

COMMUNICATING SCIENCE:  
GIVING TALKS



**THE BURROUGHS WELLCOME FUND** is an independent private foundation dedicated to advancing the biomedical sciences by supporting research and other scientific and educational activities. Within this broad mission, BWF seeks to accomplish two primary goals-to help scientists early in their careers develop as independent investigators, and to advance fields in the basic biomedical sciences that are undervalued or in need of particular encouragement.

With its endowment of more than \$750 million, BWF makes approximately \$30 million in grants annually in the United States and Canada. BWF's financial support is channeled primarily through competitive peer-reviewed award programs, which encompass five major categories: biomedical sciences, infectious diseases, interfaces in science, translational research, and science education. BWF makes grants primarily to degree-granting institutions on behalf of individual researchers, who must be nominated by their institutions. To complement these competitive award programs, BWF also makes grants to nonprofit organizations conducting activities intended to improve the general environment for science.

Governed by a Board of Directors composed of distinguished scientists and business leaders, BWF was founded in 1955 as the corporate foundation of the pharmaceutical firm Burroughs Wellcome Co. In 1993, a generous gift from BWF's sister philanthropy in the United Kingdom, the Wellcome Trust, enabled BWF to become fully independent from the company, which was acquired by Glaxo in 1995. BWF has no affiliation with any corporation.

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## INTRODUCTION: STAND AND DELIVER

Talking science with a colleague or two isn't usually frightening. But for many people, talking with a hundred colleagues is an entirely different proposition—one that can lead to awkwardness, sweaty palms, or procrastination. It's not surprising that some researchers would rather do another experiment altogether than to stand up and present.



**Still, science moves forward** on a series of conversations, from informal ones between colleagues in hallways to very formal ones... at dissertation defenses, job talks, and sometimes festschrifts where there is often very much at stake. The importance of being comfortable at standing up and speaking, and thinking on one's feet, cannot be overemphasized.

When you look closely at excellent speakers, you'll find they rarely speak "off the cuff." They may seem casual and at ease, but most of all, they're prepared.

The Burroughs Wellcome Fund has put together this Career Development Guide to provide advice from great scientific speakers, tips on putting together your own talks, insights into how to use technology to your benefit (and avoid shooting yourself in the foot), horror stories about speeches gone wrong (and how to avoid generating new horror stories), and pointers to inexpensive, approachable resources available in most communities to polish up your speaking skills and gain confidence. We hope they'll help you whether you're just starting out in the lab, interviewing for a BWF competitive award, or trying to wrap your mind around the job search process.

Enriqueta Bond, Ph.D.  
*President*

Victoria McGovern, Ph.D.  
*Senior Program Officer*

# PRESENTATION MATTERS

It's after lunch, you and 50 others shuffle into the dim seminar room. You have your mental list of afternoon chores ready to prioritize as soon as the speaker loses you—typically about five to 10 minutes into a talk. After all, you're really just here for the coffee.


**Then something magical happens.**

**The speaker's voice** exudes confidence and enthusiasm as she starts off with a slide of a young girl grinning wildly at a tower of cookies she has stacked. People are sitting up in their seats, wondering what could be the science behind this goofy slide.

“I’m going to share with you today some of our work that shows that you can predict the impulse control of teenagers from how well they could delay the gratification of eating cookies when they were four years old.” Aha, delayed gratification! you think, but why do I care about impulse control in teens? “Now why do we care about teenagers’ impulse control?” she continues and you settle in for what you know will be a good story and informative seminar.

Contrary to popular lab culture myth, giving a great scientific talk is not a natural born talent available only to a few, rare scientific story-tellers. In fact, some of the most accomplished weavers of scientific research tales started out as graduate students with shaky voices and nervous tics. They got better with time, but also with considerable and ongoing effort. As they and other up-and-coming scientists share in this article, becoming a better speaker is mostly about practicing giving talks, getting critical feedback from colleagues, and then finding another opportunity to get up and do it all over again.





For many scientists, giving talks is a dreaded duty that goes against their introverted tendencies to run and hide from the spotlight. And talks can be viewed as a nuisance, something that sucks up time that could otherwise be spent at the bench or writing up results or the next grant proposal. But we've coaxed some excellent speakers out into the light to share some thoughts on why giving talks is so important to an academic career and why many scientists should adjust their attitude and also to persuade you that giving a talk is a welcome opportunity to share your excitement about your work and to receive unique outside perspective on your projects.

"Giving a talk forces me to prepare and project outward—come away from what my lab does daily, get to 30,000 feet and look at the main thing my lab is doing," says Dr. Neil Kelleher, a chemical biologist at University of Illinois at Urbana-Champaign. "Incorporating new results into an existing line of investigation through a seminar is really energizing for my research team. What do we really know here, and how do we explain it to other human beings?"

In a research career you will be asked to give everything from a five-minute elevator pitch to a handful of potential funders to a 60-minute keynote address to a ballroom-filling audience and everything in between. There will be the rare, but oh-so-important thesis defenses, job talks, and chalk talks as well as the opportunity to explain science to high school students or the general public. And as uncomfortable as it sounds, the messenger is also always being judged along with the message.

Every talk you give is an opportunity to impress potential employers, grant reviewers, and future collaborators and trainees sitting in the audience. In addition, every time you stand at the podium you have a chance to position your work in the largest research context possible. You



“Goal number one should be to educate the audience—it’s about them. But goal number two is to convince them that you are the best thing since sliced bread.”

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Dr. John Boothroyd  
Stanford University

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don’t just want the audience leaving having understood your research question—you want them sold on your approach and yearning to be associated with such an innovative thinker.

“Goal number one should be to educate the audience—it’s about them. But goal number two is to convince them that you are the best thing since sliced bread,” says Dr. John Boothroyd, microbiologist at Stanford University in California. To learn how to do both of those things well, as well as handle questions and visual aides with grace and style and overcome the anxiety of public speaking, we’ve sought the advice of some of the best and brightest health scientists working today. They share their tips for slide-making, how they survived their own horror stories, and wise advice on how to communicate your science successfully.

# STRUCTURING YOUR TALK

To know your audience is to  
love your audience  
(and have them love you back).



**Before you launch** into making your slides, it helps to give some thought to some of the principles of effective public speaking. Two key rules are to know the expectations of the talk and to know your audience. How much time do you have to speak? How much time do you have for questions from the audience? What aspects of your research will you be expected to convey? Who is your audience and why should they care about your work? What is their level of expertise? Are they mostly cell biologists or mostly infectious disease clinicians who see patients all day?

“Nothing is more insulting to an audience than if they don’t understand what you are talking about. Knowing your audience should be the basis for everything else,” says Dr. Kathleen Caron, a reproductive biologist at University of North Carolina-Chapel Hill. Dr. Caron teaches part of a graduate course on scientific presentations and says the course drills students to always tailor a talk based on who’s listening.

Some points about audiences in general to consider:

- Your audience’s level and background will determine how you frame your talk. Set up your research question so that you leave your audience hungry for the answer.
- One trick for giving a more general talk is to practice giving a job talk to a diverse group of biology department sophomores. They are curious, but not experts in your field.

- Your audience is giving up precious time to listen to you. Respect that and consider speaking to be a privilege. Don't be disorganized or flippant—it makes people wonder what else they could be doing rather than listening to you.
- Everyone appreciates a good story (and our brains will remember it later), so use storylines. Chronological order does not always work best in a presentation. Try flipping it around to give the 'punchline' first and then work through how you arrived there. Or, use a structure that gives the big picture context, then zooms in on the details of your work, then comes back to what you have added to the larger picture. At the end of the day, what do you want them to remember?
- Spend some time coming up with an analogy that fits your particular scientific problem. Is your biosynthesis pathway like an assembly line? Does your protein have a day job and a night job? How many megabases make up the human genome—a small wall of 40 phone directories? A mental picture is worth a 1,000 words. Don't force the analogy when it breaks down. It will not make sense.
- For any audience, do not be afraid to simplify. Your audience will thank you if they do not have to wade through jargon, complicated experimental set-ups, or visually overwhelming slides. "Mortality" becomes "death." "Utilize" is the same as "use." Use a cartoon to explain a complex genetic cross experiment. Remember, most scientists are absorbing information all day long, especially at conferences. Make it easy for their brains to follow and retain your talk.

“If I’m about to write a paper, preparing a talk is one of the best ways to synthesize my ideas. It also gives me a preview of what my reviews will look like. I want to hear all the naysayers, that’s money in the bank for me.”

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Dr. Leslie Kean  
Emory University

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### Successful Slide-Making, Part I

Once you’ve thought of a general structure for your talk, you’ll want to jump into crafting your slides. There are some universal guidelines to follow here as well. As Dr. Nika Danial, cell biologist at the Dana-Farber Cancer Institute in Boston notes, “Talks are not publications—pieces of data should not be overwhelming. You should not see five panels of a figure on one slide.” Also:

- A good rule of thumb is to have one slide per minute of talk. A few less is even better. Typically, a good 40-minute talk will have about 32 slides.
- Every slide and everything on each slide should be meaningful to your story. Clip out anything not relevant. Slide-making has become easy, but don’t use a bad slide just because it’s there.
- Don’t try to show all of your data related to a discovery. Pick the experiment that best highlights your point. Feel free to mention, “We also did experiments X and Y,” without adding more visual information.
- If your talk has discrete sections, consider using really obvious transition slides like “Now to Genetics.”
- Repeat a model cartoon slide or other important visuals throughout the talk frequently. Your audience’s brains will thank you.

### Leave them with a smile

Giving some thought to the structure of the end of a talk can mean the difference between an audience leaving with pleasant thoughts of you or grumbling on their way out. Dr. Aaron Batista, neurobiologist at the University of Pittsburgh, says the best advice he ever got about a talk was

from a friend who had not yet heard it. “He said, ‘You have too much in it.’ And he was right. You do not have permission to go over the time limit.”

A surefire way to make your audience hate you and forget everything brilliant you just said is to go over the time limit. The longer you go over, the angrier people get. To avoid audience meltdown, you must rehearse your talk to make sure it fits the time frame. But anyone can misjudge the actual event—you may speak faster when nervous, you may get questions that slow you down, or a technical glitch delay.

Practice with your slides and practice without them. Practice in the shower. Practice when you drive. Note which moments in your talk that tempt you to digress or overexplain and practice especially diligently at navigating these potential speed bumps.

So the second thing you must do is keep the end of your talk flexible. Have your final take-home message or summaries memorized and plan how best to skip a few slides if necessary. Do not have 20 extra slides that you click through frantically. Keep your eye on the clock or have someone in the audience remind you when you have 10 minutes left. If you have too many slides for the time allowed, take out complicated or tangential ones and place them at the end to use during the question session if appropriate.

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### **Helpful Hints: Nonverbal Communication Cues**

How effectively you deliver your presentation may matter more than what you say. Surprised? While your content is always important, numerous studies provide evidence that between 65 to 90 percent of meaning that a speaker conveys to an audience is nonverbal many experts agree. Therefore, understanding how to manage non-verbal communication cues can help speakers convey more confidence—and credibility—to an audience than they might feel. Here’s a few quick tips on how to present confidently:

“A surefire way to make your audience hate you and forget everything brilliant you just said is to go over the time limit. The longer you go over, the angrier people get.”

- **Eye contact**—If the situation demands that you spend time to the side of a stage in front of a large audience, the audience won't expect considerable eye contact. If you're speaking to a small group, on the other hand, remember that studies show audience members in small groups are more likely to perceive speakers who use sustained eye contact as confident, credible, and personable. Don't scan the room too quickly; focus on individuals' faces to read their facial expressions—and thus their nonverbal response to your message.
- **Gestures**—Use bold, purposeful gestures to visually reinforce specific comments. For example, if you say, “Now for the second stage of our study...,” hold up your hand with two fingers extended to indicate the second stage. To gesture with purpose, do so around chest level—not waist level. If you talk extensively with your hands, minimize unnecessary gestures by dropping your arms relaxed down by your sides at times.
- **Movement**—Unless you're restricted behind a console (i.e. need to use a stationary microphone for a large audience), feel free to use movement to exhibit confidence. Step out from behind a console so that it doesn't appear a barrier between you and the audience. Stand with your weight evenly distributed on both feet and move several steps at a time when you do move. Avoid rocking, swaying, or moving aimlessly.

One final suggestion—be yourself.

For more in-depth information on presentation delivery skills, see *Effective Business Presentations* by Judy Tisdale. (2005, Prentice Hall Publishers).

# WHAT TYPE OF TALK?

There are some special considerations for certain types of talks. Your audience can tell when you've tried to repackage your 45-minute seminar into a 10-minute short meeting talk. Ironically, short talks take more time to put together—**every word must count.** Give each type of talk the preparation it deserves.





### **Five Minute Pitch**

This type of talk may be for the casual grad student round-table or for a high-stakes grant award. You may or may not have visual aids such as a chalkboard or flip-chart, but either way, you won't have time for presenting data. Instead, you want to sell your research question and your system or approach. Memorize your spiel from start to finish, until it's as easy and casual to outline your work as it is to recite your name or telephone number. Practice and trim it. "You should always be working on how to respond to the proverbial elevator conversation of 'What do you do?'" says Dr. Batista.

### **Poster Presentations**

Giving a poster presentation to an interested passer-by is a unique one-on-one type of science communication, but you can still plan ahead. Make your poster eye-catching and easy to read from a distance. Don't cram too much information on the poster and simplify figures. Don't pounce on people as they approach, let them read and then ask a question. Print handout versions of your poster with your email address included for people to take home.

"You must get to the point and excite them in two minutes," says Dr. Maurizio Del Poeta, a biochemist and infectious disease physician at the Medical University of South Carolina in Charleston. "Otherwise, it is absolutely pitiful if you trap the person there for 10 minutes or more."

### **15 to 30-Minute Talks**

These talks might be for a lab meeting presentation, a small conference or a large conference. Whatever the case, stick to the timeframe! You should have 10 to 20 slides total, with a maximum of five to seven data slides. Dr.

Del Poeta has his trainees print out their slides and go over the rationale behind each slide and the transitions from one slide to the next. In these brief talks, you want to try to put a few key data points or one slice of a project into the context of the larger lab project for your audience. Be open to suggestions from the audience of where to go next.

#### **45-Minute Seminar**

This format is the most familiar for the weekly departmental seminar, a thesis defense, job talks, and tenure talks. As such, it is important to convey the progress you have made on a project without it turning into a laundry list of publications and experimental details. Focus on framing your story-line first, then choose the most pertinent experiments, lines of inquiry, and publications to highlight. Usually a seminar audience is fairly diverse, so don't skimp on giving the context of your field or the significance of the research question. The exception would be a small specialized conference in your field where you can maximize data and scale back the context.

#### **60-Minute Invited Talk**

Although this type of talk may not come until later in your career, it is worth noting that it is not just a longer version of your regular seminar. Giving a talk in front of a large conference means an even more diverse audience that expects to hear big ideas.

You want to take a step back from your own group and include some historical perspective from your field on the research question at hand. Include your competitors and collaborators work as well and give them credit in the corner of the slide. Don't be afraid to encapsulate the field—it's not arrogant to capture and share a big picture view, just be sure not to aggrandize your place in it.

“A job talk is what makes or breaks a job offer... For many of the faculty, it will be the only impression they have of you, so you’d better give the best talk of your life.”

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Dr. Kathleen Caron  
University of North Carolina-Chapel Hill

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“The best speakers can hit multiple people at multiple levels in a big talk. In the wind-up, they are vacuuming people up and can capture even the most senior people in that opening,” says Dr. Kelleher. “A good trick is to have discrete sections and then say, ‘If I lost you in that last section, let me reconnect you to this point.’”

The last two categories of talks are extremely rare in a career, but will probably be the most important talks you’ll ever give. Make them count.

### **Job Talks**

More than any other time in your career, the audience will be judging the personality giving the talk as much as the science of a job talk. This audience wants to see how you will fit into their department as a colleague, what your teaching style is like, and what expertise or special skills you will bring to the table. They are just as interested in what you plan to do in the future as they are in hearing what you’ve already accomplished as a postdoc, so be sure to devote at least the last third of this talk to future directions. The most important message to convey is your zeal for doing research and answering scientific questions.

During the question session, don’t be thrown by ‘oddball’ questions from faculty who are outsiders to your field. Instead, use them as a moment to teach the audience about a classic experiment in your field. Also, don’t be afraid to acknowledge an insightful question that you don’t have an answer for—turn it into an opportunity to show that you recognize good science. Use a simple but effective phrase like, “That’s an excellent question and we haven’t looked at that yet. But it would be a great way to test our hypothesis that X does Y.”

## Chalk Talks

The second component of most job interviews is the chalk talk. It can take many forms—whiteboards, flip-pads, transparencies, or literally, chalk and blackboard. The purpose of the chalk talk is to see how well you can explain your research (sometimes for teaching) and how well you think on your feet. The main goal of a chalk talk is to outline your future research program.

The biggest mistake most job interviewees make is not practicing what they are going to draw, says Dr. Caron. You should rehearse at a board, knowing what you are going to draw and how. After all, she notes, you are diagramming your life's work—it shouldn't appear as nondescript squiggles and arrows. Use simple diagrams, cartoons or flow charts. Use your analogies and don't worry about your drawing skills. For example, turn a question mark into a brain and spinal cord.

Expect to be interrupted by questions and to roll with the punches. “I remember thinking it was painful at the time,” says Dr. Erica Ollman Saphire, structural biologist at the Scripps Research Institute in La Jolla, California, of her chalk talk interview for a Burroughs Wellcome Fund career award. “But going through that and preparing for my first NIH grant really complemented each other. The questions you get are very similar to what a study section would ask.”

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### Helpful Hints: Talking to Joe Public

At some point you will be asked to give a science talk to the public. It may be your child's third-grade class or the community business leaders group. When your research group is young, it may seem like a lot of effort for very little payoff. But Dr. Jim Hudspeth, biophysicist and hearing researcher at Rockefeller University, outlines why you should step up to what can be a very rewarding duty.

“People don’t get bored in science talks because the points are too similar—they get bored when they can’t follow a talk that is too fast.”

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Dr. Aaron Batista  
University of Pittsburgh

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“The public misunderstanding of science is a real societal threat. The only way scientific reasoning will win out is if scientists go out and teach the public to think for themselves on issues like energy policy,” says Dr. Hudspeth.

There are three striking reasons for speaking to the public, he says. The first is to attract good young people into science at the critical junior high and early high school years. The second motivation should be explaining to the taxpayers who foot the bill for your research how it benefits them and society.

“The third thing is more ethereal, but I consider it most important of all,” he says. “Real science is a social embellishment, like fine art or music, it first and foremost has aesthetic appeal. There’s a real beauty there and it’s the reason most people are curious about science. It’s a waste not to share that with people.”

Once you’ve taken up the call to give a lay talk, it helps to put it into perspective. Dr. Caron advises to keep in mind that now you are representing the scientific community and not just your own group’s work. “Your science, your lab’s results, your last paper are completely irrelevant to the public.”

Check your ego at the door and instead focus on something the audience can grasp and relate to like a new technology, the gee-whiz factor of a recent discovery in the field, the intersection of science and society, ethical dilemmas in a research area, or how an advance in science will change the way an industry does business. Forget talking about specific genes and throw out your data slides. Rely on demonstrations, analogies, historical anecdotes, and audience participation to give listeners a sense of a scale or the mechanics of a phenomenon. Dr. Hudspeth carries with him a “pet hair cell” made of some pipes strung together—the pipes move back and forth just like the stereocilia in our ear’s cochlea.

### The Café Scientifique Movement

A new type of public science talk has become popular around the world in recent years—the Café Scientifique. Though café formats vary from place to place, at a typical Café a speaker might be invited to give a 20-minute presentation on some aspect of her research that raises controversial questions for society. Usually the talk will take place at a pub or coffee house and with no powerpoint. Then Café participants might discuss what they've heard amongst themselves and come up with questions for the speaker for the next 15 minutes or so. Finally, an interactive Q&A session, where the audience and the researcher share the mantle of authority, follows for the next 40 minutes or longer.

Since the Cafés usually take place in an informal setting, the audiences usually have a broad range of ages and backgrounds.

A knowledgeable technophile, whether a cranky skeptic or an eager high schooler may throw out difficult ideas or try to dominate the discussion. Participating in science cafes, whether as a speaker or as an audience member, can teach you a great deal about rolling with whatever an audience throws you and about having fun with an open discussion of ideas. A good Café speaker will get the audience thinking in the first half—sometimes by presenting extreme uses of a technology or provocative research scenarios. Café speakers should also remember to hold a few points in reserve that will stimulate discussion during the Q&A. Café audiences tend to be highly interested in science and well-read, so be prepared to answer questions that cover the range of your own field and beyond in a broad-strokes manner.



## Interviewing Candidates

How many times have you heard the phrase “looks good on paper?” Whether you’re looking at the sports section or at a resume, what’s written down on paper is not always as it seems. To receive a Burroughs Wellcome Fund competitive award (the exception is the science education award) each candidate undergoes the interview process. Standard procedure is a brief five minute talk followed by 15 minutes of question and answer from the advisory committee members whose task is to select the best candidates from the pool. Dr. Andrea Dunaif who co-chairs BWF’s Clinical Scientist Awards in Translational Research said that the most important components of the interview is simplicity and context. “Explain why this is an important question you are working on and how does it fit in to field,” she said.

The way the candidate handles questions from the advisory committee is another factor. “We look at how well the candidate is poised and if he or she can respond to questions in a thoughtful way and not get defensive,” said Dr. Dunaif.

Being mindful of time is also key. Don’t try to cram a dissertation into a five minute talk by talking too quickly. “Keep in mind how many points someone can grasp in your allotted time frame. Get your point across in a global context and don’t overwhelm the audience with details,” she said.

When in doubt it never hurts to fall back on the old high school adage: tell them what you’re going to say, say it, and tell them what you said.

# THE SPEAKER'S TOOLBOX

## IMPROVING YOUR SPEAKING SKILLS

When great speakers give superb talks, they make it look so easy and natural. They perform comfortably in front of a huge audience as if they were just talking to a few friends or they have that entertaining streak as if stand-up comedy is their other job. How do you get better at giving confident, smooth, and engaging talks? Our experts share some secrets of the stage.





## Conquering nerves and anxiety

1. **Practice, practice, then practice some more.** Too many speakers err on the side of little to no rehearsing of their talks. Practicing in your head doesn't count. You must say the words out loud to get comfortable saying them in different ways. Even better, practice in front of friends, colleagues, or willing senior scientists to add the nervous factor and to get feedback. If your advisor doesn't already make lab members give practice talks, ask him or her for the opportunity for a critique. Though you may not observe senior scientists practicing this way you can be sure that years of experience and considerable practice with the slides have gone into their most polished talks.
2. **Write down what you will say.** Some scientists find this helpful and practice from this script. Others find this does not work for them. Figure out what works for you (hint: see above). Try to avoid reading your talk aloud on the "big day," but have it on hand, if you must, to improve your confidence.
3. **Memorize your first three slides and your take-home messages.** Dr. Leslie Kean, of Emory, memorizes a touchstone phrase for each slide of a presentation when she knows she will be nervous. Write out a clear, simple sentence for each take-home message. Practice key slides like they were free throws, corner kicks, or the opening

of a tricky movement in a piece of music. Turn them into set pieces that you can say as easily as you can write your own name.

4. **Imagine the worst case scenario and then put it into perspective.** “It’s not a court-martial,” says Dr. Danial. “You are the expert, sharing what you have learned. Then be receptive to what others will share with you.” Keep in mind these are just your colleagues who have the same kinds of anxieties when they talk, she says.
5. **Remember, there can always be something that throws you off.** It’s how you handle it that counts.

### **Polishing your presentation style**

1. **Videotape yourself.** Have a friend videotape one of your talks from the back row of the room. You will see all the bad habits, um’s, ah’s, pacing, and how you come across to others (as painful as that is). It will also let you know if you are projecting your voice enough and if you are engaging all areas of the room.
2. **Dress appropriately.** It shows that you respect the audience’s time and that you are taking the event seriously. Everyone can recall a time when a speaker dressed too informally for a conference or job talk. Even if your science is phenomenal, people will notice your ratty sneakers.
3. **Project your voice.** You must work on this, especially if you are naturally soft-spoken. Mentally tell yourself to ‘shout.’ Always ask at the beginning if those in the back can hear you and, if necessary, move the lapel mike up close to your mouth. If, despite trying, you have a weak or soft voice, you might want to turn to a well-trained

“Variation in your delivery will keep your audience awake and engaged (or wake them up and re-engage them at critical points).”

singer or an expert in the anatomy and physiology of speech to help you understand potential physical roots of the problem. Remember, you taught yourself to speak when you were a very inexperienced human being. If your infant-self discovered a way of making speech that did not use your vocal structures to their best advantage, musical voice lessons, speech therapy, or speaking voice coaching may help you improve the tone and quality of your voice.

4. **Modulate the pitch, intonation, volume, and emotional intensity of your voice throughout a talk.** Variation in your delivery will keep your audience awake and engaged (or wake them up and re-engage them at critical points). Pause for dramatic effect, or infuse some excitement into your voice right before a key data slide. Or you can raise your voice a notch and say, “You’ll want to pay attention to this next point—it’s really important for the rest of the talk.” Avoid intonations that indicate “I’m just telling you a list of things, da-duh-da-duh-da-duh...” or ending each phrase with a questioning tone, as in, “See what I mean?” The former can seem dismissive and the latter can seem as if you are unsure of your data.
5. **Show some energy!** Most talks are delivered too deadpan. It’s rare for anyone to show too much energy or enthusiasm for their work. “If you don’t believe in it, then why should anyone else?” asks Dr. Kelleher. The key to this for young scientists, he says, is preparation. Have your visuals in order, practice the words out loud 15 times, and take care of any deficits in your technical knowledge that you can, he advises.

6. **Don't apologize for anything.** If you apologize for unreadable slides, the audience will wonder if you were just too lazy to fix it. If you are showing something unreadable, for example a long DNA or protein sequence in one-letter form, or a complex microarray, think about how to best use the image. Would shading much of the array or protein sequence in gray make what you want to point out easier to see? And don't apologize for things beyond your control—A/V difficulties or your accent.
7. **Always acknowledge the work of others.** Squeeze it in even if time is short. Better yet, do acknowledgements in the beginning or throughout a talk. It's rude and arrogant to leave it out.

The bottom line is that you can always work on improving your presentation style no matter what level of science you have reached. Find as many opportunities to speak in front of others as possible and keep practicing. Make it part of the culture of your lab. Encourage undergraduates to give a lab meeting presentation. Get involved in a journal club, give departmental or university seminars, or apply to give talks at conferences. Join your local Toastmasters club, get involved in improvisational comedy, or just explain what you study to your mother.

“Everyone finds their own way forward. Insist on opportunities and go in there and break two things, but fix three. Roll up your sleeves and get to it,” says Dr. Kelleher.

## Speaking in a foreign tongue—English

Improving English speaking skills may seem like an added burden for international scientists, but a little effort goes a long way toward building a career. Many international labs use English as the common language of science and almost all scientific conferences are conducted in English. If English is not your first language, resources are available that can help give you the skills and confidence to make communications one of your strengths.

“Succeeding in science is all about effective communication,” says Dr. John Boothroyd of Stanford. Advisors should take a similar tack when discussing an international trainee’s need for improvement. Let the lab member know you want them to succeed.

Many universities offer English as a Second Language (ESL) or accent reduction classes for international graduate students or postdocs. Or, they may have a teaching center or writing center that offers similar courses or tutoring. When giving a talk, a non-native English speaker should ask herself, “What is someone in the back row hearing?” For some accents, focus on perfecting pronunciation of the small set of sounds common in English but uncommon in the native language. This can make a dramatic difference.

### Using and abusing visual aids

The majority of talks you give in your career will have a significant audio-visual component. Visuals greatly enhance audience understanding, but they can also trip you up. For a smooth presentation, make sure you are on top of the technology you are using.

Do a walk-through in the room beforehand so you know how to adjust the lights, the microphone, the laser pointer, and projector. During the first few minutes of your talk, take care of any technical distractions right away—fix the focus or the mike feedback. Wear an outfit that can accommodate a lapel mike and battery pack.

Get a remote control slide changer and laser pointer that works with your computer to advance slides. It will allow you to move around the room more freely and address more of the room. Use your laser pointer sparingly—point to the area of focus on a slide then turn it off.

Demonstrations work well for lay talks or teaching classes. Use them to show a microscopic structure or complicated phenomenon. You can find things around your house or garage to use. For example, a foam pool ‘noodle’ becomes a linear protein sequence that can be folded into a tertiary structure. Corn syrup that slows down the action of a spring shows how water in the cochlea dampens the vibration of the basilar membrane.

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### Helpful Hints: Data Visualization

Mike Dickinson ran a series of 90-minute workshops for Duke University's Office of Information Technology. Here he offers some tips for presenting your data in a PowerPoint presentation. His website [www.giantflightlessbirds.com/workshops](http://www.giantflightlessbirds.com/workshops) includes handouts and exercises from the course.

- Sketch out ideas on paper first, before you turn on the computer. All graphics used to be drawn by hand. Software reduces creativity; good graphics are created despite your software.
- People will look at your pictures before they listen to you, if they listen at all. The graphic has to be self-contained. Put your conclusion right there on it.
- The graphic has to tell a story (if it doesn't, don't use it) and your job is to keep redesigning it until the story is as clear as possible.
- Show the actual data, as much as you can. People can deal with much greater data density than you think. Your job is to help them see the patterns in the data, but...
- Show as little non-data stuff as you can. Remove boxes, lines, colored backgrounds, grids, shadows, and other decoration, except where it's essential to understanding the data. If you can't remove it, fade it out or make it smaller, thinner, or dotted.
- Minimize the number of steps required to interpret your graphic. Don't put required information in the text that could go in the



“It’s hard because you are kind of married to your data and want to show it off, but I find I have to be realistic and ask myself, ‘Of all the pieces of data that prove point A, what is best to highlight that issue?’”

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Dr. Nika Danial  
Dana-Farber Cancer Institute/Harvard University

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caption, or in the caption if it could go in a key, or in a key if you could just label the points or lines directly.

- Avoid color; it disappears on photocopying or printing. Use contrasting thicknesses, tints, line styles or shapes first, then color. Your graphic must work in black and white.
- If you use color, use an intuitive scale that relates sensibly to your data, not all the colors of the rainbow. Make sure colors vary in intensity, not just hue, and remember some of your readers will be colorblind.
- Provide context. Always use a scale and give sources. Six small, related graphs juxtaposed in the space we’d usually use for just one provides more than six times as much content.
- Learn some basic typography, Illustrator, and Photoshop. It’s not hard to find tutorials, and they’re wonderful transferable skills.
- Never print out your slides. Give people a handout with your contact details, a couple of graphics or tables (including ones too detailed for a PowerPoint slide), your conclusions, and a bibliography.
- Don’t make long lists of bullet points, like this one. Show, not tell.

There are many great resources on the Internet for data visualization. If you’re really stuck, you may want to consider consulting with a professional graphic designer. It’s not cheap but it may help you get over the hump.



### **Successful Slide-Making, Part II**

Slide-making used to be such a tedious process that each slide was precious and expensive. Today, great software programs make designing slides as easy as point-and-click. However, as seasoned speakers point out, each slide in a presentation should still be precious and valuable to the talk. Reign in those impulses to make a flashy slideshow and stick to some basics:

- Choose a font that is sans serif for your text (e.g. Arial or Helvetica). These are designed to be used for reading at a distance.
- No moving, flashing, shimmering anything. No cute noises. No unreadable color choices. Make time to see your slides projected before using them. Some colors look fine on a monitor but are unreadable when shown on a screen. The fancy gimmicks you use to highlight an important point will most likely just distract or annoy the audience. Don't do it!
- Avoid long lists of bulleted points or lots of text on slides. Words are not nearly as helpful as cartoons or diagrams. If you must have them, limit text slides to 30 words or less and bulleted lists to three points. Avoid the common impulse to have slides that show every word you will say.



“No moving, flying, flashing, shimmering objects or words. These PowerPoint things to get attention are the devil. People do this to emphasize big points and it absolutely backfires.”

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Dr. Kathleen Caron  
University of North Carolina-Chapel Hill

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- Use animation wisely. Use it to reveal bullet points individually so that the audience is not reading ahead. Or use animation to build up the story of an individual slide by adding things into the picture. Dr. Aaron Batista, of University of Pittsburgh gives this example: “I might be showing an X and Y graph. I put up the title first which has the conclusion of the relationship. Then I put up the axes, which forces me to read the label of each axis. Next, I show one example data point, then the cloud of points, and finally the line that fits the data.” His method forces the audience to stay on pace with your spoken words and it can turn 10 good concept slides into a 45-minute presentation.
- Make sure your slides are consistent. Don’t cobble together slides from three different talks. Use the same colors, gene names, or model cartoon throughout. The less new visual information your audience has to process, the better.
- Consider using a final resting slide as a prop during the question session. Dr. John Boothroyd at Stanford uses a four-paneled slide that takes the four most important points or data slides from his talk. It will stimulate discussion questions and give the audience a visual reminder of gene names or structures that they might want to reference. “It literally burns onto their retina a picture of your work,” he says.

# HANDLING QUESTIONS GRACEFULLY

Many early-career scientists approach the question and answer session with dread, believing it to be an arcane grilling ritual or a chance to trip speakers up on their own words.



**In reality,** most questioners are genuinely interested in understanding what they just heard or providing additional information. It's really the most valuable part of the presentation for you—getting feedback on your work and new ideas from some brilliant minds. As always, practicing fielding questions is the most efficient way to get better. You want to be comfortable enough so that 10 minutes later, when you sit down, you can remember what you were asked and how you answered.

### Things to Do

**Always repeat the question.** It serves several important purposes — to make sure everyone in the room heard the question, to make sure you understood what the speaker was actually asking, to give yourself some time to think about your answer, and to stimulate other questions.

**Have your own 'question' on hand.** Nothing is worse than getting no questions, so have a point in reserve to jump start the discussion. Say something like, "Here's a point I didn't cover..." or "You may be wondering why we did this..."

**It's okay to admit when you don't know the answer.** Get comfortable saying, "We hadn't thought of that, but it is a good point." or "It is not known yet, whether..." And avoid saying, "I don't know." when you really mean, "The field does not know."

**Practice escape phrases.** Simple things, such as “Let’s talk afterwards,” can get you unstuck if you freeze or draw a blank on a particular question.

### Things Not to Do

**Don’t answer a question you don’t understand.** Ask the speaker to come up afterward. And don’t launch into a different answer altogether just because you can—that is a waste of the audience’s time.

**Don’t be caught off-guard by a question that you have already answered in your talk.** At any given time, only 70-80 percent of your audience is paying attention. If someone asks a question that you covered, simply state it again. Don’t assume he or she is asking something deeper—if so, he or she will clarify.

**Never get defensive.** It changes the tone of the whole situation and will leave your audience with a negative impression of you. Remember, if someone seems to attack your work, it’s most likely not about you, personally, so don’t take it that way. Especially during a job talk, consciously tell yourself to relax and enjoy the give-and-take.

**Don’t hide from a question.** If there’s a question you fear, incorporate that point into the talk and open the door for it. Otherwise, you risk being in a frame of mind where every question will seem like it’s picking at that one point.

**Always answer questions respectfully.** You never know who’s doing the asking and a rude or flippant response to a senior or well-respected scientist will do more damage to you. Likewise, don’t belittle a competitor, an alternative interpretation of an emerging story, or (remarkably, people do this) your own past or current advisors.

“When I know I’m going to be nervous, I practice the touchstone phrases in every slide. I might practice them while I’m exercising, just to get those phrases. What do I really need to communicate on that slide?”

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Dr. Leslie Kean  
Emory University

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### Tricky questions

**Oddball questions:** If you get a question that seems unrelated to your work or extremely naive, remember, many of those in your audience will be outsiders to your field of study. Take a moment to think about how you might best explain the field history in relation to your work or draw parallels to the questioner’s field if you know it. Never make someone feel bad for asking a question, be gracious.

**Getting questions in the middle of a talk:** If someone’s hand goes up during your talk, you can take the question if you are at a comfortable point. But don’t let it derail you. If you would rather wait until the end, smile or nod at the person to let them know you will come back to them. It’s a good idea to ask your host ahead of time if questions are normally fielded or held until the end.

**Competitor’s questions:** You may often get the same question from a competing group at conferences. It may be wise to plan ahead for how best to address a weakness in your data or approach. “Have a standard Dr. X rebuttal plan that asserts confidence in your research without sullyng her reputation,” advises Dr. Leslie Kean, of Emory.

# WHAT IF THINGS GO TERRIBLY WRONG?

We've all had that nightmare of giving a talk while naked or unprepared. Hopefully, reality will never come to that.



**But there can be some harrowing situations** that threaten to knock you so far off kilter, that recovering your composure seems impossible. Giving just a bit of forethought to “What would I do if that really happened?” can make the difference between an audience who cheers for you and the audience who just pities you. The following are some scenarios that have happened to experienced speakers and ways you can think ahead.

**The complete audio-visual failure.** This is always a possibility. Dr. Kathleen Caron of UNC-Chapel Hill, says it helps to remember that you as the speaker are in charge of the audience and responsible for them learning something. Your host is responsible for the technical stuff, let them handle it and just start your talk, using a chalkboard if possible. Always be prepared to switch into chalk talk mode. Paralysis over a technological glitch will not enhance your career.

“Even if you just give a 15-minute version of your hour-long talk, you will be so admired for having done that,” says Dr. Caron.

If the talk is a high-stakes presentation, be sure to bring three different electronic copies—your computer, a flash drive, and a CD to help you recover if one technology goes bad. Let the host know they are available. If it will be absolutely critical for a small audience to see your slides, bring photocopies too. Ask yourself, what is really the bottom line I need to get across to these people and make sure your material conveys it.

**You've completely lost the audience.** You can almost see their eyes glazing over. It is not uncommon to misjudge the education-level or background of your audience. If you see you are not communicating well, don't just barrel ahead. Stop, take a deep breath, and back-up your talk just a bit. Do it in a way that doesn't blame the audience. Say, "I'm sorry, I just realized I have neglected to give you some important background information. Let me start again." Your audience will be grateful.



**The embarrassing or rude introduction.** What do you do when your host introduces you with an inappropriate remark that blows your concentration? If you can respond to the remark with grace, do it. If he has read the wrong biography, you might say "my own accomplishments are more modest" and keep going. Give yourself an internal pep-talk. Then move forward and remember that giving a successful talk is the best revenge.

**The interpersonal disaster.** A questioner stands up and says, "Well, you've really just told us about a bunch of failed experiments. And your approach lacks creativity." Resist the urge to get into a confrontation with this person. It never puts you in a good light and it will be the only thing the audience remembers about your talk (no matter how brilliant your talk was).



“Don’t fall prey to the telltale heart syndrome. We all have some deep, dark secret in our data, some control we should have done... Don’t jump to the conclusion that someone’s question is going to the heart of that.”

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Dr. Aaron Batista  
University of Pittsburgh

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“You’ve got a split-second to decide how to take the high road,” says Dr. Kean. “You can say, ‘I take offense.’ but say it with a smile. Try to gracefully get out of the situation—practice those escape lines.”

You can also try a cheerful “Obviously we differ,” while looking to another row for the next question. Move on. Take another question, and use it to re-affirm the story that you’ve presented. Remember, you have the podium, the room’s high ground. Use it to underline your authority.

For an enjoyable lesson on parrying comments and moving on, you might spend some time watching the British Parliament, where defusing put-downs has been refined to an art ([www.parliamentlive.tv](http://www.parliamentlive.tv)). Just be careful not to pick up that institution’s love of the well hurled insult though.

# GETTING THE MOST FROM YOUR TALK

Giving a talk is an opportunity and a privilege. Sure, the main goal is to educate your audience about a scientific topic. But, the very important secondary goal is to promote yourself, your laboratory, and your research projects.




**It's marketing, pure and simple.** Many scientists don't like to think of themselves as self-promoters or selling their work, but it is an essential part of moving your career forward.

"In the best situation, what you get out is an advertisement of your ability to think clearly about your data and synthesize it into a good story," says Dr. Kean. Giving coherent, impressive talks at meetings raises the visibility of your lab among your field. It will help you recruit the best students and postdocs to your group. A great speaker's name or a nice research story will be remembered by a journal editor or a grant reviewer. The successful scientist recognizes that the time spent polishing a presentation, is time well-invested.

It is also wise to recognize the rare instances when it is not in your best interest to give a talk. The best way to give a confident talk is to have good, solid data that you believe in. If it is too early or you still have some key control experiments to do, you might wait another month before trotting out an incomplete story. This may happen especially when a new investigator is just starting up her lab.

Be cautious, but not overly paranoid, when giving a talk just before you are about to publish results. Dr. Kelleher suggests opening up a bit to get feedback from more senior people in your audience. Dr. Kean uses departmental seminars to test-drive her soon-to-be-published work. That way she can get a glimpse of what her reviews might look like from non-competing, but very smart colleagues. At meetings, you might consider



leaving a little bit of the story hanging, so that interested researchers seek you out at the coffee break for a more detailed discussion.

When you've just published a research story, you can have a bit more speculation at the end of a talk. Or add data that didn't make it into the paper or that have been added recently to make the talk richer. Use the question session to get outside advice on where to take the project next.

For very short talks or presentations to funding sources, spend more time selling the research question you are trying to address and the system or approach you are going to use. Showcase the relevance of the work to the organization's mission or other broader implications. You want to leave audience members thinking, "I'd like to be associated with that project."

Sometimes it helps to shift your whole attitude about giving talks. Dr. Suzanne Admiraal, a biochemist at the University of Michigan, says it helps her relieve anxiety and set the tone of a talk to think of it as a gift you are receiving.

"People are giving their time to listen to you. How many times in life do you have an audience captive? It's an opportunity to share something you or your lab members have discovered or a new way of thinking about a problem and then have busy, intelligent people contribute feedback. It's a wonderful chance to improve your own ideas."

## What's the worst talk you ever gave or heard?

**Dr. Neil Kelleher:** I didn't prepare enough for a lecture on chemical instrumentation. I got lost in the material and once you start to bleed, the sharks start to circle. No amount of humor or energy can overcome a lack of preparation.

**Dr. John Boothroyd:** I don't drink caffeine, normally. But I was totally jetlagged once, so I had four or five cups of tea before my talk. I could barely talk. It was an unpleasant experience, to say the least.

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### Helpful Hints: Packing when Traveling to Give a High-Stakes Talk

- Appropriate clothes, clean and in good repair. You don't want to remind yourself of that hole in your pocket by dropping the host's laser pointer into your pants leg. It's not elegant
  - Slides, less than one per minute, practiced through 10 times, projected on a screen at least once, spell checked, put them on a CD, a flashdrive, and your laptop, email them to your host beforehand if possible.
  - Antacids, pain relievers, and medicine for upset stomach, especially if you know nervousness causes you problems.
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## Suggested Reading

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## Other References

Toastmasters' *10 tips* handout: [www.toastmasters.org/tips.asp](http://www.toastmasters.org/tips.asp)

The Gettysburg Address reduced to a powerpoint presentation:  
[www.norvig.com/Gettysburg/Gettysburg.ppt](http://www.norvig.com/Gettysburg/Gettysburg.ppt)

Paul N. Edwards' *How to Give an Academic Talk: Changing the Culture of Public Speaking in the Humanities*:  
[www.si.umich.edu/~pne/PDF/howtotalk.pdf](http://www.si.umich.edu/~pne/PDF/howtotalk.pdf)

*How (not) to give a seminar* from FEBS Letters 534:5-6, 2003:  
<http://www.bio.chemie.uni-mainz.de/Praktika/How%20not%20to%20give%20a%20seminar.pdf>

Phil Agre at UCLA called *Hosting a Speaker: A Guide for Graduate Students*:  
[polaris.gseis.ucla.edu/pagre/hosting.html](http://polaris.gseis.ucla.edu/pagre/hosting.html)

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[www.grc.org/advice.aspx](http://www.grc.org/advice.aspx)

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