How to give a good maths talk (a personal view)

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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).

Goals of this talk

1) discuss what makes a good maths talk

2) discuss common obstacles to giving good talks

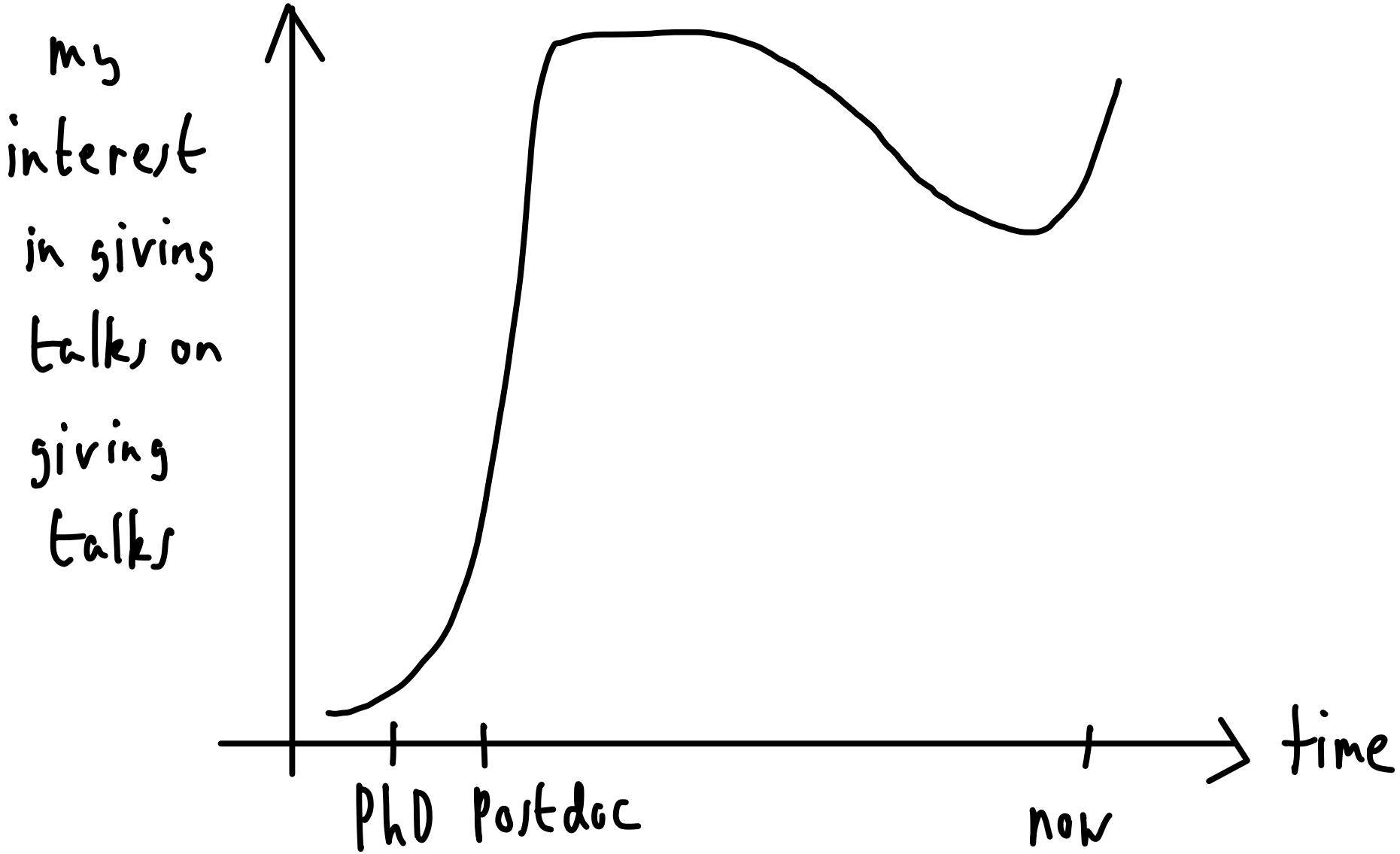
3) give you some tools you can use to overcome these obstacles

How did I start giving talks on giving talks?

+ bad talks =

↑

me as a PhD student


my interest in giving talks on giving talks
time
PhD
Postdoc
now

Maths talks: how I see the situation

- you will have to give several (many?) maths talks
- lots of maths talks are not very good, and everyone knows this

"Piled Higher and Deeper" by Jorge Cham www.phdcomics.com

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Maths talks: how I see the situation

- you will have to give several (many?) maths talks
- lots of maths talks are not very good, and everyone knows this
- (plus side: good talks stand out!)
- giving a good talk getting harder because

increasing specialisation $\Rightarrow$ larger knowledge gaps to bridge

My definition of a good talk

good maths talk = successful communication of ideas to audience

(corollary: the same talk can be good / bad depending on the audience!)

Almost all good advice in life:

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simple, but not easy

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're asked to stand up in front of an audience and talk about it!) but, on the other hand, many (otherwise intelligent) people inadvertently "sleepwalk" into giving bad talks.

The 3 key questions

Q1. who are the audience?

Q2. what do I want to tell them
(and what do they want to hear)?

Q3. what are the constraints
(on time, on delivery)?

use answers to formulate realistic plan
for talk

Issue 1

diverse audience

(i.e. range of answers to Q1)

Issue 2

you might not like the answers to Q1, Q2, and Q3!

Issue 3

communication of ideas is sometimes not the only goal

e.g. job talks

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difficult maths $\Rightarrow$ hard to understand

$\neg B \Rightarrow \neg A$

easy to understand $\Rightarrow$ easy maths (?)

The risk that if the audience understand everything in your talk then they'll think that it was easy is a genuine one.

Indeed, Nick Trefethen talks in his "index card" book (in the essay "Shrinking the diameter of intellectual space") on how he thinks his early career was hampered by the fact that he tried to make his contributions easy to understand (in both talks and papers).

Personally, I've found that trying to make my work easy to understand has uniformly helped my career, but what you communicate to your audience in the last third (say) of a job talk requires careful consideration.

Issue 4

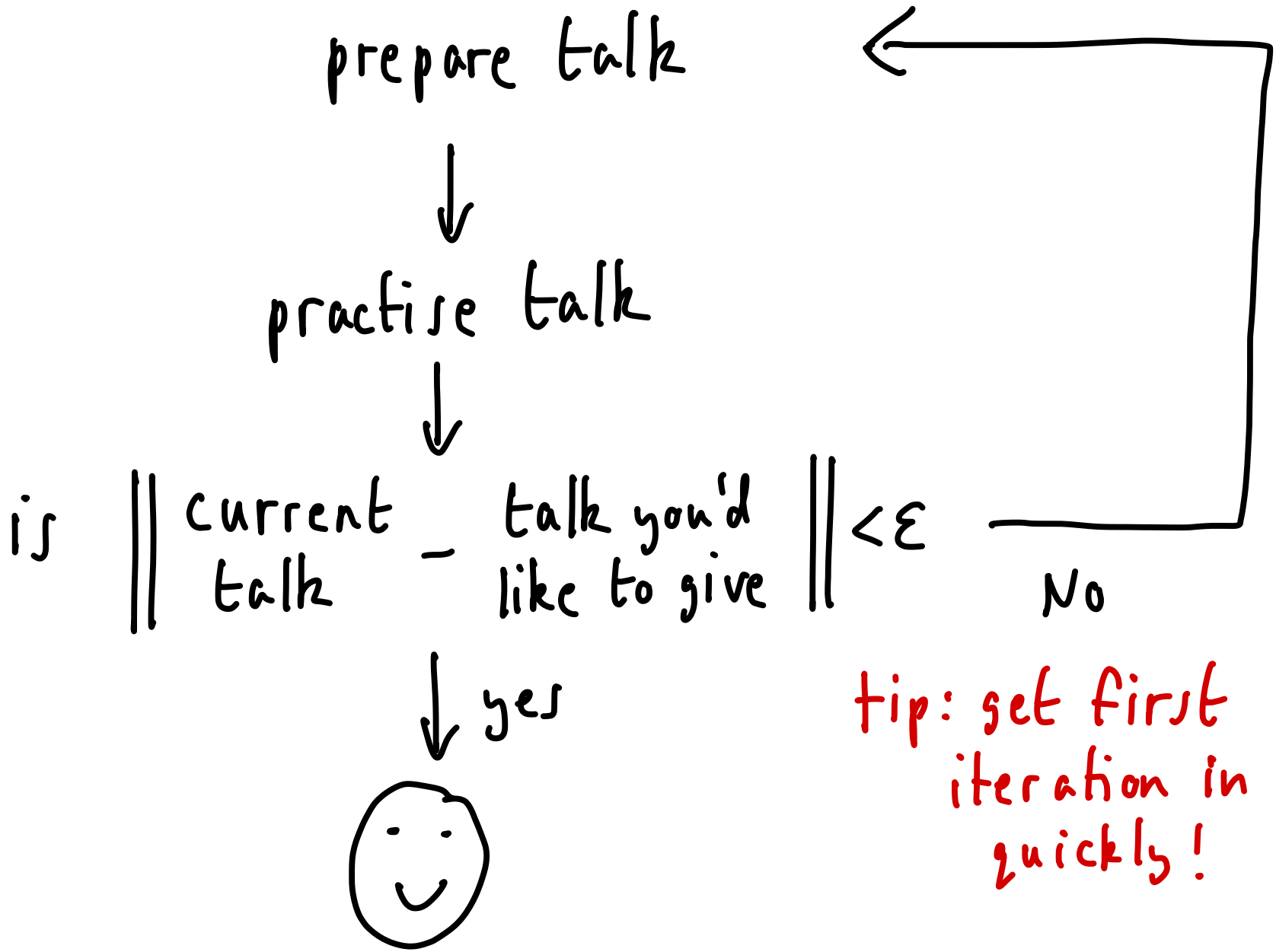
preparing talks (especially to non-experts) sometimes exposes gaps in your own knowledge

Issue 5

fear!

- about delivery
- about questions

An (almost) foolproof algorithm



tip: get first iteration in quickly!

Regarding the "tip: get first iteration in quickly!":

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, just handwrite them on paper for now.)

After having done this exercise you should hopefully

(a) feel more confident, since 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).

Questions

"Piled Higher and Deeper" by Jorge Cham www.phdcomics.com

Issue 5 fear!

- about delivery
- about questions

tips:
- take time to understand the question (e.g. ask a clarifying question)
- be completely honest...
- ... but don't automatically assume the questioner is right!

The advice given in this talk

- three questions

  Q1. who are the audience?

  Q2. what do I want to tell them (and what do they want to hear)?

  Q3. what are the constraints (on time, on delivery)?

- three tools / concepts to bear in mind

Concept 1: tell a good story

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... but make it a good <u>maths</u> story

Crustacean style

- structure (skeleton) on outside
- good for maths talks

Vertebrate style

- structure hidden inside
- good for detective stories

Concept 2: a fundamental inequality

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

"A good mathematics lecture is an exercise in self-restraint"

Steven Krantz ("A primer of mathematical writing")

"Only wimps do the general case. Real teachers tackle examples."

Beresford Parlett

Ask yourself: do they NEED to know?

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.

Concept 3: "trial by PhD student"

The following analogy (due to Marj Batchelor, from whom I also learnt about "crustacean style") illustrates the importance of the question "Do they NEED to know?".

> *"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."*

Much of the advice in these slides can be seen as simple consequences of trying to communicate as if your life depended on it.

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Power and responsibility

"with great power comes great responsibility"

Power and responsibility in talks

with great time-wasting power comes great talk-giving responsibility

Power and responsibility in talks

Realising this talk-giving responsibility can lead to great(er than expected) communication power

If you only remember one thing from this talk...

Q1. who are the audience?

Q2. what do I want to tell them (and what do they want to hear)?

Q3. what are the constraints (on time, on delivery)?