Common advice

and what I think about them

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13th Logic Mentoring Workshop
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About me

Cornell University, USA (2013–2019)

- PhD in mathematics, supervised by Richard A. Shore
- Special masters in CS

Sources: `math.cornell.edu`
`mathtourist.blogspot.com`

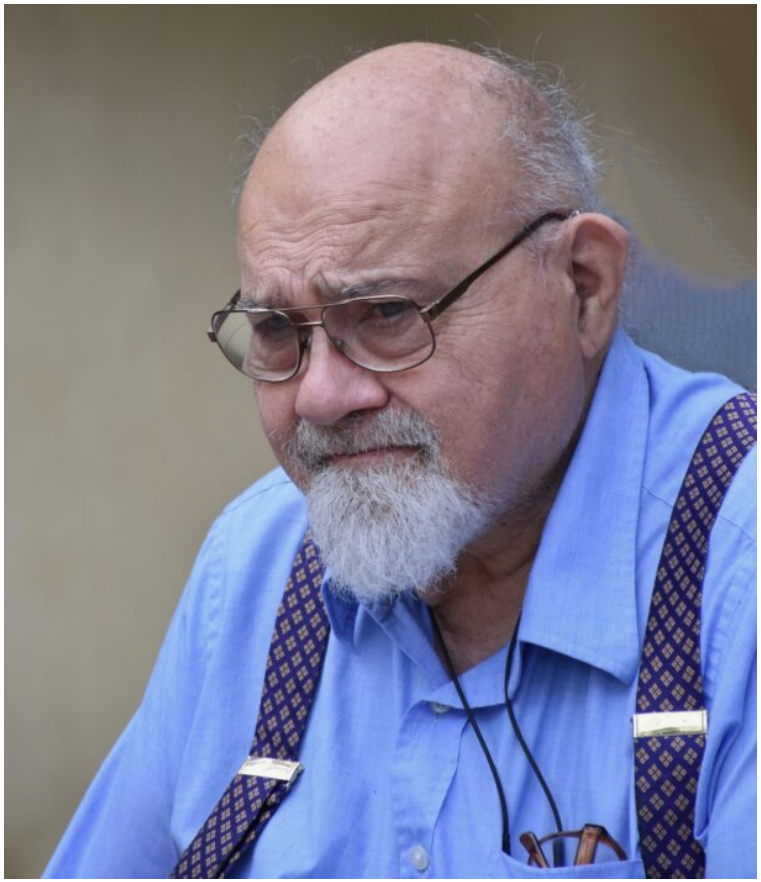
University of Wisconsin-Madison, USA (2019–2022)

- Postdoc, Department of Mathematics, cosupervised by Steffen Lempp and Mariya Soskova

NUS (2022–)

- Tenure-track assistant professor, Department of Mathematics

I. Talking about your research



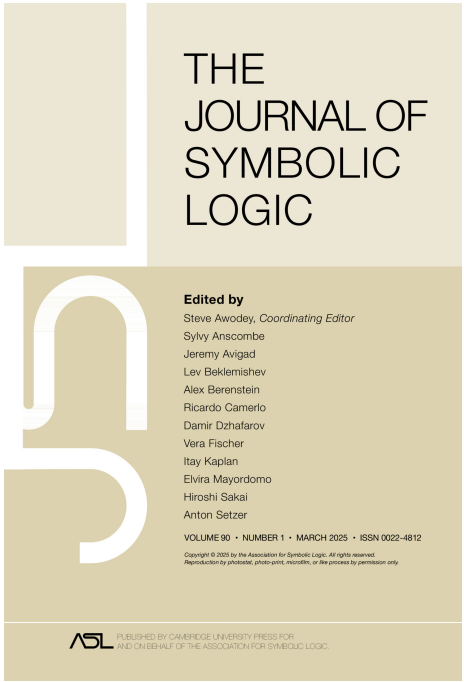
You need to learn how to talk about your research.

Anil Nerode to me, 2015

Important in both academia and industry!

Imagine two senior faculty members having a conversation over lunch. One asks: "What's new?" Another answers: "Oh, I just saw a paper on the arXiv which does [your story]." It is your goal to tell your story so clearly that the casual reader can pick it up and tell others without much effort.

Igor Pak, How To Tell A Good Mathematical Story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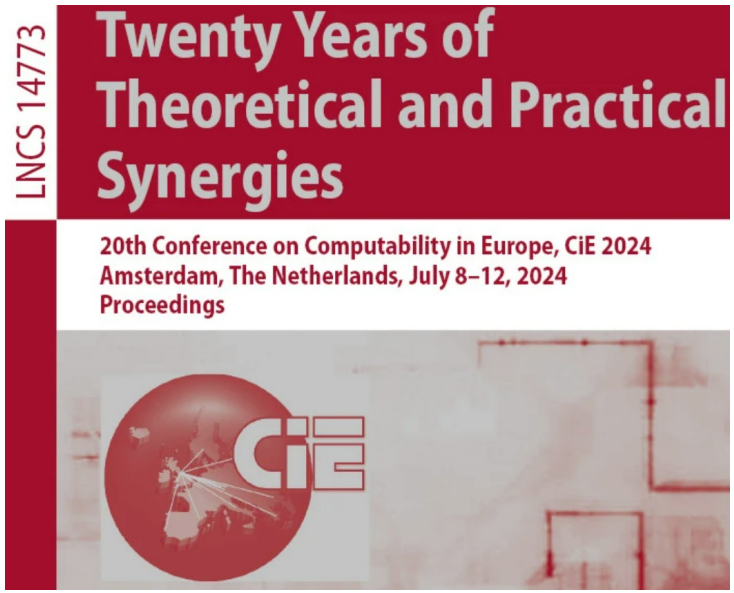
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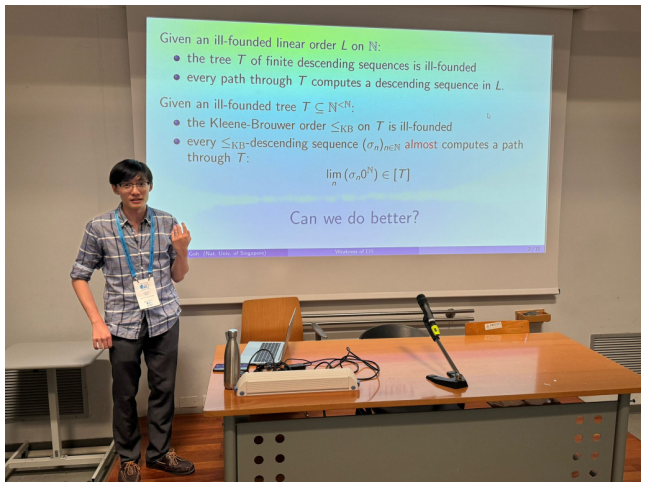
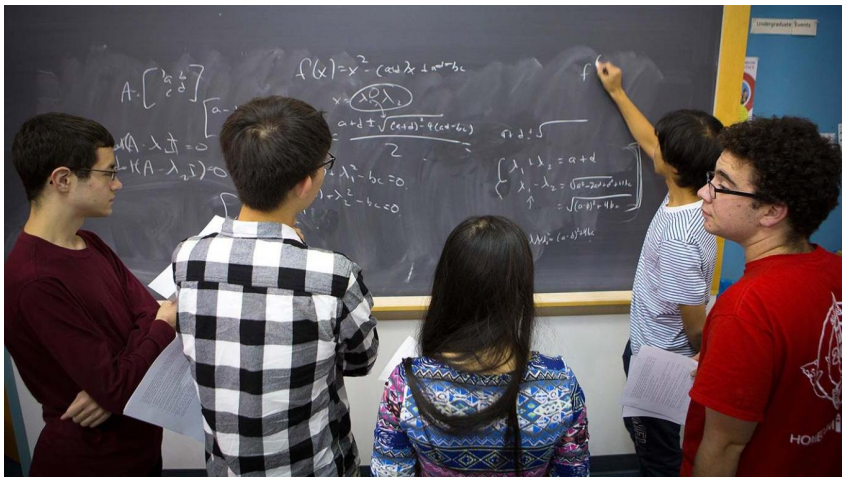

Given an ill-founded linear order L on $\mathbb{N}$:
the tree T of finite descending sequences is ill-founded
every path through T computes a descending sequence in L.
Given an ill-founded tree $T \subseteq \mathbb{N}^{<\mathbb{N}}$:
the Kleene-Brouwer order $\leq_{KB}$ on T is ill-founded
every $\leq_{KB}$-descending sequence $(\sigma_n)_{n\in\mathbb{N}}$ almost computes a path through T:
$\lim_n (\sigma_n 0^{\mathbb{N}}) \in [T]$
Can we do better?



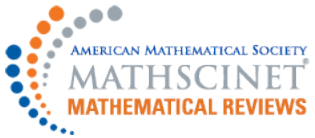
Understand your audience

What are they likely to be familiar with?

What are they likely to care about?

Why might they find your area/work interesting?

Learn this by:

- Reading papers
- Reading reviews of papers 

- Attending talks outside of your area
- Asking people about their work

Practice talking (about your work and other things)

$$\text{Subarea} \subsetneq \text{Area} \subsetneq \text{Logic} \subsetneq \text{Math/CS} \subsetneq \text{STEM} \subsetneq \cdots$$

It's ok to oversimplify as long as you are honest about it.

II. Time management

	Research	**Teaching**	**Service**
PhD	Papers	TA (Co-instructor?)	Student seminar? Refereeing?
Postdoc	Papers Travel grants Begin research program	Primary instructor (large class?)	Logic seminar Refereeing Co-organizing special sessions
Junior faculty	Papers Research grants Crystallize research program	Primary instructor (large class sometimes)	Refereeing (Co-)organizing workshops Committee(s) UG/MS/PhD advising

Questions you might ask when interviewing for a job

Research support:

- Is there a start-up grant?
- When are you expected to apply for your own grant? Which are the funding agencies?
- How many postdocs/grad students in your area, typically?

Teaching:

- How many courses?
- What kind? How many students?

Service:

- How many committees?
- What kind?

(and other qualitative questions)

As career progresses, time for research (typically) **decreases** and is broken up into **smaller blocks**.

One must **adapt**:

> *When I'm with my son at the playground, half my mind is watching him while the other half is thinking about research. You never know when a breakthrough might happen.*
>
> *Unnamed colleague to me*

and **prioritize**:

It's ok to say no (sometimes).

How to do research when I have no time/so much time?

Consciously set aside time for mathematics everyday [..]

Daniel Thompson, Do Mathematics Every Day

I found good approximate upper and lower bounds for how hard I can work and still produce.

Steven Senger, Productivity and Time Management in Research

Leave everything until the last possible minute—except your research.

Elizabeth Milićević, My Research is DUE Tomorrow!

See also Allison Pacelli's article *Important vs. Urgent*.

III. Dealing with adversity

Source: Wikipedia

I just saw the paper on your webpage, and read it. There seems to be a major flaw in the proof. I already tried exactly the same approach and had exactly the same problem.

Unnamed colleague, to us on Thanksgiving 2015

Interrogating yourself

[..] I was unable to find flaws in my "proof" for quite a while, even though the error is very obvious. It was a psychological problem, a blindness, an excitement, an inhibition of reasoning by an underlying fear of being wrong. Techniques leading to the abandonment of such inhibitions should be cultivated by every honest mathematician.

John Stallings, How not to Prove the Poincaré Conjecture

We're not supposed to admit it when we feel stupid, or underappreciated, or jealous, or that we cared so much about something that when it didn't go our way we felt shattered. Techniques leading to the abandonment of such inhibitions should be cultivated by every honest mathematician.

Danny Calegari, Disappointment

Imposter syndrome

I realized that comparing myself to other people was always going to be self-defeating, no matter what career I pursued. There will always be someone more skilled at things I feel I am skilled at. Becoming more centered in who I was (e.g., the things I love and why I love them), rather than what I could accomplish, has helped to free me from the pressure to compare myself to others.

Francis Su, Should I Quit Mathematics?

Effort may not be commensurate with output

[..] I do not have a uniform experience of proving theorems. Some of my best results [..] did not cost me much effort, while some research that I pursued for months led me to nothing. [..] in some cases, writing a mediocre paper pushed me to change the direction of my research.

Claire Voisin, How to Make a Portrait of a Bird

Sunda pangolin

Cropped from `ourwildneighbours.sg`

For long-term survival, it is necessary to be **thick-skinned**:

- deflecting external negativities
- accepting that even though you may not be [insert superlative], the best you can do is try.

Thanks!