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# Research Presentations

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# Overview

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Aims.

Content.

Organization.

Slides; pictures and words.

Preparation and delivery.

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A presentation: a lecture or poster about research, intended for an audience of other scientists.

Research presentations are used to present to your peers:

- ▶ Your research directions.
- ▶ The status of your research.
- ▶ The outcomes of your research.
- ▶ Issues and uncertainties raised by your research.
- ▶ Research material such as interesting work you have encountered.

The usual formats are oral (seminars, talks – that is, with slides) or by poster.

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Research presentations are different, in both audience and content, to other kinds of lecture, seminar, or talk.

- ▶ They are used to convey ideas and discoveries. The intent is to openly educate, inform, and learn.
- ▶ Business or information seminars may strive to convey an impression, philosophy, or strategy. Education and openness may not be priorities.

Delivery of an effective presentation requires several skills:

- ▶ Distillation of ideas and messages from a body of work.
- ▶ Explanation of the idea to an audience in a controlled time.
- ▶ Effective preparation.
- ▶ Creation of a positive, lasting impression.
- ▶ Management of a critical, but interested, audience.

# Aims of presentations

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A research presentation is primarily an introduction to your research – perhaps a demonstration that a particular piece of writing is worth reading, or an opportunity to canvass problems with informed colleagues.

- ▶ Appropriate for a *topic scholar* (my terminology).

It is secondarily a collection of messages that you want the audience to take away.

- ▶ Appropriate for a (mere) *listener* (my terminology).

It is also a demonstration of your merit as a researcher.



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A research talk is very different to a lecture or tutorial.

The pacing, slide design, style of delivery, and kind of content of research talks are due to specific constraints and demands.

This lecture is not an example of a research talk!

# Challenges

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Choosing a message.

- ▶ *Message*: What is to be learnt.
- ▶ *Content*: How it is delivered.

Selection of content; structuring the presentation to lead the audience to understanding.

Linearity – talks have directed flow, not hierarchical structure.

Layout – a readable poster has restricted space.

Timing and pacing.

Nerves: lack of confidence in the content, lack of experience in public speaking.

Having an audience of peers, supervisors, and professors.

Making the right impression.



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# Components of a typical talk

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A series of parts that forms a coherent narrative:

- ▶ Introduction – identifies the problem, sets the context, motivates the listener.
- ▶ Overview or goals – might be the structure, might be the lessons that an attentive listener should learn.
- ▶ Background – state of the art; achievements, highlights, and limitations.
- ▶ Contribution – what is proposed, how to understand or appreciate it.
- ▶ Evaluation – observations, experiments, demonstrations, proofs, problems.
- ▶ Conclusions – what the audience should have learnt.

An 'early' research talk may focus, say, on problems or difficulties rather than evaluation.

# Components of a typical poster

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The structural elements are the same as in a talk – but may be laid out hierarchically rather than shown in linear order.

The narrative should derive from what you plan to say:

- ▶ *Don't ask yourself* how can my work be crammed into this space?
- ▶ *Do ask yourself* how can my work be explained in a couple of minutes? What illustrations and text will help me?

A poster should interest passers-by – consider vivid headings, intriguing illustrations, substantive claims.

(But keep it scientific! 'Pop science' statements are inappropriate.)

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A good poster is a balance of several separate aims. It serves as:

- ▶ A summary of the work.
- ▶ A magnet for attracting passing interest.
- ▶ A support for brief or detailed conversations about the research.
- ▶ A demonstration that the work has been undertaken in a robust way.

Consider what the 30-second explanation will be; and what might be needed in the ten-minute version.

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Write down the main message – the key idea the audience must learn.

Note a few words on every topic you may have to cover (you may eliminate many of these later on).

- ▶ Uncritical brainstorming, critical selection.

Include anything that the audience will need to understand the main point and to appreciate its significance.

- ▶ What do you need to compare against?
- ▶ What are the out-of-field basics that a listener needs?

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Find an angle or perspective that motivates the listener.

- ▶ A concrete example for explaining the work.
- ▶ A parable or tale that sets the context in an accessible way.

Order topics into sequence.

Prune or set aside material that doesn't have to be part of the main narrative.

Find a balance between the key components:

- ▶ Aim to give the audience the feeling that the talk is moving steadily from start to end.
- ▶ Don't dwell too long on any one aspect.
- ▶ Make sure that enough space is given to important elements; audiences need time to digest non-trivial ideas.



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Novice presenters spend too long preparing their talks.

(However, it can take a long time to find images and build illustrations.)

Once the talk is more or less ready, forget about it for a while.

# Drafting a poster

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Rough sketches on A3 (or larger) can save a lot of work later on.

Investigate tools early.

- ▶ Inkscape is effective, but there is a learning curve.
- ▶ PowerPoint works fairly well.

Create components separately to see how big they need to be, before deciding how they are going to be integrated.

Consider making use of factors such as eye-height – it often makes sense to keep highlights high, and details low.

Whatever tool you use, plan to spend significant time in the polishing phase – good layout is a highly manual task.

# How much detail?

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Explain the area – the audience may not be expert.

Your interpretation of the background may be one of the main things the audience learns from the presentation.

In the background, focus on methods and results rather than individuals and citations.

Give enough detail to allow understanding of the main results.

Avoid messy details such as a proof of a theorem or internals of a data structure – unless the proof *is* the main result.

- ▶ If you struggle to speak to some material, don't include it.

Avoid detail such as issues that are only of interest to people with your knowledge of the problem (i.e., almost no-one).

# Common mistakes

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Making the talk too complete, too comprehensive.

Not considering the audience's needs:

- ▶ What must they know to understand the main point?
- ▶ What must they remember?
- ▶ What is just an aside?

Leaving out vital background.

Having too much material for the allotted time.

Including material that is too technical or detailed, or concerned with minor aspects that a (mere) listener doesn't need.

Attempting to explain complex concepts that can't be comprehended by the audience in the available time.

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A good presentation is a combination of visuals (slides) and delivery.

There are plenty of examples of visuals on the web – though they are not always easy to find.

There are also plenty of examples of presentations, as streaming media for example – but they are tedious to locate, sift through, and watch.

- ▶ Actively seek opportunities to attend talks.
- ▶ Note the approaches and styles that you find effective.

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Aim to capture the audience's interest in the first few sentences.

Make the objective clear.

Explain the structure – the route to the objective.

Have a slide with the title, your name, affiliation, collaborators, and maybe funding source.

Consider:

- ▶ Demonstrating a problem.
- ▶ Making a surprising claim.
- ▶ Motivating the topic before discussing the content.
- ▶ Opening: 'In this talk, I am going to show you that ...'

Have an opening sentence or thought that starts the the talk in a natural way – so don't read out the title!

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A talk should consist of a logical sequence of steps leading the audience to the single main point.

There should be an obvious reason for the inclusion of each part of the talk.

Have material that can be skipped if you run out of time.

Don't switch back and forth between slides.

- ▶ Repeat important information instead – e.g., show a complete algorithm, then show each step with an example.
- ▶ Repeat tables or figures if you need to discuss them again.
- ▶ If necessary, and to add variety, plan to use a whiteboard.

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Add occasional reminders of key facts.

- ▶ For example, don't expect people to remember acronyms and definitions.

Aim for about one slide per minute or two.

Again – take care with balance. Don't speed through topics; don't spend too long on any one thing.

And again – to others, the background state of the art may be surprising (more impressive than people expected, worse than people expected); make the case carefully.

Don't regard a draft as rigid. If it isn't right, actively seek ways to change.

Experiment with alternative orderings and inclusions or exclusions.

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Once you have a reasonable draft, practice speaking to it (delivery is discussed below).

- ▶ If it does not flow, if you cannot find words to go with a slide, etc., then you need to revise.

Each slide should be fairly self-contained – don't depend too much on notation or details introduced elsewhere.

Put a heading on every slide.

# The conclusion

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Sum up the main points.

Review the objective and explain how it was achieved.

Make a prediction or recommendation; look forward to open challenges.

Ensure that the summary and observations are a logical consequence of the talk.

Clearly signal the end – ensure that you have rehearsed a final, finishing sentence.

Acknowledge all funding, support, and collaborators.

# Checking the organization

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Is anything important left out?

Are all topics relevant?

Is the relevance obvious to the audience?

Is the sequence logical? Does it flow?

Is the structure obvious?

Is there enough detail? Is there too much?

Are the elements of the talk well balanced?



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# Slides (a.k.a. transparencies, overheads, foils)

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Two kinds of material: text and pictures.

- ▶ Text slides are a visual guide to the structure of the talk.
- ▶ Illustrations (graphs, diagrams, images) should show results or explain an idea.

Why have slides at all?

- ▶ To give explicit structure to your talk.
- ▶ As a tool for focusing the audience's attention on the main elements of what you are saying.
- ▶ To provide visual entertainment (it is boring to listen).

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Software: beamer (etc.), powerpoint (etc.), ... For example,

- ▶ Powerpoint allows rapid drafting and easy layout of images, and has a simplistic drawing tool.
- ▶ Beamer<sup>1</sup> supports talk structure well and is preferable for maths and tables.

Choose an effective slide design. Opinions vary! In my view,

- ▶ Simplicity is good.
- ▶ Complex designs and bright colours are a distraction.
- ▶ Dark fonts on light backgrounds are easy to read.
- ▶ Have discreet running headings and structure guides.
- ▶ For the body of the slides avoid huge fonts and tiny fonts, and stick to a couple of typefaces in a couple of sizes.
- ▶ Animation and fancy transitions are strictly forbidden.

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<sup>1</sup>These slides were written with beamer.

# Perspective

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## Slides made by children:

- ▶ Use lots of *comic sans* font.
- ▶ Have flickering flash animation.
- ▶ Use slow transitions ... things fade in ... and then fly out to the right. And spin. And pixelate. Yawn!
- ▶ Have a lot of exclamations! Or more!!
- ▶ Have fonts ... lots of fonts. And colours .

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# Text slides

A text slide is a lists of points that the audience will expect to hear discussed – that is, each point is a summary of information you want to convey.

Keep slides simple, avoid clutter such as frames, shading, shadows, artwork. Ornaments (photos, artwork, etc.) should have an obvious purpose.

Simplify complex equations and explain all variables.

Use short, straightforward sentences and white space.

Write in complete sentences, not a form of SMS (c.f. above):

- ▶ Text slide: points list for audience; information summaries.
- ▶ Yes: simple.
- ▶ No: clutter (frames, shading, shadows, artwork).

Focus the audience on you, not the slides.

Most slides should have less text than this one.

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A slide is a reminder of the points you plan to discuss – not a script, and not an independent piece of writing.

- ▶ **Never** read the slide to the audience.

You may want to have notes to refer to while speaking, but don't recite them – written English sounds stilted.

(You won't forget how to speak in the middle of your talk.)

Instead write notes as lists of points of a few words each.

Make them easy to handle so you can read them while operating a computer, lectern, and microphone.



# (Ex:) Approximating number sets

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One technique for coding a  $b$ -bit approximation of a set of numbers is as follows. Each number  $x$  is such that

$$L \leq x < U$$

for some positive lower bound  $L$  and upper bound  $U$ .

In practice  $U = \text{Max} + \epsilon$  for some small  $\epsilon$ .

For a base  $B = (U/L)^{2^{-b}}$  chosen so that  $\log_B(U/L) = 2^b$  the value

$$f(x) = \lfloor \log_B(x/L) \rfloor \quad (1)$$

will be integral in the range  $0 \leq f(x) < 2^b$  and will require only  $b$  bits as a binary code.

If  $x$  is represented by code  $c$ , that is,  $f(x) = c$ , an approximation  $\hat{x}$  to  $x$  can be computed as  $\hat{x} = g(c + 0.5)$  where  $g$  is the inverse function

$$g(c) = L \times B^c \quad (2)$$

Each code value  $c$  corresponds to a range of values  $x$ :

$$g(c) \leq x < g(c + 1)$$

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## (Ex:) Approximating number sets

Assume that each number  $x$  is such that

$$0 < L \leq x < U$$

Use  $U = \text{Max} + \epsilon$  for some small  $\epsilon$ .

For a base

$$B = (U/L)^{2^{-b}}$$

any value

$$c = f(x) = \lfloor \log_B(x/L) \rfloor$$

will be an integer in the range  $0 \leq c < 2^b$ .

The inverse function is

$$g(c) = L \times B^c$$

$c = f(x)$  corresponds to a range of  $x$  values:

$$g(c) \leq x < g(c+1).$$

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# (Ex:) Total access costs

Inverted file vocabulary disk-resident.

Small ( $\approx 50$  Kb) memory-resident index.

One access per term.

In total two per query term, two per answer.

Ordered disk accesses  $\Rightarrow$  lower average cost.

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# (Ex:) Total access costs

The vocabulary of the inverted file is on disk.

There is a small ( $\approx 50$  Kb) index to the vocabulary in memory.

Only one disk access is required to the vocabulary, then a further access to fetch the inverted list.

In total there are two accesses per query term, two per answer.

(Reminder: one access to the pointer table, then an access to get the answer).

If the accesses (to the vocabulary, lists, and answers) are ordered, average costs are reduced.

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Long sequences of text slides can become repetitive.

An interesting picture, accompanied by a discussion, can help focus the audience's attention.

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# Illustrations

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Figures should be clear – the same principles as in a paper.

Label everything.

A complex table will require a long, careful explanation.

Take the time to draw figures and graphs well – they may be the part of your presentation that gets the most attention.

Graphs are easy to grasp and can convey complex ideas – but you may need to explore different ways of interpreting the data.

Photos and cartoons are often used for humour; as for all joke-telling, choosing pictures well takes experience.

Most photos on the web are subject to copyright. Do not use them without permission ... so look for creative commons (Wikipedia, Flickr).

# Progressive reveal

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Consider building a table, graph, or figure in stages:

- ▶ Show how an algorithm progresses.
- ▶ Highlight significant features.
- ▶ Explain components, show the whole.
- ▶ Reveal surprises in a surprising way.

Like many presentation features that provide variety, underuse is preferable to overuse.

- ▶ Don't reveal text point by point.

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A talk that has some meaty technical content, presented in a straightforward standard style without any animation or clever pictures, is perfectly acceptable and will engage attentive listeners.

More elaborate presentations can entertain or impress, but can also backfire.

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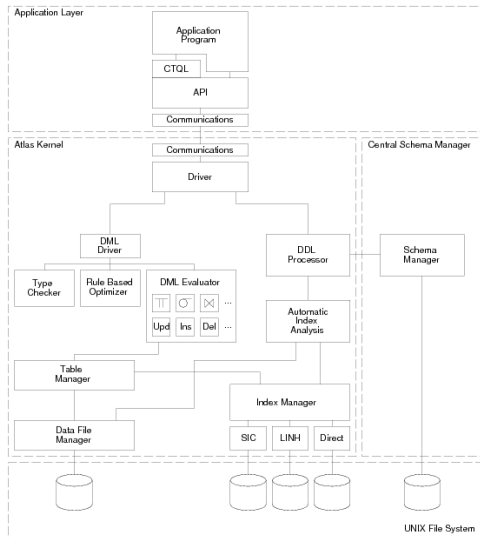
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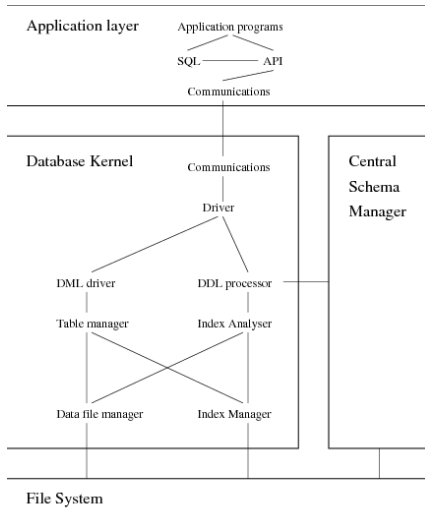
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Pass	Output	Size Mb	%	CPU Hr:Min	Mem Mb
Pass 1:					
Comp.	Model	4.2	0.2	2:37	25.6
Inversion	Vocab.	6.4	0.3	3:02	18.7
Overhead				0:19	2.5
Total		10.6	0.5	5:58	46.8
Pass 2:					
Comp.	Text	605.1	29.4	3:27	25.6
	Doc. map	2.8	0.1		
Inversion	Index	132.2	6.4	5:25	162.1
	Index map	2.1	0.1		
	Doc. lens	2.8	0.1		
	Appr. lens	0.7	0.0		
Overhead				0:23	2.5
Total		745.8	36.3	9:15	190.2
Overall		756.4	36.8	15:13	190.2



## (Ex:) Results

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Task	Size (Mb)	CPU (Hr:Min)	Memory (Mb)
Pass 1:			
Compression	4.2	2:37	25.6
Inversion	6.4	3:02	18.7
Overhead		0:19	2.5
Total	10.6	5:58	46.8
Pass 2:			
Compression	607.9	3:27	25.6
Inversion	137.8	5:25	162.1
Overhead		0:23	2.5
Total	745.8	9:15	190.2
Overall	756.4	15:13	190.2

The overall size of compressed index and text is 36.8% of the size of the indexed data.

# Checking an illustration

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Does it illuminate a major point?

Is it self-contained?

Is it uncluttered with plenty of open space?

Is all of the text legible?

Is all of the text horizontal?

Is it well-reproduced or blurred and distorted?

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Speak clearly, use a natural tone; never shout.

If there's no microphone, breathing and practice will help you get enough volume.

If there is a mike, manage the volume and don't pop or howl.

Speak somewhat slowly – say 500 words in 3 minutes.

Avoid speaking in a monotone.

Show your enthusiasm, but don't gush or gibber.

Overemphasize consonants.

Pause occasionally.

Minimize your verbal static (yep, um, I mean, err).

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Keep your head up, face the audience, make eye contact.

Body language is important:

- ▶ Relaxed expression, casual (but professional) manner.
- ▶ Appropriate dress. Seek advice if you are concerned, but for an academic talk you are unlikely to need a suit, and it may make you uncomfortable.

If you are not naturally fluent in English, don't worry.

- ▶ 'The international language of science is broken English' (from Ascheron & Kickuth).

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A typical effective presenter speaks as if in a conversation with interested friends.

Neither a formal style (e.g., an after-dinner speech) nor showiness and exaggeration (e.g., an advertisement) are appropriate.



# Delivery of a talk

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Have something ready for discussion, in case there are no questions – perhaps the detail of a skipped point. (Or cheat – prime a friend with a question you'd like to have asked.)

Pick friends to make eye contact with (keeps you in touch with the audience), look around.

Avoid distracting mannerisms, e.g. pacing or gesticulating, but don't freeze.

Be casual, relaxed, lively.

Vary what you are doing: use the whiteboard, walk away from the lectern and talk to the audience directly.

Take off your watch.

Expect to be nervous – make use of the adrenaline as a source of energy.

# Other speakers

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Experienced speakers may:

- ▶ Tell jokes, tell anecdotes.
- ▶ Use their experience as a lesson, e.g., talk about a stuff-up.
- ▶ Use props, play-act.
- ▶ Not use slides.
- ▶ Walk into the audience and ask questions.
- ▶ Play with the audience – use games, reveal misconceptions.

These are skills that the speakers have learnt gradually over a long time.

# Audience issues

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Your goal is to establish a bond with the audience.

Avoid things that build barriers:

- ▶ Reading from notes or slides.
- ▶ Opening with an apology (which can sound like a boast or a plea for approval).
- ▶ Getting between the projector and the screen.
- ▶ Acting cool, laid-back, hip, jokey, matey.
- ▶ Timidity: mumbling, not looking up, facing the wrong way.
- ▶ Telling jokes at which nobody laughs.
- ▶ Changing slides several times per minute.
- ▶ Scratching, fiddling, fidgeting, jangling keys, pacing.
- ▶ Showing off, being grandiose, overgeneralizing.
- ▶ Proof by repeated assertion.

That is, don't send negative messages about you & your work.

# Audiences

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Listeners who look sleepy may be concentrating.

Audience silence can be disconcerting but it is a good sign.

The audience wants to enjoy your talk – their attitude is positive.

People have different reasons for attending; they may discover that your talk is irrelevant to them, and lose attention. This does not mean that the talk is going badly.

Listeners (mostly) understand, and allow for, the differences between novice researchers and experienced professors.

Talks have logical structure – convey it to the audience.

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Pay attention to people's expressions. If they seem lost, ask them, or pose a concrete question.

Try and revisit problematic material from a different angle.

Stress important points, and summarize at changes of topic. Use backward and forward references, signposts, and summaries, to explain how current topic relates to rest of talk.

If you skip important detail, say so.

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Peers: provide interest and encouragement; will be supportive and sympathetic.

Supervisors: use a presentation as an opportunity to understand how thoroughly you have grasped the subject, and to help you work on aspects that are not yet strong.

Others are a wide mix:

- ▶ Self-important people who just like to ask questions.
- ▶ Habitually questioning or negative (but may nonetheless be impressed or interested).
- ▶ Genuinely curious about the work.
- ▶ Egotistical, hung-over, excitable, irritable, exhausted, ...
- ▶ Attending a talk to avoid other responsibilities.



# Questions

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Honest replies to difficult questions:

- ▶ That idea is new to me.
- ▶ Perhaps we can discuss it afterwards.
- ▶ I need time to think about that one.

Don't try to bluff the audience – you will look stupid.

Some questions are dumb (red herrings, misunderstandings), even from smart people. All answers should be respectful.

Keep answers brief; don't debate with an audience member.

Handle distractions politely; never be dismissive or rude.

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Rehearse! In front of a mirror? (But don't memorize)

Get someone to give you feedback – and pay attention to what they tell you.

For a talk, time yourself and note what point you expect to reach at 5, 10, 15 minutes, to help you finish on time.

Think about possible questions.

Familiarize yourself with equipment.

Remember:

- ▶ Spontaneity takes practice.
- ▶ Anxious preparation leads to a confident talk.

## Research Presentations

Justin Zobel

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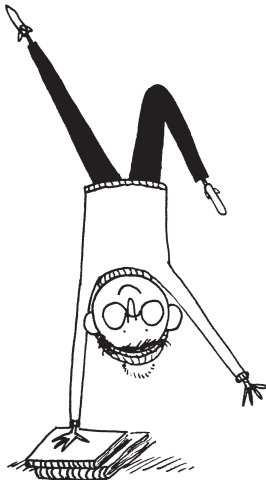


Image courtesy Anna Zobel