

to present first thing in the morning, or at least before lunch. If a speaker must present immediately after lunch, and has any say in what is served, Agan recommends a light meal. Heavy fare will put an audience to sleep, he warns.

Inexperienced presenters can risk losing their audience because of unpolished technique (see 'Presentation peeves'). Rehearsing often in front of as many different groups as possible — lab mates, other postdocs or students, mentors, advisers — can mitigate the problem. Ideally, rehearsals should be filmed so that speakers can see themselves, and listeners need to be frank about recurring glitches such as repeated use of 'you know', talking fast, blinking frequently, looking down or frowning. "Ask them to be hard on you," says Nicchitta. "The more you're aware of what you're doing, the easier it is to control it so that it doesn't become a distraction."

Panic can trigger nervous mannerisms, but speakers can stave it off with a back-up plan or two. Divya Koura, a specialist in internal medicine who is doing a fellowship in oncology and haematology at Emory, gave one of her first talks in December, to a medical society. She gained confidence not only through practising for weeks in front of different groups, but also by creating a brief script. "By the end of all my rehearsals, I knew I didn't need it — it was just there," she says. "But at least I knew I was saying everything I had wanted to. There was less stumbling and no 'ums' or blank spaces."

Many speakers recommend using the 'Presenter View' feature of PowerPoint, or presenter notes in Keynote, to provide digital crib notes — safer in some cases than paper. Agan remembers watching a speaker drop a sheaf of notes in the middle of his talk. "By the time he had retrieved everything, he was so desperate and so flummoxed that his presentation turned into an indecipherable and impenetrable disaster," recalls Agan.

Seasoned presenters warn against writing out the entire talk, no matter how short — or long. It is all too easy to start reading from notes. The audience will know that they are being read to, and will drift — or, worse, leave. It is much better to create a brief outline with key points, and to rehearse the talk incessantly. Relying solely on slides can be dicey, as Raff's experience shows.

But even the best talk can suffer if the speaker doesn't use the simplest, most effective tool for establishing rapport with the audience. "The human face has 250,000 different expressions, and one stands head and shoulders above all else in terms of influencing an audience," says Agan. "And that is a smile." ■

Karen Kaplan is assistant Careers editor at Nature.

COLUMN

Ticket to everywhere

The fossilization of the PhD harms students, employers and science in general, argues **Peter Fiske**.

Many career paths are undergoing a startling transformation. Instead of locking themselves into one discipline for an entire career, professionals now switch jobs often and jump disciplines and industries routinely. Such dynamism increases productivity, creativity and entrepreneurship; interdisciplinary mobility promotes exchange of ideas and business models.

And yet the training of scientific professionals through the PhD has remained essentially unchanged since the nineteenth century. Promising students are apprenticed in academic laboratories. They learn how to conduct research, but are not prepared for success outside academia. Despite decades of policy papers, earnest admonitions and hand-wringing in the United States and Europe, actual reforms have been marginal.

The 'fossilization' of science PhD training is detrimental to young researchers — and to science as a whole. Poorly equipped to compete for jobs outside academia, many PhD holders leave university lacking confidence in their prospects. Some feel that they have bought a ticket to nowhere.

Academia might do well to look to the private sector for a model that broadens the soft skills of PhD holders and expands their prospects. Many businesses offer their executives short, intensive training programmes that stimulate their professional development in key areas such as leadership, innovation and management. Some companies develop internal schemes; others hire consultants or send their executives on week-long programmes at business schools (sometimes referred to as 'charm schools'). The goal is simple: to develop the capabilities of junior managers without costing a lot in terms of time, money or disruption to their jobs. These programmes also reflect an acknowledgement that a supervisor should not be the sole source of professional advice and mentoring.

Some research universities in the United States and Europe provide professional-development offerings for graduate students, often led by a campus career centre — a few of which have specialists dedicated to PhD students. But support is meagre: a university may have only one person to support professional development for hundreds or even thousands of PhD students. Science departments (and funding agencies) rarely provide financial support for such activities.



ALBACHHARRA-/SHUTTERSTOCK

Where such programmes exist at all, they are more tolerated than encouraged by the faculty. Academic culture enshrines the adviser-advisee relationship as the core of the PhD. But although the adviser is ideally suited to guiding students through the rigorous training necessary to become an independent researcher, he or she may be ill-equipped to help them to develop the skills to succeed in other fields. Not only do few faculty members have experience in industry, but most already have enormous demands on their time. Urging them to provide all manner of professional development is unfair to both adviser and advisee.

Formal professional-development programmes for science PhD holders should be expanded. But how to finance them? Those who benefit should pay. That includes not only funding agencies, but also students. They might pay through general student fees. Even better — to ensure that they are fully invested — they might devote credits to an actual course on career planning (see *Nature* 489, 593; 2012).

The students themselves will benefit from realizing broader career options. Universities benefit both through greater demand for their graduates and by ending up with more-satisfied (and better-paid) alumni.

But the largest benefit may be to national economies, when scientifically educated individuals enter every professional discipline — no longer because they couldn't find a job in academia, but because they chose to apply their training to important problems in a wide range of fields. With the combination of the right professional coaching and the right experience, a science PhD could turn out to be a ticket to everywhere. ■

Peter Fiske is chief executive of PAX Water Technologies in Richmond, California, and author of *Put Your Science to Work* (American Geophysical Union, 2001).