before he had said even a word. This kind of assessment goes on every time you get in front of an audience.

The members of the audience are about to give you one of their most valuable possessions: their time. Even before you speak they’re wondering if it’s worth it. If you stroll up there looking as if you’re going to read last month’s newspaper, and you’d rather be doing it alone, why should they listen? If you aren’t interested in your material, why should they be?

You have to begin to show enthusiasm and interest the moment you’re introduced, because—gosh darn it—you’re excited about what you’ve got to say! This doesn’t mean you’ve got to froth and bubble like a bottle of champagne. Just let your interest in your subject show through.

If the members of your audience were on the phone when you walked to the front of the room, would they hang up to hear what you’ve got to say? Did you engage the attention of your audience?

...a presenter who entertains and impresses stimulates curiosity in such a way that members of the audience enjoy themselves.

Ensuring memorability

Enough already, you say. I don’t need to “engage the attention” of my audience, they’ll be listening raptly to my every word. After all, I’ve got a wavefront analysis technique good to 1/50 using off-the-shelf beamsplitters as reference flats. The world is just waiting for this!

The world may indeed be amazed by your new technique, but if you don’t communicate effectively they’ll never realize what you have. You need to be sure they’re giving you their full attention. That’s why you need to focus on entertaining and impressing. The attention of your audience is divided: they’re wondering what session to attend next, where to attend lunch and with whom, and who’s going to win the basketball game. Your ideas have to fight for a place among all these other concerns. The more of their attention you engage, the more their minds are working with you, and the easier it is for them to hear and remember your presentation.

Tools of entertainment

OK, so I admit I want my audience to enjoy my presentation and be interested in my ideas, but I don’t know about this entertainment stuff. What am I supposed to do, grab some tap shoes and sing about my unstable confocal resonator?

Of course not. But you can use some specific presentation techniques to make your material come alive. For example, tie your ideas into concrete images.

Take the wavefront analysis example above. If you say, “We can use cheap, low-quality windows and still measure 1/50,” you have given your audience the facts. But if you say, “We could use a car windshield as our reference flat and still measure 1/50,” now you have given your audience an image—an image that will help them recall your message.

The imagery entertains, and the image impresses itself on their memory. Some other presentation hints that will keep your audience attentive: vary your voice tone, volume, and rate. Use gestures to illustrate your points. Focus your attention on your audience—look at them, not at the viewfoil, the walls, or your feet. A lot to remember? No, because you do all those things already.

Remember when you told your colleague how you had finally managed to co-align your beams to half a microradian? Your face and voice were animated, your hands created pictures of what you had done, your eyes focused on her face as you watched her reaction. Did you practice these techniques? No, you just let your enthusiasm show through.

What excites you about your project? Why? What do you find most interesting, and why? Your audience will probably be excited and interested in the same things you are, but you have to communicate, not just the facts and ideas, but the excitement and interest also.

You may have developed an inexpensive glass that transmits from 355 nm to 12 microns, but if your colleagues (or customers) have been lulled to sleep by your monotonous dull drone you won’t get anywhere near the approbation (or sales) you deserve. Entertain and impress and the entire community will be looking through your new glass.
Making visual aids work

What’s your first thought when asked to give a presentation? Possibly “Not more viewfoil engineering!” But if you were asked, “Why viewfoils?” you’d say “It’s just the way things are done.” By examining the reasons for using visual aids, we can improve the product itself as well as the entire presentation.

The object of visual aids

Visual aids should enhance your message and support your purpose. For example, if you’ve developed a blue diode laser, your message may be: our new diode puts out 8 mw at 490 nm. Your purpose might be to stimulate interest among potential customers. If your charts show the efficiency curves for six different levels of dopant concentration, they may illustrate your thorough technical approach, but they probably don’t enhance your message.

The fact that you choose to highlight some elements of your presentation with supporting visual material alerts the audience that you consider that information to be important. In the previous example, wouldn’t it be just as effective to say, “We investigated several different dopant levels and selected this 3% Cr as the optimum.” Then present your single efficiency curve, showing the astounding performance of your diode.

What visual aids should do

Visual aids provide a framework for your ideas, making it easier for your audience to follow and remember your presentation. Say you’ve spent the last three months refining a complex image processing algorithm that significantly enhances pattern recognition. To prove this, you would have to fill several viewfoils with equations. To illustrate what you have done, you could simply list your algorithm’s major steps on a viewfoil, then describe each step in enough detail to show you know what you’re doing.

“But why should they believe me,” you say, “when I haven’t proven anything?” Perhaps you haven’t, but most people would have to take pencil to paper and convince themselves you’re right anyway. Your presentation should demonstrate the soundness of your ideas so effectively that your audience wants to work it out for themselves.

Dealing with human limitations

In some perfect future world you may be able to formulate your thoughts, and instantly transfer them into the minds of your audience. But for now we must transfer information through the senses. And, of course, our visual aids go through the eyes. So let’s make it easy on our eyes.

One simple step you can take to improve your visual aids is to look at them from the audience’s viewpoint. As electro-optical professionals, we are in a unique position: we can use our specialized knowledge to analyze the tools we use to present our knowledge. For example, we can select character size based on the eye’s sensitivity. In his excellent SPIE course on imaging systems, Gerald Holst cites several different Modulation Transfer Function (MTF) models that show the eye’s peak sensitivity is between three and eight cycles per degree. Unless the viewer is able to adjust the distance, then the eye MTF is essentially one. Our viewfoils should be near that three- to eight-cycle range, unless we want our audience getting up to adjust their eyeto-screen distance during our presentation.

What does that translate to? For audience members seated about 20 feet from the screen, one degree is about 4 inches. Assuming a text character is on the order of a cycle and a half, the character width on the screen should range from around 2 inches to about eight-tenths of an inch. If a viewfoil projector is located 10 feet from the screen, 24-point characters will be about 2 inches square (see Figure 1). As you can see, 24-point characters are appropriate for an audience range from 20 to 50 feet. You probably want to vary character size to show the precedence of concepts, but the further you stray from the peak sensitivity range, the harder you make your audience work.

We’ve dealt with some of the eye’s limitations, but there is one other human system whose limitations we must understand: the brain.

Getting in their heads

Where psychologists used to discuss the “short-term store” to describe the first stage of our memory, they now use the term “working memory,” because it reflects the fact that the brain is actively considering only about seven items at any one time.

Implication 1: Don’t push it! Put no more than five or six items on a viewfoil.

Implication 2: Don’t put long, involved descriptions in your visuals. Your audience will occupy themselves trying to figure out what you have written rather than pay attention to you. Don’t waste some of their seven items on distractions.

Implication 3: Make your organization evident so your audience doesn’t have to think about how to organize the information in their own brains. They can use the structure you provide.

The “easy rule”

You must give the audience the benefit of your hard-earned expertise in only a few short moments. Your message may be of great technical complexity, but your visual aids are there to make it easy on your audience: easy on the eyes, easy to understand, and easy to remember. If you follow the easy rule, the audience will have no trouble seeing your point.
Bringing it together

OK, you've resigned yourself to presenting your work. Sure, color viewfoils would be nice, and wearing that freshly pressed suit would be bound to impress somebody in the audience, but you can't take two weeks out of your schedule just to be smooth for fifteen minutes. In this article, we'll talk about the real world, and real presentations.

Your appearance. It's likely that your parents told you that first impressions make the difference. When you stand up to speak, you make that first impression before you open your mouth. However, when we're giving technical presentations, more than in any other type of speaking, the content can carry the presentation. Professional speakers say they present themselves first, then their material. Luckily, our audiences will try to objectively evaluate our material, regardless of the appropriateness of our dress.

But consider the case of an engineer pitching her idea for a noninvasive optical blood glucose monitor. She may have a beautiful product, but if she doesn't convince her audience of venture capitalists that she is competent, reliable, and professional she won't get funding for any idea. If your audience is technical they are more likely to evaluate your presentation based on content. The real-world key? Dress so you'll feel comfortable in front of the audience—just realize that they will evaluate you in terms of your appearance.

Your nerves. The first article in this series attempted to convince you that the audience always wants you to succeed. In case that hasn't quite become ingrained yet, you may feel a bit nervous when you get up to speak. Don't despair, there are still a couple techniques you can use in the real world to calm your nerves.

First, identify what you do when you're nervous, and do the opposite. If you pace and wring your hands, force yourself to stand still and relax your hands. You won't be acting like you're nervous; so you can fool yourself into thinking you aren't nervous. It may sound silly, but it works.

Second, and more powerful, concentrate on the benefit to your audience. You are speaking to do something for your audience. For example, it will really help them to know about your single mode laser stabilization scheme. If you focus on how to help your audience learn about your technique, you won't concentrate on you—your tie, your heart rate, your sweaty palms. Then your ideas will dominate your presentation, instead of your presentation skills (or lack thereof) dominating your ideas.

Your time. Everybody in the audience knows you're not a full-time presenter. They know the time you spend preparing your presentation is time taken from technical investigations that may eventually make the world a better place. But they are taking their time to listen to you! If you make it worth their while, they will be very appreciative. What does that mean?

Give the audience the benefit of your experience, not just the facts.

- Don't just present lists of data! Organize and prioritize your material. Limit your material based on that priority. Develop an opening and closing that establish and reiterate the importance of your work. Give the audience the benefit of your experience, not just the facts.
- Prepare clear visual aids. Visual aids are nearly a necessity for technical presentations. Complex concepts, descriptions, and conclusions are difficult to convey without the benefit of visuals. They don't have to be "Monets," but they must be clear!
- Convey your emotions. Don't assume that because it's a technical talk you can't show you're excited about your material. Show and explain your interest and enthusiasm, and the audience can feel it, too.
- Practice. The most difficult item to fit in our busy schedules. Sure, you're intimately familiar with your presentation—you wrote it! That doesn't mean you know where it's smooth, where the leaps of logic are, or where it may drag. Practice until you're very comfortable with the way you present the material, and include at least one "dress rehearsal," duplicating as many of the real conditions as you can. Your presentation will be smooth, and you'll...
- Keep to your allotted time! Yes, yes, your material is important, but so is the rest of the world. Your audience has given you the privilege of addressing them—don't abuse it.

More help. Obviously four short articles haven't described everything there is to know about enlightening your presentations. Here are a few sources for more help.

You can read:
- Secrets of Successful Speakers by Lilly Walters, is targeted toward those who present for a living, but it holds valuable information about how to deal with any situation that may arise while you're speaking.
- Technically Speaking: Proven Ways to Make Your Next Technical Presentation a Success by Jan d'Arcy and Preparing and Delivering Effective Technical Presentations by David Adamy are both specifically targeted to the technical audience.

You can practice:
- Toastmasters International has clubs that meet around the world, all dedicated to improving the speaking abilities of their members. If you're serious about improving, there's no substitute for the practice you'll get here.

In conclusion. Remember, the audience wants to learn what you have to offer, but they want to learn it from you, a human being. If they didn't think they could learn better directly from you, they would just read your papers. Show you're human, and you'll become a part of their real world.

These articles originally appeared in the July, August, and November 1995 OE Reports and the January 1996 OE Reports.

Richard Gaughan has delivered numerous successful (and some not so successful) technical presentations; he has won several speaking contests. You can reach him at P. O. Box 1589, Boulder Creek, CA 95006.

OE Reports
SPIE—The International Society for Optical Engineering,
P.O. Box 10, Bellingham, WA 98227-0010.
Phone: 360/676-3290. Fax: 360/647-1445. E-mail: oer@spie.org