feature article

Who is listening? What do they hear?

Stephen G. Benka

In communicating our science, have we put too much emphasis on the information we want to convey? Perhaps there is another way to think about it.

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This past summer, at a large international scientific meeting where every contributed talk was allowed 20 minutes, I wandered into a session that seemed intriguing but dealt with a topic about which I knew nothing. After a few hours, I had heard several incomprehensible talks, a couple that justified my intrigue, and one from a fellow who spent 15 of his 20 minutes enumerating the things that he would not include in his talk. Some months earlier, I had given a colloquium in a physics department where I had a number of friends. My talk was a flop; I carried on about many things that interested me but not them. The following week, for another colloquium at a different university, I used the same title but gave a completely reworked talk, and it was very well received. All of which raised for me the following question: What really makes a talk good? Ruminations in that vein led to my giving an invited talk this past summer in Edmonton, Canada, at a meeting of the American Association of Physics Teachers. My title was, "It's the Audience, Stupid!" and I was asked by several people to write it up. This article is the result.

Most of us have heard some standard communication tips that are often treated as dogma, such as, "First, tell them what you're going to tell them. Then tell them. Finally, tell them what you've told them." Such advice can be useful, but it won't guarantee a successful talk. It might even encourage some of us to think one-dimensionally: *Here I am in front of these people, loaded with information, worrying primarily about how best to get that information "out there" where it will be appreciated. It is all about me and my information.* But what about those on the other end? How does the information appear to them? Each member of the audience brings to the room not only a unique background and set of expectations, but also a unique comfort zone of knowledge. Each will see the information through the prism of individual and professional experience. What will attendees really hear? How does one measure "success" for a talk?

One perspective on success that I find helpful was offered in this magazine back in July 1991 (page 42). James Garland wrote

> Whenever you make an oral presentation, you are also presenting yourself. If you ramble incoherently, avoid eye contact, flash illegible transparencies on a screen, and seem nervous and confused, then your colleagues are not only going to be irritated at having their time wasted, they're also going to question your ability to do your job. However, if you present your ideas clearly and persuasively, with self-assurance and skill, you will come across as a reasonable, orderly person who has respect for the audience and a clear, insightful mind.

So how does one actually assemble a compelling, successful talk?

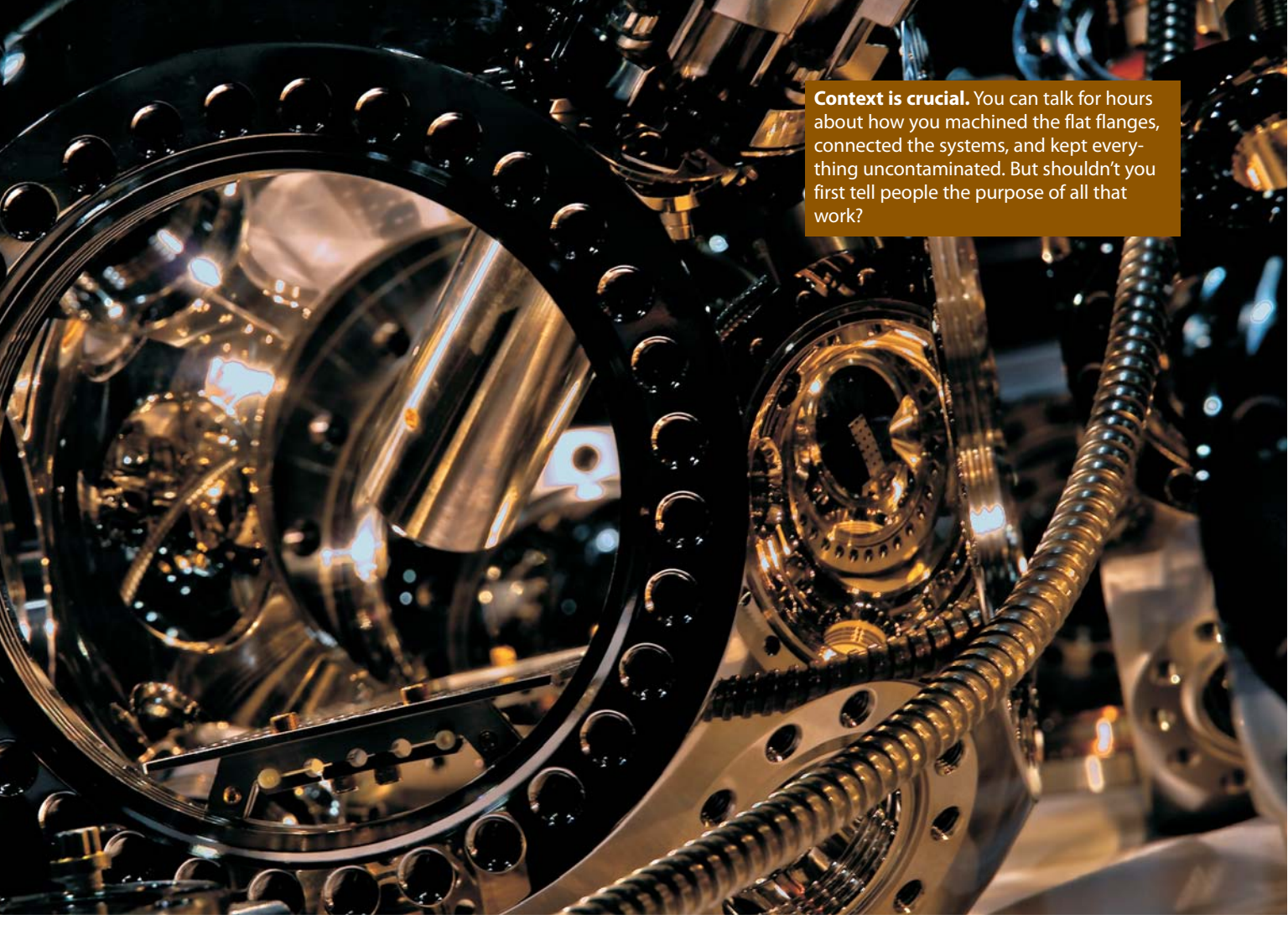
Two interacting systems

The ability to communicate effectively is unevenly distributed among humanity. Never has an infant been born and immediately begun to deliver great oratory. A newborn needs both time and effort to learn to communicate, never mind the much later accomplishment of speech. As they age, however, many people seem to talk more and communicate less. Of course, we scientists take it for granted that everyone hangs on our every word, all the time, whenever we speak. Right? Would that it were so. Unfortunately, we all need to continually learn, relearn, and refine our communication skills. Scientists are no exception. Whether naturally tongue-tied or golden-voiced, each of us can benefit by routine practice and honing of our communication skills.

Sometimes we talk and write about our work, whether we want to or not, because doing so is part of our professional lives. Other times, we seek opportunities to talk or write about something of particular importance to us. My underlying premise is that for all communication, we want somebody else to actually understand what we are trying to convey.

Communication involves two systems—a supplier and a recipient—that interact via the information passing between them. Both systems are essential. Without the supplier of information, be it a speaker or an author, the recipient is frustrated in the search for knowledge. Without the recipient, the supplier is pointless. Yet many speakers and authors never give the audience more than a passing thought. In my opinion, *effective* communication uses information to move an audience from an initial mixed state of knowledge to a final state of understanding.

As scientists, we are naturally intrigued by new developments, curious about new results, gratified when others accept our own research as important. For many of us, the easiest way to communicate results is via the dry, impersonal, just-the-facts journal article in our particular field. It is a fair assumption that those who read the article are already reasonably well versed, perhaps truly expert in the field being discussed. And so we become comfortable throwing around specialized vocabulary, diving right into the technical details



Context is crucial. You can talk for hours about how you machined the flat flanges, connected the systems, and kept everything uncontaminated. But shouldn't you first tell people the purpose of all that work?

of our work, and never really thinking about our readers. But what of the curious scientist who wants to learn something new, perhaps even change fields, and turns to the article? Without being aware of it, our tendency is often to let the neophytes fend for themselves. That tendency can too often spill over to other venues—talks at scientific meetings, department colloquia, and even casual conversations with our neighbors and friends.

Here, I want to turn upside down the assumption that in communicating science, information is paramount. Instead, let's examine the reverse premise, that determining the actual information to convey is secondary to ensuring that it be understood. Let me say it again: It is far better to be understood by your audience—even if you convey less information than you hoped—than to convey everything you intended and be incomprehensible. I am not suggesting that the information is unimportant or to be treated sloppily: The candid delivery of accurate information is a necessary *but not sufficient* condition for an effective presentation, whether written or oral.

Although this article is focused on giving talks, most of the main points can be easily adapted to the written word. For every talk and many papers, there are three major considerations: audience, audience, and audience. Identify the audience. Respect the audience. Engage the audience.

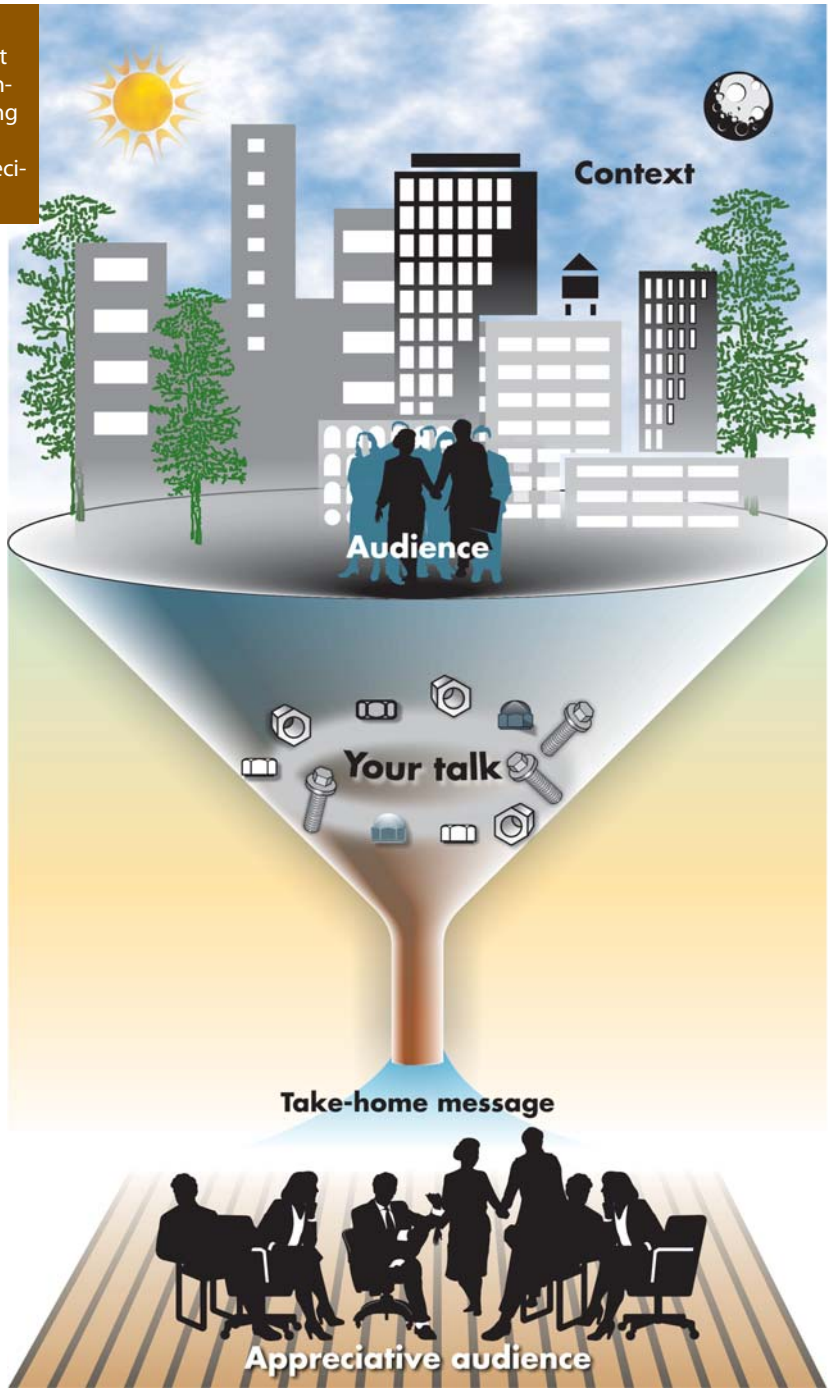
Who is your audience?

All audiences are not equal. Even roomfuls of physicists differ. If everyone present is an expert in your topic, then your job is simple. With the briefest of introductions to place your talk in context, you can launch right into a technical discussion, throwing jargon around like pieces of candy, knowing that everyone will enjoy the treat. Groups of experts in any specialized field are typically small with most individuals, including friends, adversaries, collaborators, and competitors, known to each other. In that situation, your best preparation is merely to master your subject.

Of course, not all physicists, let alone all scientists, will be experts in the given subject. When the audience broadens to include people from other specialties, the talk must also broaden to include them. No longer will everyone know all of the specialized vocabulary. No longer will each listener know the nuanced arguments and assumptions that lie behind "well-known" results. And no longer will everyone grasp the importance of the work and how it fits into the larger framework. What if the audience is broader yet, and includes nonscientists? What if you are giving a public talk? Or speaking to a class of schoolchildren? You wouldn't tell an eight-year-old about the Dirichlet conditions required for a Fourier expansion, would you? Sadly, experience suggests that some physicists would.

Vefarps, wotoiks, and two keys

To unlock minds and promote understanding in a mixed audience, two keys are needed. The first is to provide the audience with an appropriate context for the talk. Experts need little context. For example, let's say you've come up with a very clever "vefarp," a vital element for a research project.



An information funnel is one way to think of a scientific talk. Start with a broad enough context to encompass the audience. Then, explaining unfamiliar concepts and vocabulary as you go, bring your listeners through the nuts and bolts of the science to a take-home message they can appreciate and that serves your field well.

The research project—of which the vefarp is but one vital element—is actually the world's only thing of its kind, a "wotoik." Your vefarp could be a piece of equipment, a computer program, an equation, a concept, whatever. The point is that it will introduce highly significant improvements to the wotoik. In an advanced seminar, you would present the finished vefarp to your collaborators in all its glorious detail: the current shortcomings of the wotoik, the stumbling blocks to a solution, the sophisticated insight for the vefarp, the nitty-gritty development of that insight into a reality, the moment of truth, and the bright hope for the future. The vefarp excites your colleagues as it excited you because the long-awaited wotoik is now nearly ready to be put to use.

Now let's ask, Could that same presentation be given to a broader scientific audience? Of course it could. But then we must be prepared to see blank faces, fidgeting, and general frustration in a dwindling audience; the listeners won't all have the background to understand the details of the vefarp, and so they won't grasp its importance, perhaps not even extract the larger purpose of the wotoik from the details provided. For a more general audience, we must rethink the talk from the bottom up, based on our understanding of who is actually in the audience. It is crucial to lay the groundwork so that nonexperts can appreciate the significance of what we say.

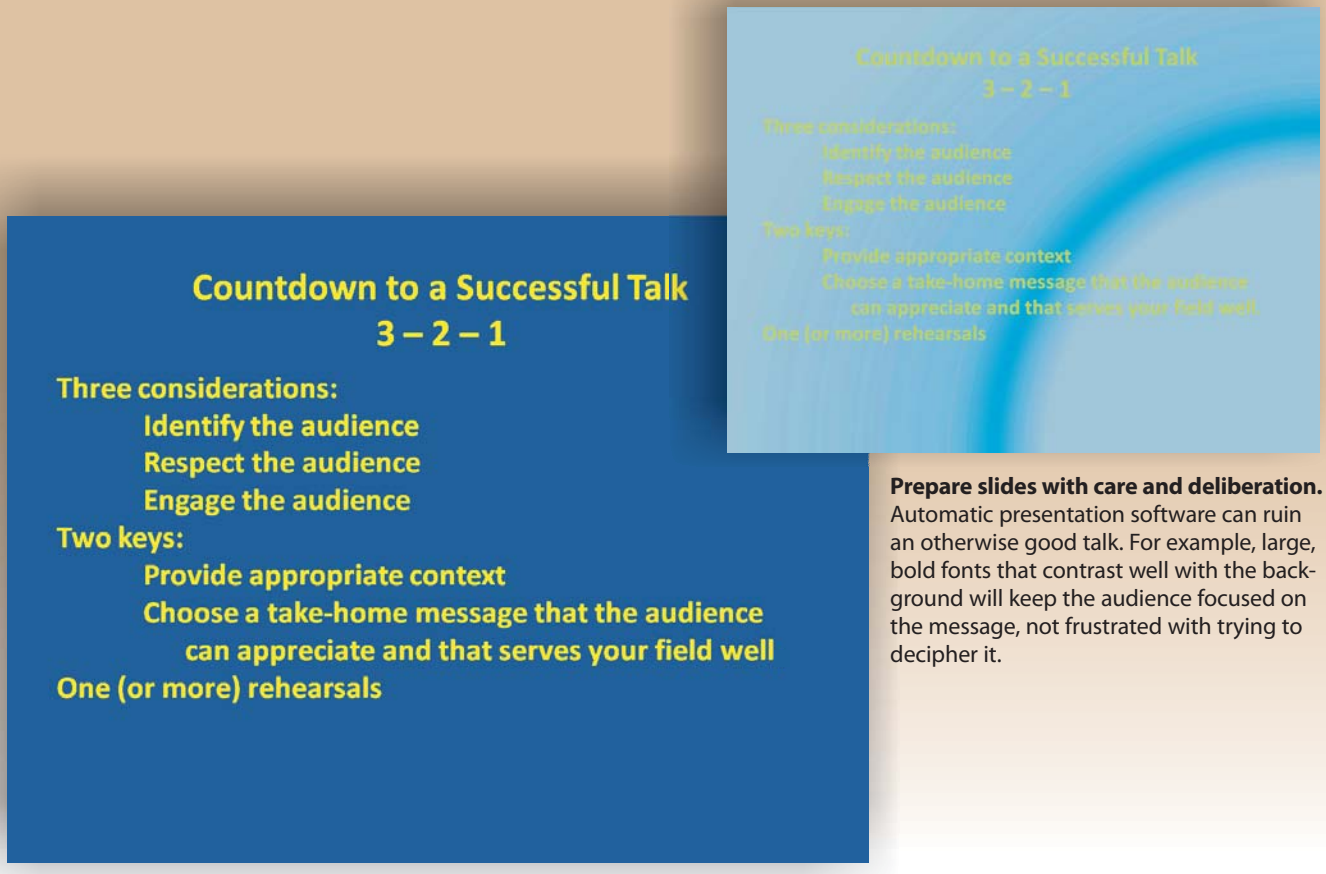
For the mixed audience, context is everything. There is a real danger of getting trapped into trying to impress the experts and thereby alienating and confusing everyone else. And there is always a chance that someone in the room will some day have a hand in advancing your career. So do your best to give everyone present something to latch on to, some understanding to take away, an appreciation of why you are so excited about the work.

To include more context and promote understanding, you will probably need to jettison some other material, perhaps many of your favorite details. It may help to remember that every talk both succeeds and fails, in various ways, with different members of the audience. In essence, the problem of developing a good talk is one of optimization: choosing the most appropriate information for the given audience and delivering it effectively.

How do you decide which information is appropriate? The answer lies in the second key: to carefully choose your take-home message. Ask yourself, If I were an "average" member of the audience, neither novice nor expert, what would I hope to learn from the talk and what should I come away with? If you do your job well, the audience will automatically learn how brilliant you are both as a scientist and as a speaker, so self-promotion or showing off need not be your goal. The secret is to choose a take-home message that most of the audience can appreciate and that serves your field well. Fit your take-home message into the scientific edifice of the field.

Into the unknown

In a talk, we are free to include information of any kind but making careful, deliberate choices will pay big dividends. Remember that we are taking our listeners into unknown territory. As their guide, we have the responsibility to see that they don't lose their bearings. Start with the audience's common experience, the one thing that unites them in that room on that



Prepare slides with care and deliberation. Automatic presentation software can ruin an otherwise good talk. For example, large, bold fonts that contrast well with the background will keep the audience focused on the message, not frustrated with trying to decipher it.

day. Use that commonality to deduce what they probably already know, and thereby establish the largest context. If half of them never heard of a wotoik, let alone the crucial vefarp, then start by telling them about the project of which the wotoik is an important part. It may be that even the reason for the project is a mystery to many in the audience. In that case, explain the grand quest, pose the questions being pursued by several projects, each in their own way. Only then can your listeners follow you down the path of the specific project that needs the wotoik that the vefarp so brilliantly enables.

Obviously, time is limited. Therefore, to provide the best education for listeners, I try to think of a talk as an information funnel: Starting with a wide enough context to encompass all members of the audience and explaining unfamiliar concepts and vocabulary along the way, I attempt to bring them along on a journey to the take-home message. The shorter the talk, the taller the challenge. There are at least two viable ways to meet that challenge: Eliminate nonessential technical details and broaden the take-home message. Both routes result in more of an overview than an advanced seminar, and by fine-tuning the level of detail and the bottom line, almost any audience can be appropriately addressed, even in a 10-minute talk.

It seems paradoxical that not talking about those details on which you worked so hard can improve your talk. But keep in mind that experts won't object to being told what they already know, while nonexperts loathe being told what they can't understand. Your thorough knowledge of every detail will be inferred if you show an understanding of the subject, and that detailed knowledge can shine brightly during the question-and-answer period. For some audiences, the vefarp might be utterly irrelevant. Then there is no reason even to mention it, despite all the hard work that went into it.

Even while stepping up to the front of the room, I try to have the take-home message in the forefront of my mind. I try to present the opening context with my take-home message in mind. I try to include only those details that have a direct bearing on the take-home message. From start to finish, it's all about, you guessed it, the take-home message. After all, that is why we give talks. So here is some advice: Recognize that your talk is not about you; it is about whatever your audience needs from you. Before preparing and delivering your next talk, write this little cheat sheet on your hand, as I now do, paraphrasing a 1992 political campaign's cheat sheet: It's the audience, stupid!

Respect

Very few of us are professional speakers; I certainly am not. But we are professionals nonetheless, and being a professional means showing respect for the audience. That respect includes more than just giving an appropriate talk, with appropriate context and an appropriate take-home message. As speakers, we have asked the audience to take time out of their busy schedules to listen to what we have to say. They don't have to come and many don't. But those who do attend have a justified expectation of learning something for their trouble.

To ensure that a talk goes smoothly, a speaker must be prepared technologically. Were the slides delivered in advance? Is the equipment in the room familiar or is a quick dry run needed? If necessary, can you switch smoothly from the slides to a video and back? Are any needed audio files you will use readily available; is the sound connected properly, with the volume set to a suitable level? Will you use a microphone; if so, what kind? Will you be able to walk freely? Do you have a pointer?

A speaker must always be punctual. Many of us have been in sessions at which a speaker failed to show up or came in at the last possible moment. Such behavior disrupts the

flow of the session, distracts the attention of the audience, dismays the chair, and disrespects everybody present.

You must always—always!—stay within your allotted time. The worst transgression a speaker can commit, the most disrespectful act, is to exceed the time limit. Here is what occurs when a speaker goes overtime: The following speakers are delayed and become annoyed; the session runs long and the audience becomes annoyed; the chair is perceived as incompetent and becomes annoyed; people who session-hop for specific talks are thrown off schedule and become annoyed; and worst of all, the offending speaker is perceived as unprofessional and disrespectful. In such a situation, the speaker sends a strong message that nobody else matters. It is a situation in which everyone loses.

The engagement

Having carefully selected the information that will funnel listeners to the take-home message, that information still needs to be effectively conveyed. To engage an audience, a speaker must first engage him- or herself, recognizing the importance of time management, legible slides, a fluid narrative, and a clear delivery.

A rehearsal is essential. With a timer. Out loud—though I've done it under my breath on airplanes. If you are bashful, practice it by yourself. Far better, practice it in front of family or friends, preferably without telling them in advance what the talk is really about. See if they get it. If you are anything like me, the practice session will reveal some significant flaws—it runs too long, the take-home message is unclear, some piece of logic or storyline is missing or garbled, proper credit was not given to others, and on and on. A practice session is a golden opportunity to identify the problems and solve them. If you haven't set the stage completely, add some more context. If there is extraneous material, get rid of it. If your message isn't clear, sharpen it. If you stumble on a detail, rephrase or eliminate it. Practice pronouncing difficult words. If a slide is cluttered or muddled with poor colors, fix it. If your transition to audio or video is not seamless, streamline it. Then do another dry run. Are you now within your allotted time, proceeding smoothly from audience-specific context, through clear explanations of the details, to the desired conclusion? If not, another iteration is needed.

I vividly recall delivering my first scientific talk, more than a few years ago. I was a nervous wreck, mumbled quickly at the screen or at my shoes, aimed a pointer that had a life of its own, dropped my transparencies. The nightmare finally ended, I fielded a question or two and collapsed into my chair. When asked later if I had practiced, I said yes, but the reality is that my practice was not meaningful; it consisted merely of seeing if my slides were all in one place.

If you are an experienced speaker, a dry run will help ensure that you stay within the time limit. If you are a relatively new speaker, you might not realize how tremendous the benefits of a real rehearsal can be. With each run, your presentation will gain clarity and you will gain confidence. With that confidence, you can concentrate on actually engaging the audience, not just surviving an ordeal. You will be more comfortable making eye contact. Asking questions, even rhetorical ones. Speaking up and speaking clearly. You will more easily discover the joy of being multilingual, using language that is expert-friendly, novice-friendly, or public-friendly. In short, you will learn to recognize your talk for what it is: an experiment designed to bring the audience from a mixed state of knowledge to a final state of understanding with you as the best instrument for the job. ■