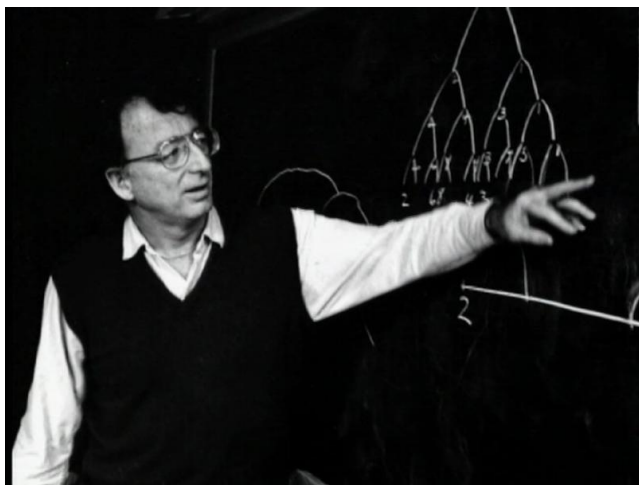


HOW TO GIVE A MATH TALK

Christopher Bishop, Stony Brook
Professional Development Seminar, 10-19-2023

www.math.sunysb.edu/~bishop/lectures



Actually, I don't know how **you** should give a good talk.

I can only explain how I give talks.

I hope some of these ideas will be helpful.

- Know your material.
- Know your audience
- Get to the point.
- Prepare and practice.
- Time management.
- Learn from the masters.
- Be yourself.

Who is the audience?



Who is the audience? Simplify appropriately.



Your lecture is a bridge between what the audience already knows and what you want to tell them.

Don't lose the non-experts. The experts won't mind feeling superior.

I will focus on research talks, not teaching or outreach.

Seminar or colloquium?

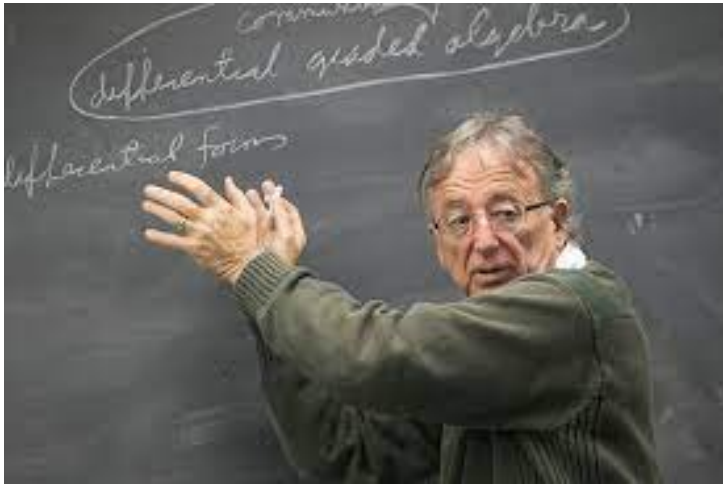


Seminar or colloquium?

- Accidentally giving a colloquium at a seminar is fine.
- Accidentally giving a seminar at a colloquium is a disaster.

Personally, I give the colloquium version no matter what schedule says.

Chalk or slides?



Chalk or slides?



Chalk or slides?

I like slides for several reasons:

- You can use nicer pictures.
- It forces you to organize your talk ahead of time.
- Can post online, audience can check later for details or references.
- You can face the audience while speaking.
- But, repeat definitions if necessary.

The introduction.



The introduction.



Peter Falk as Lt. Columbo, NBC 1971-1978, ABC 1989–2003

The introduction.

“Say what you will do. Do it. Say what you did.”

- Most important part of the talk. Make a good first impression.
- Work on it last.
- Memorize your opening lines.
- Start where you want to end. Come back with details later.

How much should I prepare?



How much should I prepare? A LOT.



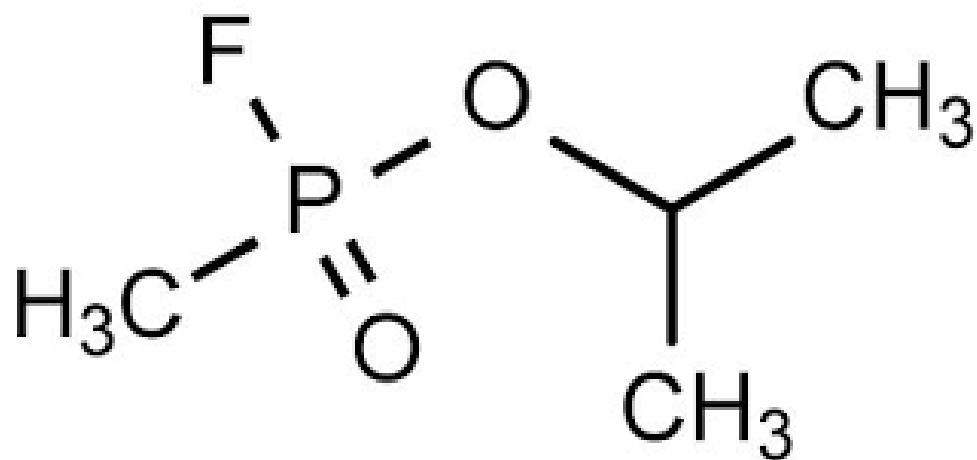
How much should I prepare?

- I spend 20-40 hours preparing a new talk. More for oft repeated talks.
- I revise a lecture each time it is given.
- Improve weak sections. Add “local color”.
- Practice. Try recording your talk and playing it back.

Should I use pictures?



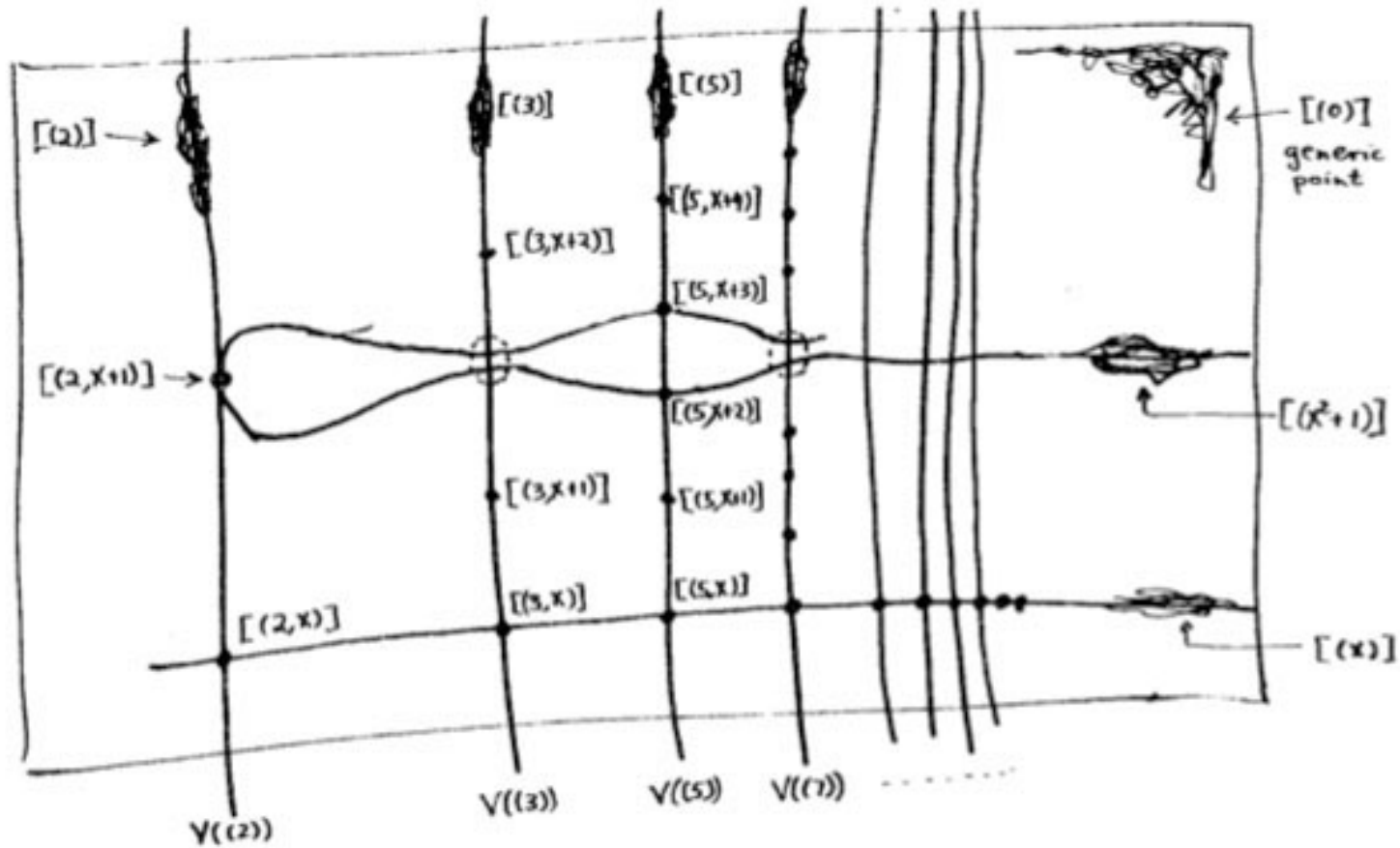
Should I use pictures?



Should I use pictures?

Yes, on every slide if this makes sense for your topic.

- (1) It is easier and more fun for the audience.
- (2) It is better for you, because you can convey more.
- (3) Harder in some areas. Use diagrams, book covers, photos,...



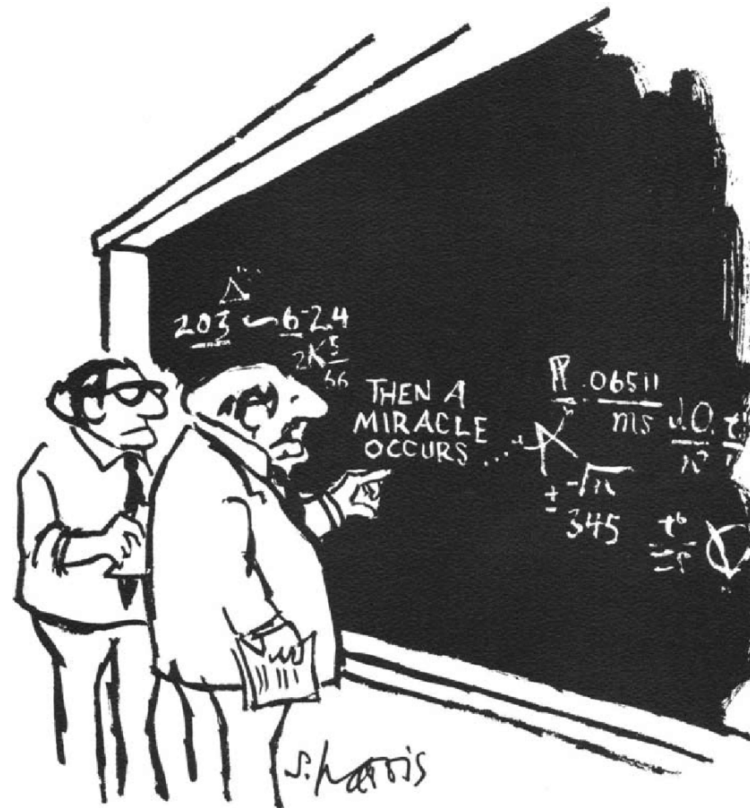
David Mumford's Treasure Map

“The affine scheme of the ring $\mathbb{Z}[x]$ of all integral polynomials”

Use careful formatting and colors in a formula

$$\begin{aligned} f_{\bar{z}}(w) - \mu(w)f_z(w) &= [f_{\bar{z}}(w) - (f_n)_{\bar{z}}(w)] \\ &\quad + [(f_n)_{\bar{z}}(w) - \mu_n(f_n)_z(w)] \\ &\quad + [\mu_n(w)(f_n)_z(w) - \mu(w)(f_n)_z(w)] \\ &\quad + [\mu(w)(f_n)_z(w) - \mu(w)f_z] \\ &= I + II + III + IV. \end{aligned}$$

Should I include a proof?



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Should I include a proof?

- Conventional wisdom is that a math talk should contain a proof.
- Consider doing an easy case.
- Sketching the main idea is OK.
- Differentiate between what was known and what is new.

How can I make my result seem important/interesting?



How can I make my result seem important/interesting?

- State it clearly and concisely (if possible).
- Cite special cases that are already new results.
- State famous theorems that are special cases.
- Connect to well known earlier work or researchers.
- Cite connection to famous conjecture.

“We characterize bounded pseudo-widgets in terms of their critical points”

“Our result would follow if Hilbert’s Grand Unified Widget Conjecture (GUWiC) were true.”

“Pseudo-widgets on the unit circle are bounded iff the critical points are all inside the unit disk. Sufficiency in this case is new. Necessity was proven by Von Neumann (Annals Math. 1955).”

“We will discuss the case of the circle in detail, and later sketch the general case, where only one new idea is needed.”

Make sure to cite any relevant local mathematicians.

Stop on time.



Stop on time.

- Very important. Don't leave a bad impression after a good talk.
- Your talk can have more than one ending point.
- Plan a shorter talk, and add some extra slides, just in case.
- Have slides that you can skip if needed (hyperlinks are useful).

To use hyperlinks, place the following in the preamble:

```
\usepackage[colorlinks=false]{hyperref}
\usepackage{xcolor}
\hypersetup{
  colorlinks,
  linkcolor={black},
  citecolor={blue!50!black},
  urlcolor={red!80!black}
}
```

Make the word “hyperlink” the what you click on:

```
... needed (\hyperlink{jump2}{hyperlinks} are ...
```

Place target to jump to a top of desired page:

```
\hypertarget{jump2}{}
```

Before the talk, I read the slides and write down the timing:

<i>3:00</i>	<i>2</i>	<i>Discuss plan for lecture</i>
<i>3:02</i>	<i>3</i>	<i>Audience</i>
<i>3:05</i>	<i>2</i>	<i>Seminar or colloquium</i>
<i>3:07</i>	<i>5</i>	<i>Chalk or slides</i>
<i>⋮</i>	<i>⋮</i>	<i>⋮</i>
<i>3:45</i>	<i>5</i>	<i>Video clip 2</i>
<i>3:50</i>	<i>5</i>	<i>Video clip 3</i>

I try to keep an eye on this during talk (but often forget).

Questions from the audience

Questions are compliments. The audience is paying attention.

If being recorded, repeat the question (good idea in any case).

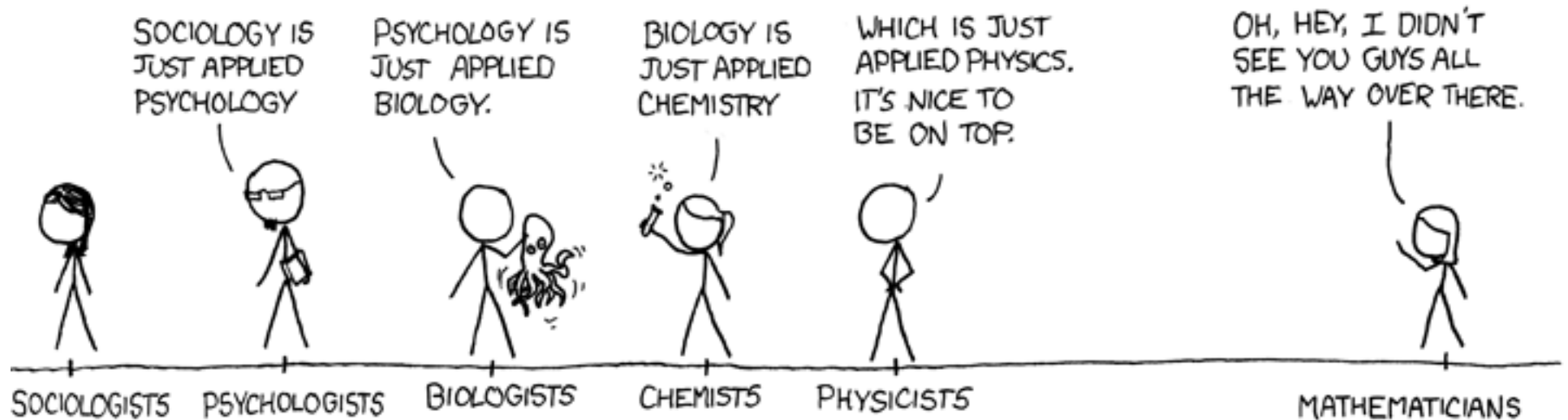
Some possible responses (depending on situation).

- “I don’t know, but that’s a great question.”
- “You’ve already anticipated what I’m going to say later.”
- “It’s too involved to explain now. Can we discuss it after the talk?”

Should I tell a joke?

FIELDS ARRANGED BY PURITY

→
MORE PURE



Should I tell a joke?

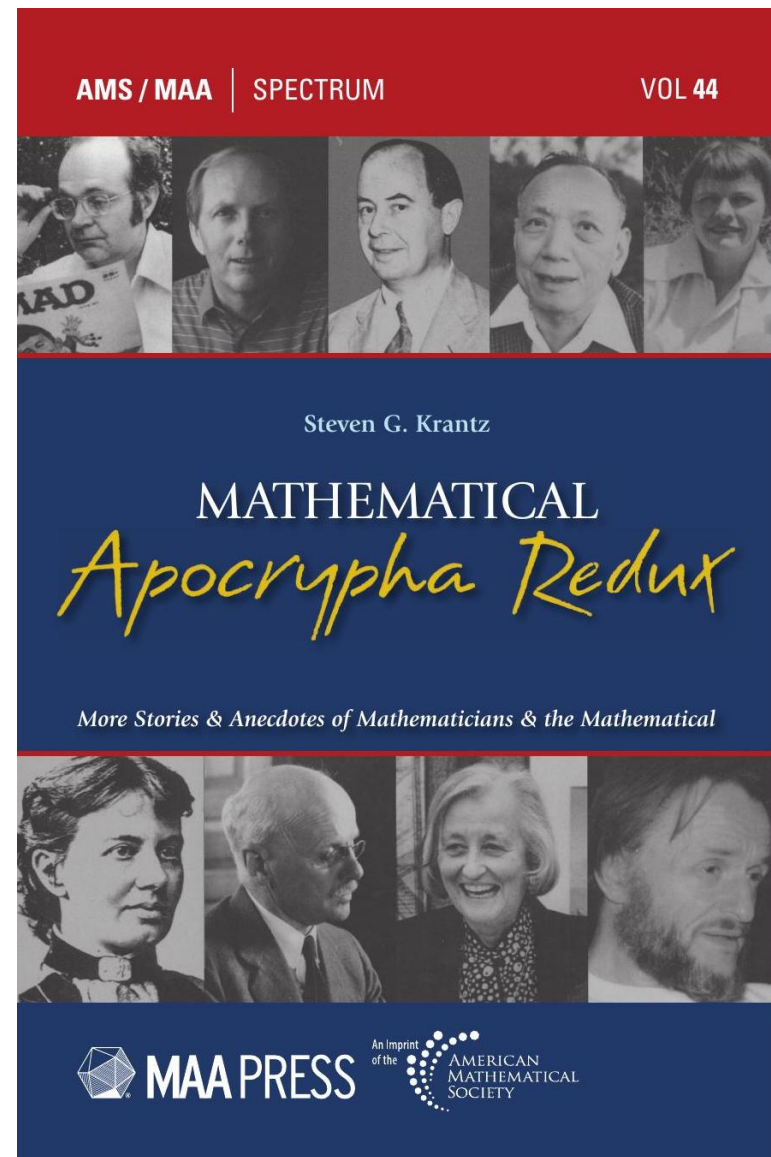
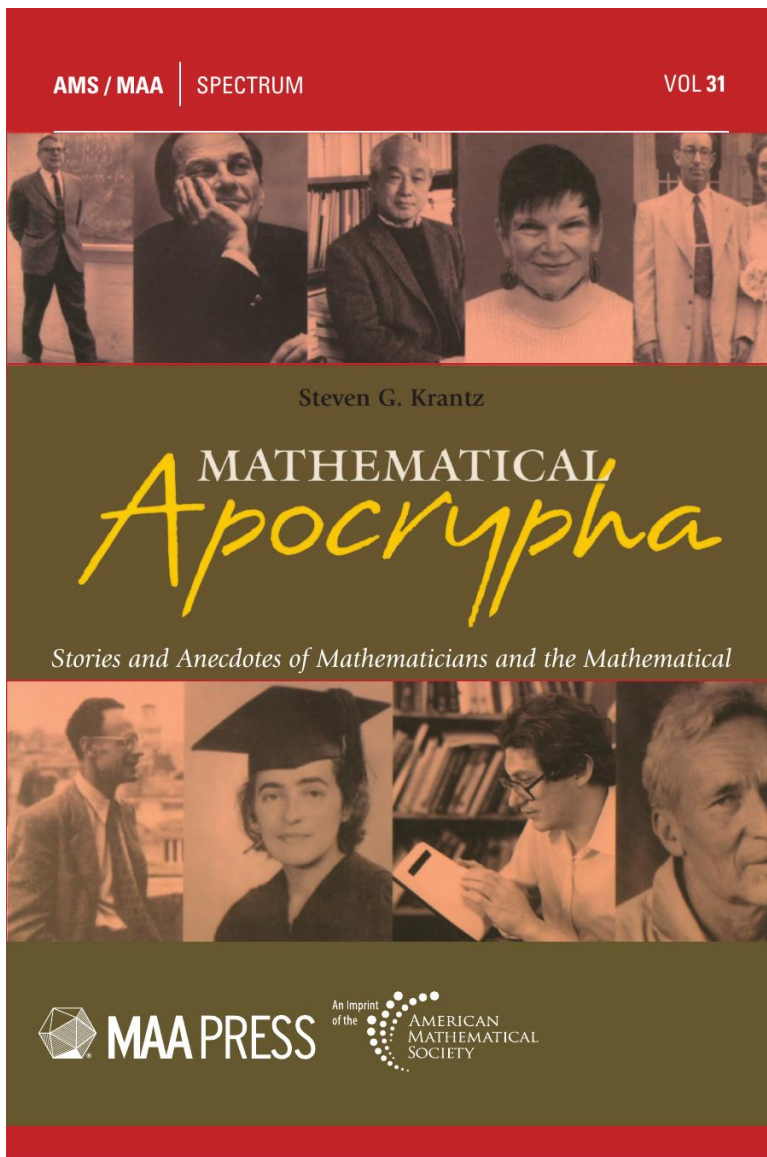
Remember “Dying is easy. Comedy is hard.” – Edmund Gwenn



Should I tell a joke?

Humor is often effective, but don't offend anyone.

Best target is yourself or mathematicians in general.



Collections of math anecdotes by Steve Krantz

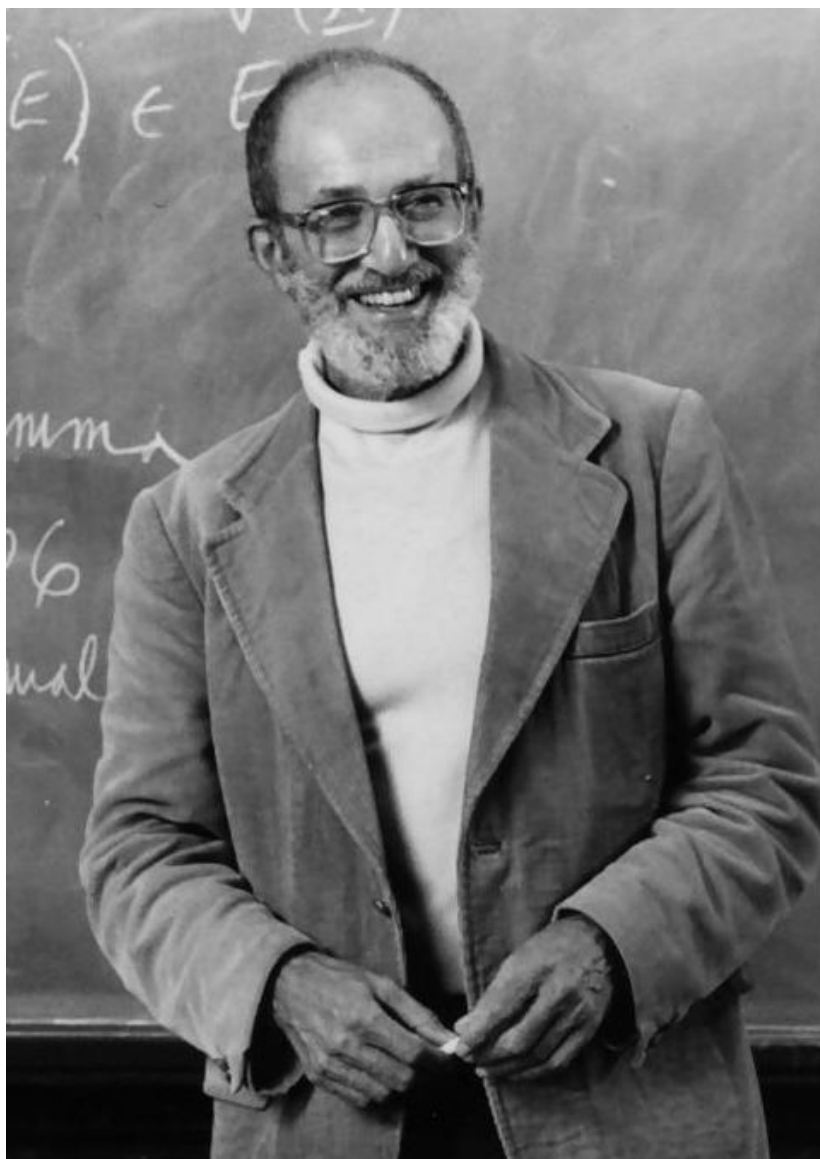
Be yourself (no one can tell if you're doing it wrong).

Be presentable. Dress nicely. Smile.

Get the mechanics right.

Make it a story.

There is lots of advice about giving talks on the internet.



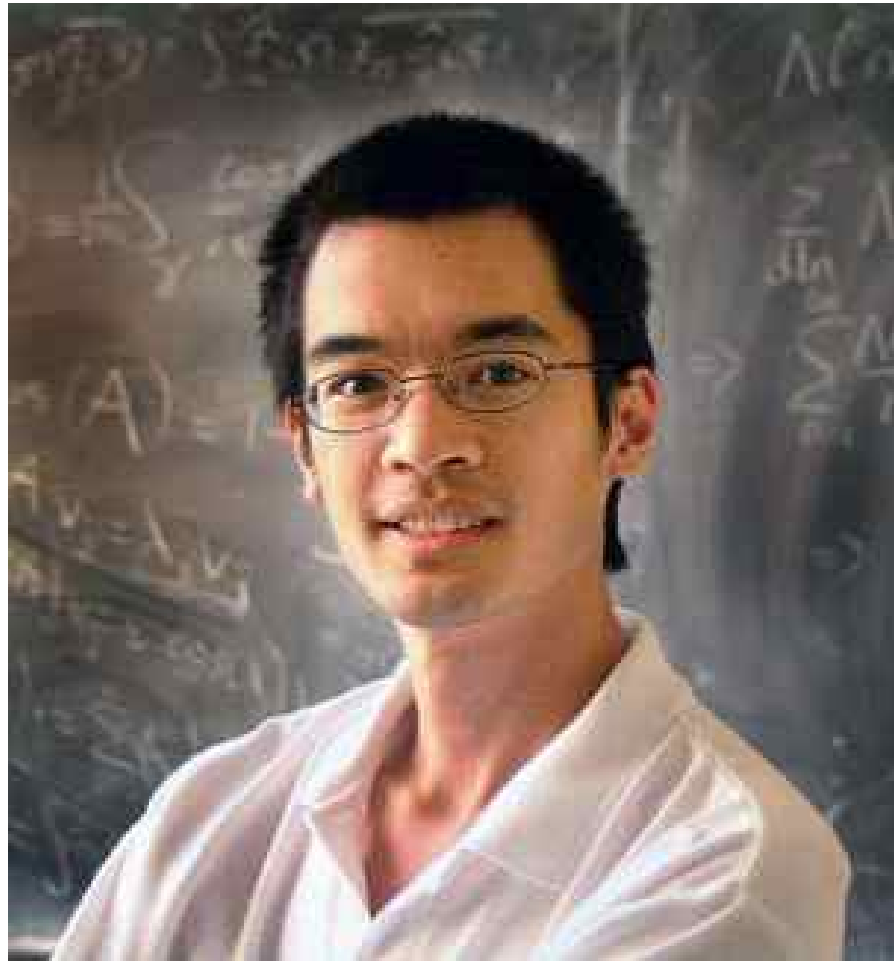
How to talk mathematics, Paul Halmos.

“A good public lecture should be a work of art. ”

“To prepare a talk, the first thing to know is the subject, and very close second is the audience. ”

“The faces in the audience can be revealing and helpful: they can indicate the need to slow down, to speed up, to explain something, to omit something.”

“You must be prepared to omit (or to add) material, and you must be prepared to do so under pressure, in public, on the spur of the moment, without saying so, and without seeming to do so.”



Talks are not the same as papers, Terry Tao

“I have found helpful is to treat mathematical talks as similar to popular performing arts such as film, television, theater, or music, in that the narrative devices such as themes, motifs, plot, etc. play an important role in making the performance memorable and in communicating the key points.”

“A small number of judicious jokes (e.g., somewhat exaggerated analogies with real-life situations, illustrated perhaps with a humorous image or two) can help make the subject of the talk less intimidating.”

How to write mathematics, Paul Halmos.

Talks are not the same as papers, Terry Tao blog

How to give a good colloquium, John McCarthy

Giving a talk, Bryna Kra

How to teach mathematics: Third Edition, Steven Krantz

The (martial) art of giving talks, Matilde Marcolli

How to give a math lecture, Tim Hsu, San Jose State Univ.

What makes a good maths lecture, Alan Slomson, School of Mathematics,
University of Leeds

Letters to a Young Mathematician, by Ian Stewart, 2006

How to give a good 20 minute math talk William Ross, 2008

The Do's and Don'ts of Giving a Math Talk, Adam Van Tuyl, 2011

How does does one give a math talk, Math stack exchange

Some advice on giving a mathematical talk - avoiding the standard mistakes, Agelos Georgakopoulos

Josh's Three Biggest Pet Presentation Peeves,

Technically Speaking, Videos of good and bad speakers

50 tips for preparing and giving math talks, Fathi Ben Aribi

Giving math talks, Anthony Bonato

How to give a good maths talk, Euan Spence 2022

How to Give a Good Talk, Joseph A. Gallian.

Tips for giving math talks, Jordan S. Ellenberg

Next, video showing how I follow (or forget) my own advice.

Clips of introductions. Feel free to watch more later.

Trees, Triangles and Tracts,

Transcendental Dynamics and Beyond: topics in complex dynamics 2021,
Centre de Recerca Matemàtica, Barcelona, April 19-23, 2021.

This is the first lecture of a 2-part series at a conference on holomorphic dynamics. The audience are graduate students, postdocs and researchers in this particular area.

Weil-Petersson curves, knot energies, traveling salesman theorems, and minimal surfaces,

Computational Differential Geometry and its Applications in Physics,
November 17, 2022

This is a lecture at a workshop on machine learning in physics. I am an outsider, so I start by introducing myself a bit; more than I would when I give this talk as a colloquium.

Optimal angle bounds for Steiner triangulations of polygons,
Symposium on Discrete Algorithms (SODA)
Jan 9-12, 2022, Alexandria VA

This is a 20 minute talk at a large computer science conference. I also have an expanded, hour long, version that I give as a colloquium for a pure math audience.