How to give a good maths talk

Euan Spence

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These are the slides from the talk, annotated with some of the things I said (which appear in boxes like this one).

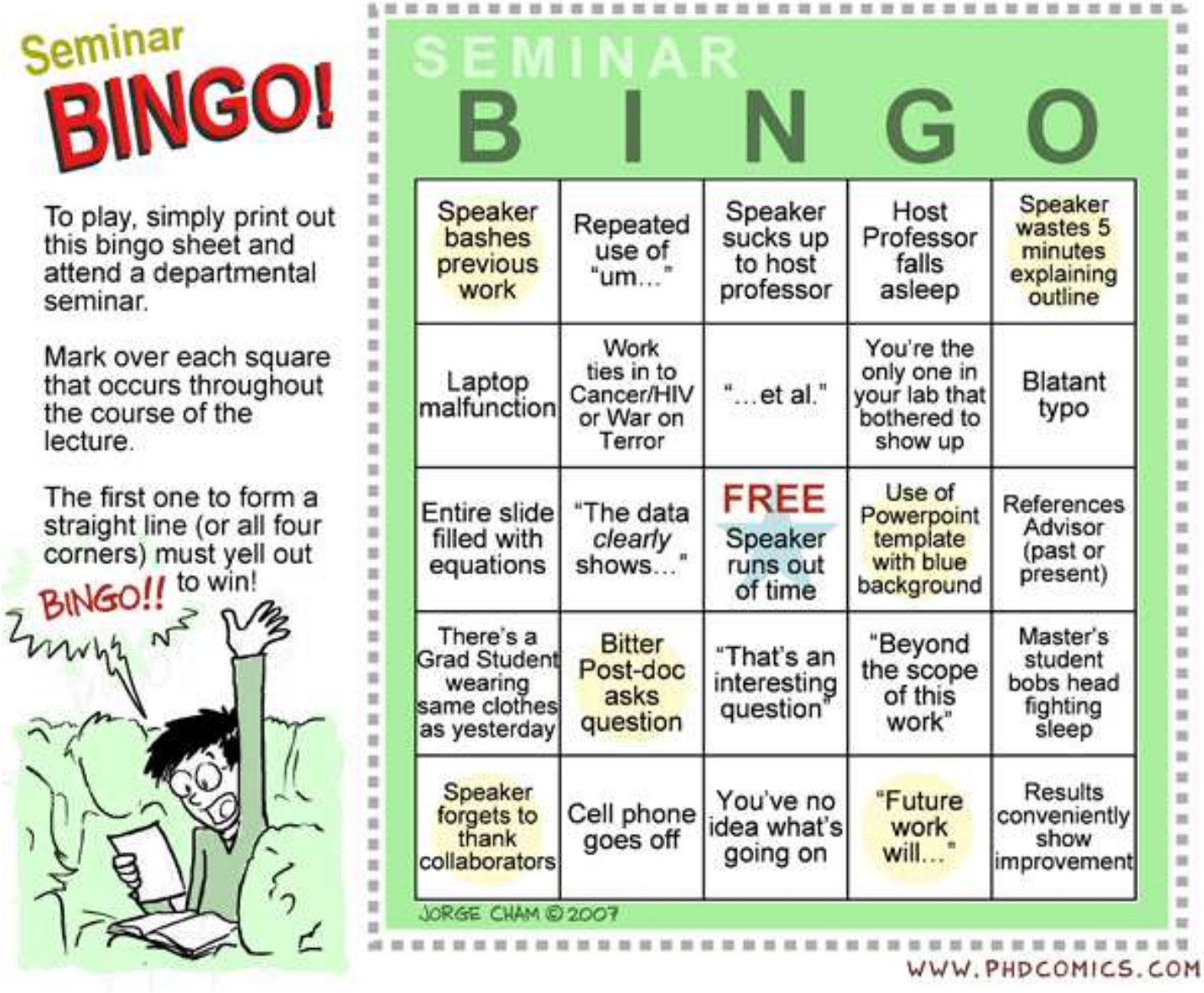
My only qualification...

+ bad talk =

Maths talks: how I see the landscape

- You will have to give a maths talk at some point
- The majority of maths talks are not very good (some are terrible!) and everyone knows this

Exhibit A



(legal bit) "Piled Higher and Deeper" by Jorge Cham www.phdcomics.com

Exhibit B

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Exhibit C

The last 3 talks you attended:

1. What general area was the talk about?
2. What was the specific problem? (and why is that problem interesting?)
3. What was the main message of the talk?

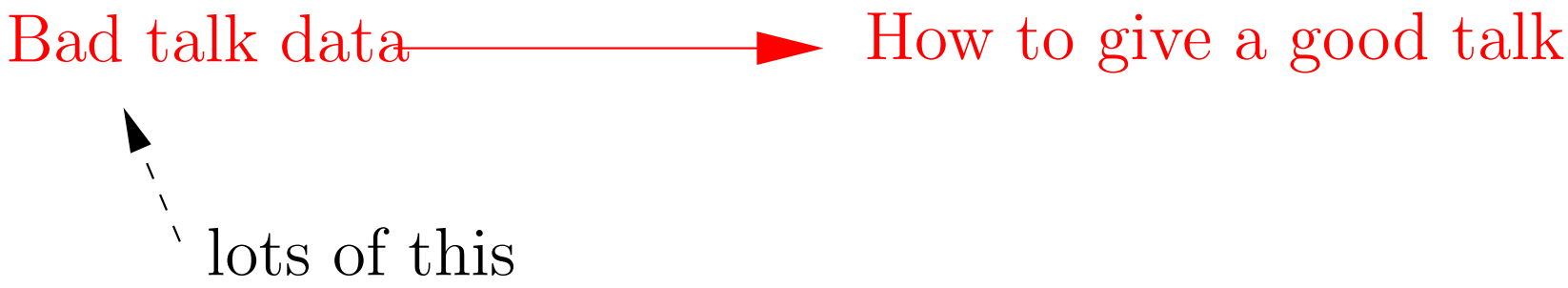
Most people find it hard to answer Questions 2 and 3 on the previous slide!

Maths talks: how I see the landscape

- You will have to give a maths talk at some point
- The majority of maths talks are not very good (some are terrible!) and everyone knows this
- (Plus side: any moderately good talk will stand out from the crowd)
- Giving a good talk is not rocket science....
  ...but requires effort and careful judgement (gets easier with practice)

The great conundrum of maths talks is that, on the one hand, the advice everyone gives about how to give good talks is simple and seems pretty obvious in hindsight (especially when you have to stand up in front of an audience and tell it to them!) but, on the other hand, many (otherwise clever) people inadvertently "sleepwalk" into giving bad talks.

"Inverse Problem"



Try solving it yourself

Why give a talk?

A range of practical reasons....

- "My supervisor told me to."
- "Someone asked me to."

...and a range of different goals....

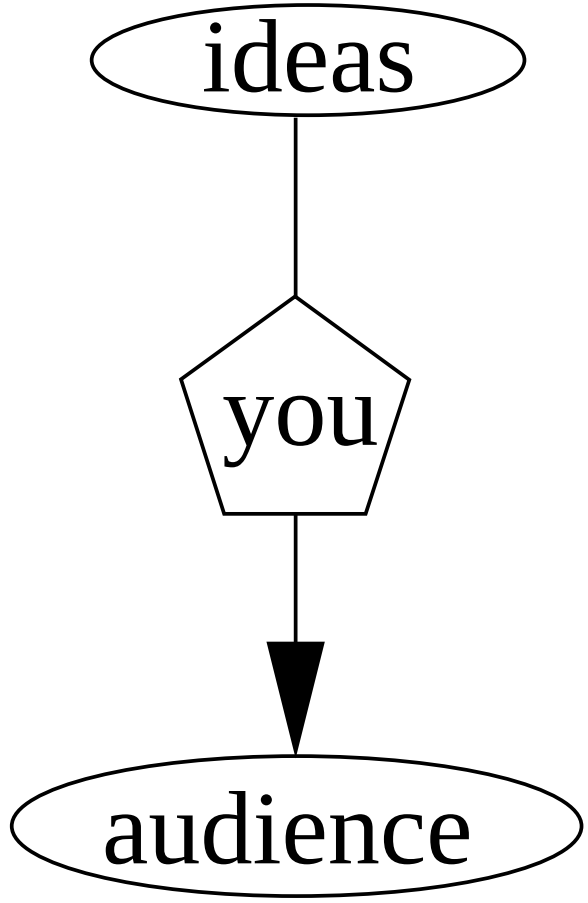
- "Not look like an idiot!"
- "Show everyone how clever I am."
- "Get a job!"

When planning and giving the talk your only goal should be

to communicate ideas

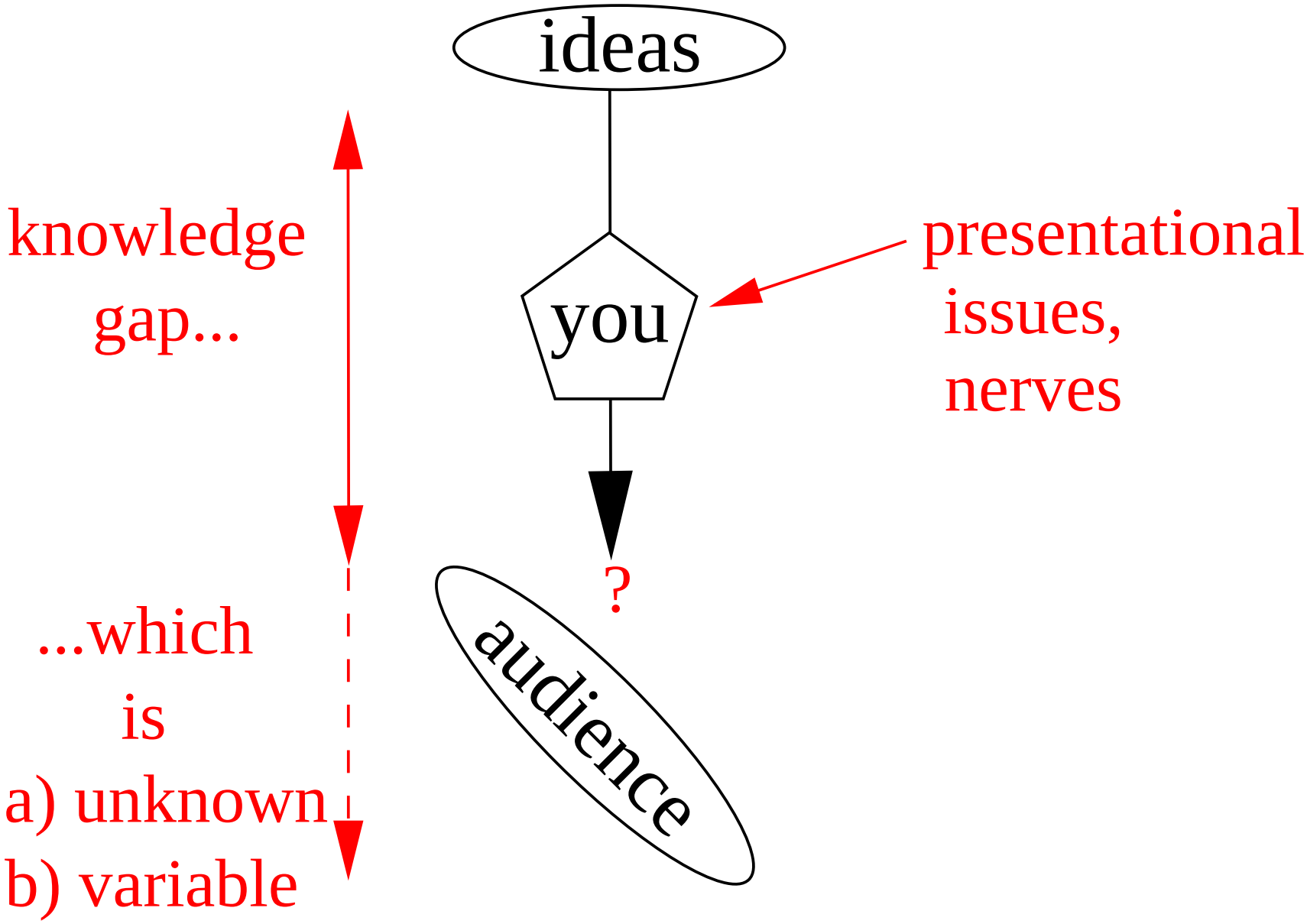
(can still achieve other goals as a by-product)

Diagram of a talk



Simple, right?

The reality...


ideas
you
?
audience
knowledge gap...
...which is a) unknown b) variable
presentational issues, nerves

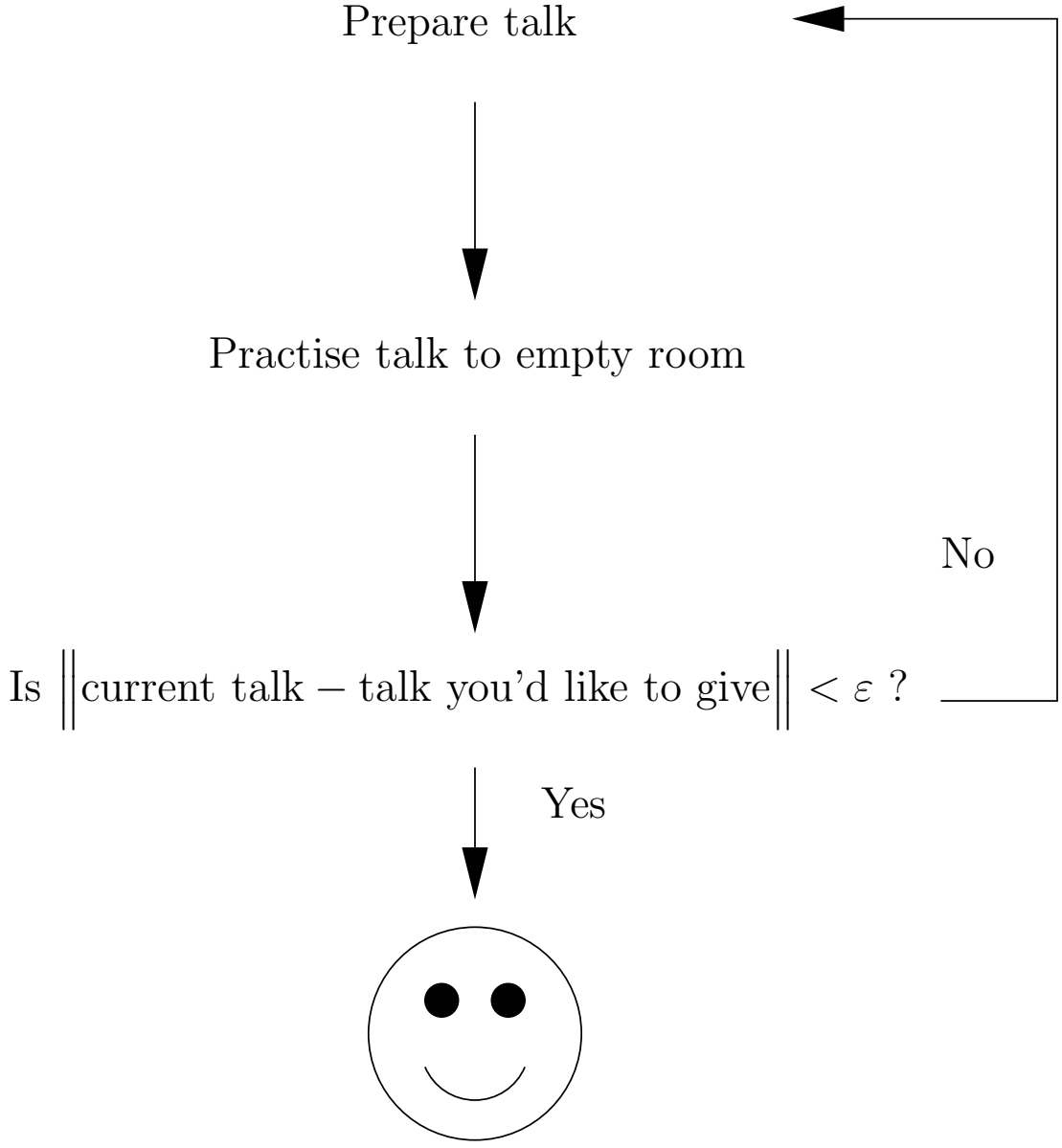
Euan's anti-bad-talk magic bullet [1]

Give yourself enough time to prepare

"Failing to prepare is preparing to fail."

[1] patent pending, all rights reserved, contents may have settled during transit

An (almost) foolproof algorithm:



(algorithm needs enough time to run)

One important point regarding time:

The last couple of slides have emphasised giving yourself enough time to prepare a talk. However, many people (especially those giving a talk for the first time) start preparing a talk early and then spend a lot of time (sometimes far too much) on it.

If you find yourself having spent a lot of time preparing a talk but with not much "talk" to show for it, I recommend the following: pretend you are giving the talk the next day and set yourself a time when you will deliver it to an empty room. In the time before then, prepare the best talk possible and then give the talk to the empty room at the allotted time. (When preparing this "mock talk", if you come across things you're not happy with and want to improve but don't have the time, just make a note of them, and, if you're giving a talk with slides, don't worry about making the slides with beamer, just handwrite them for now.)

After having done this exercise you should hopefully

(a) feel more confident, as you now know you can at least give some form of talk when the time comes,

(b) be much more aware of the areas of the talk you need to work on (e.g. any gaps in your knowledge or parts of the talk you need to explain better).

Rest of today's talk:

- (Typical situation: you're giving a talk about your research)

1. Big-picture (choosing your message)
2. Smaller-scale (maximising the chances your message gets across)
3. The talk itself (presentational issues)
4. "The audience strikes back" (handling questions)

"Big picture"

Ask yourself 3 questions:

1. Who are the audience?
2. What do I want to tell them? (and what do they want to hear?)
3. What can I *realistically* communicate to them in the time given?

2 common "big picture" stumbling blocks

1. Temptation to pitch talk to expert in the room and ignore everyone else

2. You feel you have to talk mostly about YOUR research

No "one-size fits all" solution, but

- be realistic about who will understand what
- try to make sure everyone comes away with something from your talk
- "do the math" with the time your audience are investing in you

“Trial by graduate student”

This analogy is due to Marj Batchelor:

> *"While travelling in Strange Places you find yourself apprehended by the unscrupulous regime in power there, accused of unspecified crimes and thrown in prison to await trial. The method of trial under that regime is known as Trial by Graduate Student. The procedure is as follows:*
>
> *You are set a topic and allowed a week to prepare, at the end of which you will be given one hour in which to explain some significant result to a graduate student who is certainly no cleverer, and possible slightly less well prepared than yourself. At the end of the hour, he (not you) will sit an exam on the subject. Should he fail, you (not he) will be shot at dawn.*
>
> *Now you can see the need to be concise, to avoid introducing unnecessary complications, to provide memorable examples, to make sure that your talk is aimed at the right level; in short, to communicate efficiently."*

All the advice on the next few slides can be seen as simple consequences of trying to communicate as if your life depended on it.

How to maximise the chances of your message getting across (1/3)

Tell a good story

.....but make it a good *maths* story

Crustacean style

- structure on outside
- good for maths talks

Vertebrate style

- structure hidden inside
- good for detective stories

How to maximise the chances of your message getting across (2/3)

- Remember

$$\max\left(\begin{array}{l}\text{rate you can}\\ \text{communicate info}\end{array}\right) \gg \max\left(\begin{array}{l}\text{rate audience}\\ \text{can absorb info}\end{array}\right)$$

- *"A good mathematics lecture is an exercise in self-restraint"*
  Steven Krantz ("A primer of mathematical writing")

- Do they NEED to know?

- *"Only wimps do the general case. Real teachers tackle examples."*
  Beresford Parlett

Regarding the "fundamental inequality" on the last slide: the key feature of giving a talk on the black/whiteboard is that it brings down the left-hand side (or at least the rate you can communicate *written* information) to the same order of magnitude as the right-hand side.

How to maximise the chances of your message getting across (3/3)

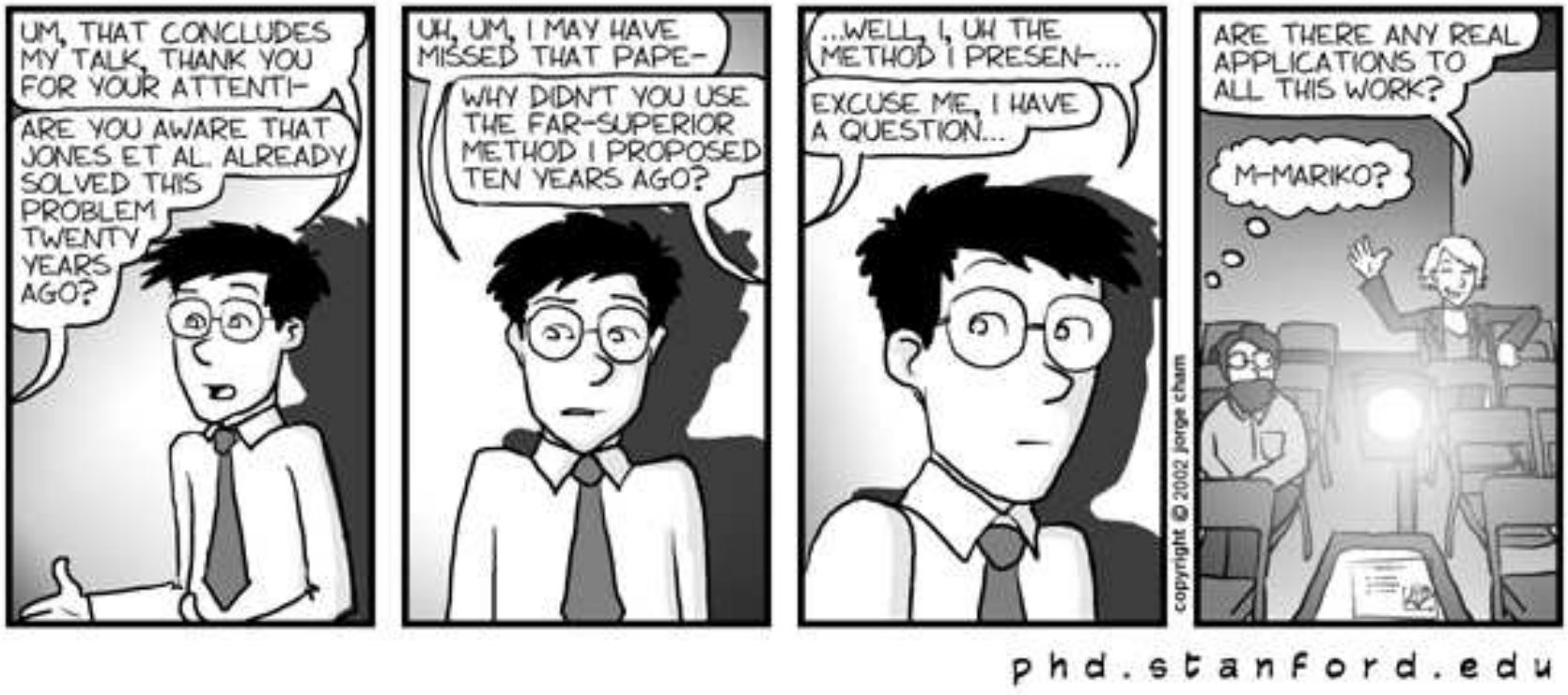
- Expect the audience to get lost $\rightsquigarrow$ use
  - outlines
  - recaps
  - "take home message"

- Sign post:
  - "the main point of all this is...."
  - "summary so far...."

The talk itself

- (Practising beforehand makes this much easier)
- Talk clearly
- Look at (!) and engage with the audience

Questions



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Questions

Why do people fear questions?

- Afraid someone is going to say your work is rubbish/been done before
- Afraid someone is going to ask a question that you don't know the answer to

How to combat this?

- Don't say anything in the talk that you're not sure of
- Don't be afraid to clarify the question.
- Be completely honest...
- ...but don't automatically assume the questioner is right!

Questions = feedback, any kind of feedback is good

A wise man once said....

"With great power comes great responsibility" (Spider-Man)

"With great time-wasting power comes great talk-giving responsibility" (ES)

The converse: realising this talk-giving responsiblity can give you great(er than expected) communication power

Final thoughts

- Whatever you do after your PhD, being able to communicate well and give good talks will be valuable skills.
- You get better at giving talks by giving talks!

$\Longrightarrow$ Give lots of talks

- Postgraduate Seminar Series = great opportunity

The next slide gives a list of books/talks/essays about maths-specific communication that I've found useful over the years. (There's a lot of good advice out there, but out of the resources I've personally come in contact with, I found these the most useful.) To find them, just type the names of the authors and the titles into Google.

Resources on maths-specific communication

- "A primer on mathematical writing" by Steven Krantz
- "Handbook of writing for the mathematical sciences" by Nick Higham
- "How to make sure your talk doesn't suck" by David Tong
- "Crustacean style" and "Trial by graduate student" from Marj Batchelor
- "How to write a paper?" by Arieh Iserles