HOW TO NAVIGATE THE WORLD OF PHYSICS AND IMPROVE ITS ENVIRONMENT

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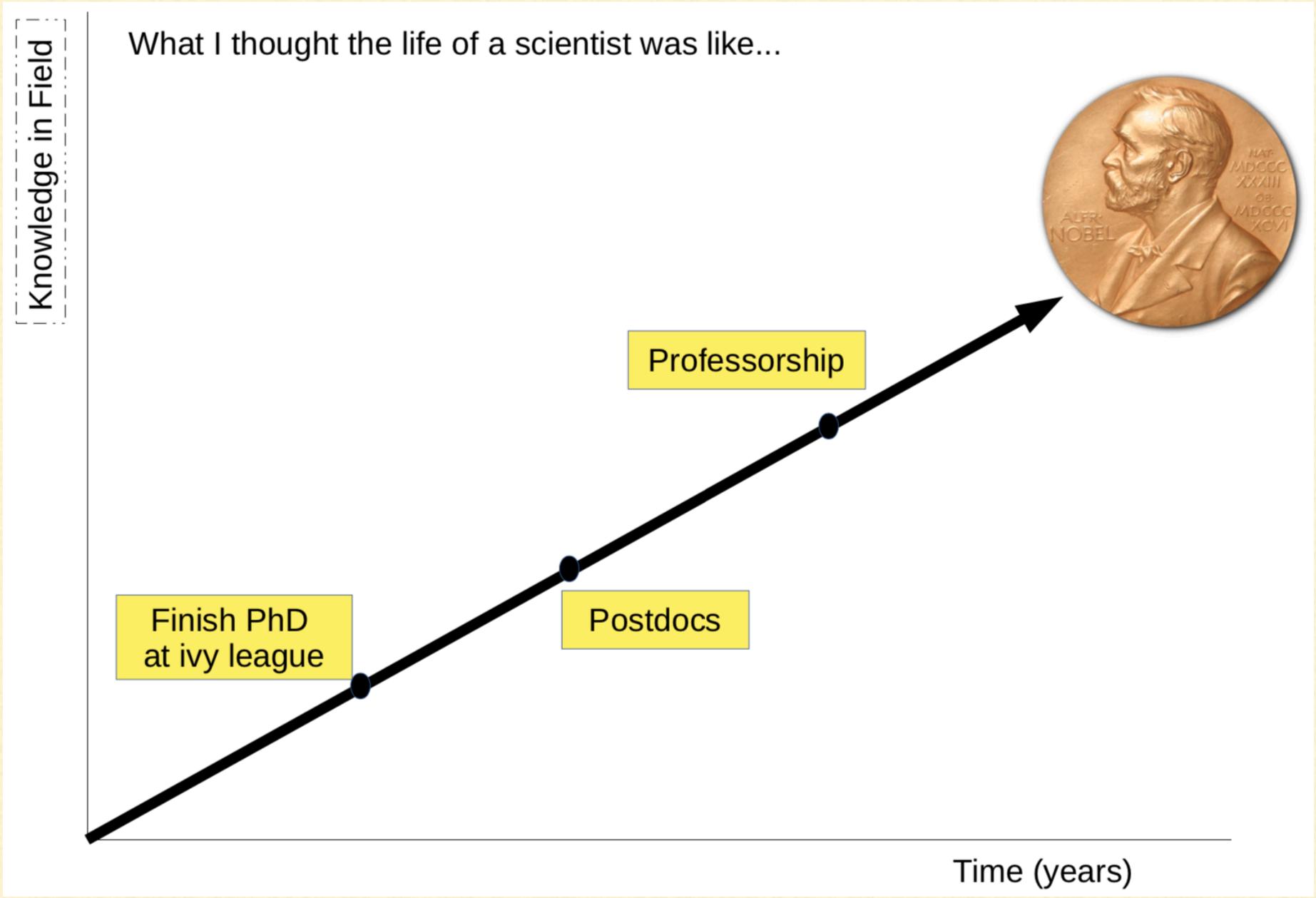
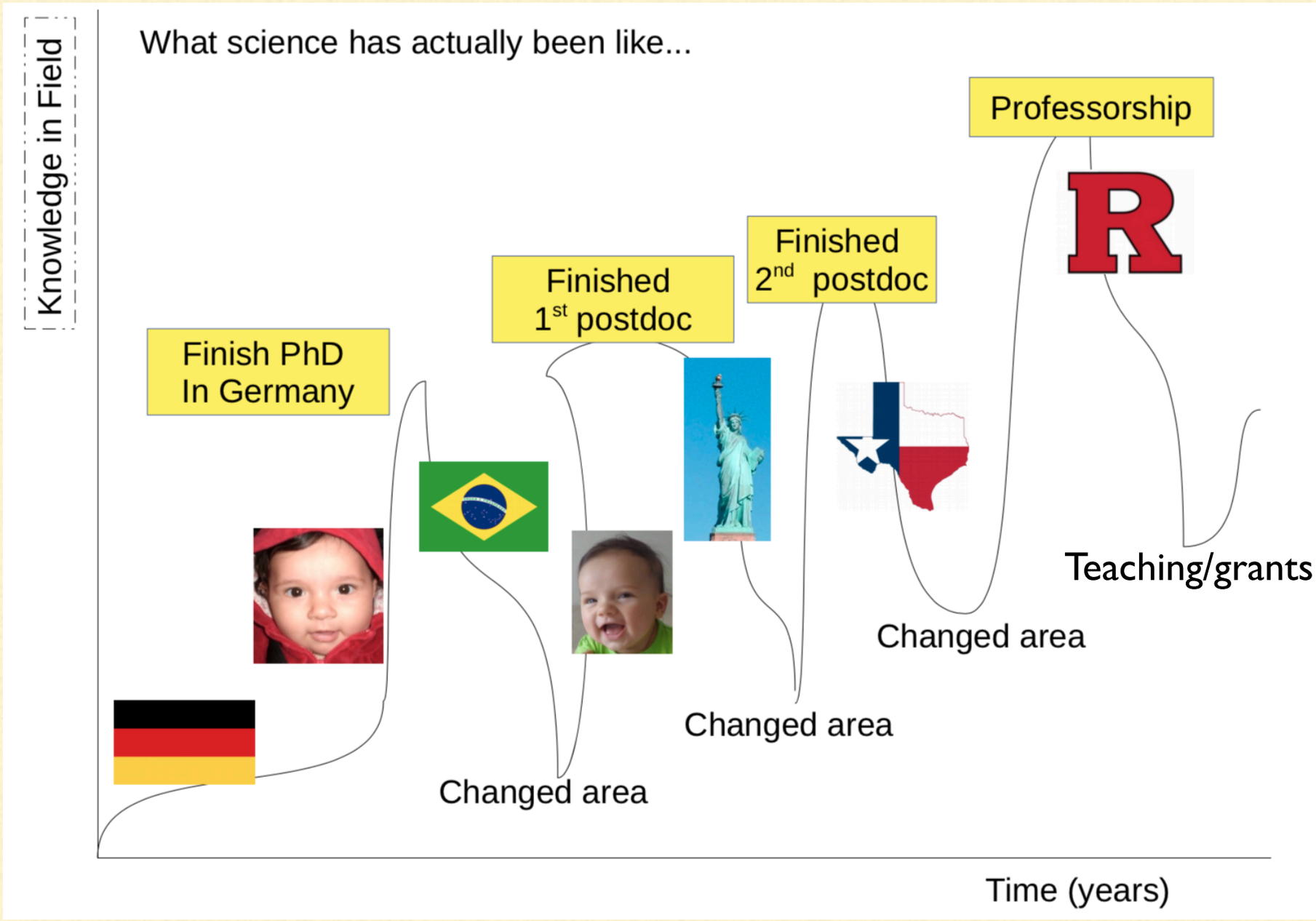
MYTH OF ACADEMIA



REAL LIFE


What science has actually been like...
Knowledge in Field
Finish PhD
In Germany
Finished
1st postdoc
Finished
2nd postdoc
Professorship
R
Teaching/grants
Changed area
Changed area
Changed area
Time (years)

BASICS OF ACADEMIA

RESEARCH VS. STUDYING

Undergraduate		Graduate school
Memorization	Work	Critical thinking
		Teaching assistant
Well-defined questions		Self-defined schedule
Grades	Highly structure schedule	Ill-defined questions
Extracurricular activities		Jumping in
		Group work
Prizes	Dorms	Different physics backgrounds
Student life	Debt	Courses intensity increases

GRANTS AND FUNDING

When you're hired as a graduate student/postdoc (unless you have a fellowship, start-up, or outside funding), it's normally to do a specific task on a Principle Investigator's (PI) grant

They have *some* flexibility, but it's limited

Often, rejection isn't about you (seriously), it's about them (lack of funding, full group, or mismatch skills/objectives).

Picking an advisor: Doktorvater/Doktormutter - this is a long term work relationship, pick someone you're compatible with

INTERNET FOOTPRINT

- Link your articles on **Inspire-HEP, Google-Scholar**
- Make a website (**Wix** is extremely easy to use), especially useful for faculty jobs. Keep your updated CV there!
- Gmail helps to keep email in one spot so you don't lose them with different jobs (faculty should use their university emails)
- Consider **Researchgate**
- Industry jobs **Linkedin**

COLLABORATIONS

Analytical

vs.

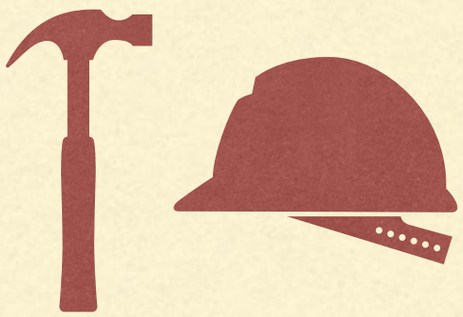
Computational

The best collaborations bring in people with neighboring, NOT identical skills.

Diversity drives innovation

Sylvia Ann Hewlett, Melinda Marshall, Laura Sherbin,"How Diversity Can Drive Innovation", Harvard Buisiness Review, Dec. 2013

Hardware



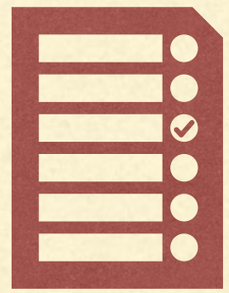
vs.

Data Analysis

Big ideas

vs.

Meticulous



MYTH: PHYSICS IS ALL CONSUMING

Physicists that I know…

Performance art helps Black physicists succeed

S. Hyatar-Adams et al, Physical Review Physics Education Research 14 (1), 010132

LANDING A JOB

ACADEMIC JOB SCHEDULE

- Graduate school is a paid job, apply in the fall, visit in the winter, start in Sept.
- Theory postdocs apply in the fall/winter, start the following Sept/Oct.
- Experimental postdocs apply year round.
- Consider going abroad (especially for the first postdoc), no schedule
- Faculty jobs- fall applications for following year

PREPARING FOR INTERVIEWS

- What are the most important questions in the field? How do you fit in?
- What projects do you want to work on in the future (for faculty jobs, what projects do you have in mind for students)?
- What grants can you apply for?
- Where will your field be in 10 years, how will you contribute?
- How does your work relate to other fields?

INDUSTRY INTERVIEWS

- Brush up on computer science basics!
- Prepare for "Human Resource" questions: how did you deal with a difficult situation at work? Conflict resolution etc
- Research the place
- Know your worth and be able to explain it to a non-expert (try it out on non-physicists)
- Unlike academia, this doesn't need to be your forever home
- Be prepared for things to happen fast

CV

- Physicists like numbers, if you can quantify your research, do so!
  - Citations, # of papers/talks, # of papers from a code etc
- Separate out invited talks vs. general talks, published papers vs. published proceedings vs. manuscripts
- Example CVs are often online (look at websites of physicists you know)

RESEARCH SUMMARY

Postdoc

~2 pages

More about what you did (tell a story with your research)

Briefly, ideas for the future

Faculty job

2-4 pages

~1 page of what you did

Mostly about the future, projects for PhD students, timelines etc

TEACHING STATEMENT

Mention Mentoring

Diversity discussions can go here (although some places have diversity statements)

Research common terminology (e.g. inquiry based education, clickers etc)

Leave off flowery statements!

Examples, examples, examples

JOB TALKS

WHEN DO YOU GIVE A JOB TALK?

Entering graduate school

They're looking for:

- Interest
- Experience
- Critical thinking

Postdocs skype interviews

Same as grad school+

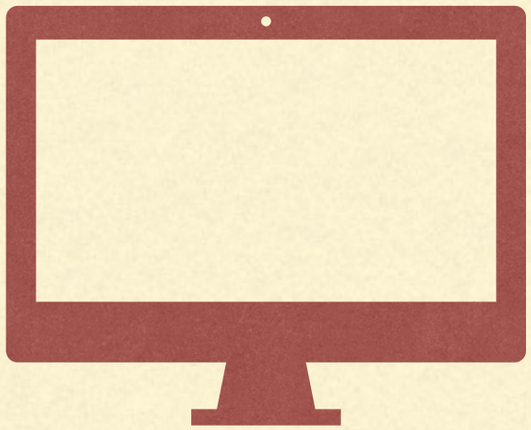
- Specific skills related to their grant/work
- Someone who can mentor students
- Neighboring but not identical skills
- Individual contributions on papers

Faculty/lab positions

- Ability to get grants
- Sustainability of the field (experiments in 10-20 years)
- Effective teaching/presentation skills
- Good colleague
- If you're on the short list, they know you're smart already

POSTDOC SKYPE INTERVIEWS

Ask if you should prepare slides



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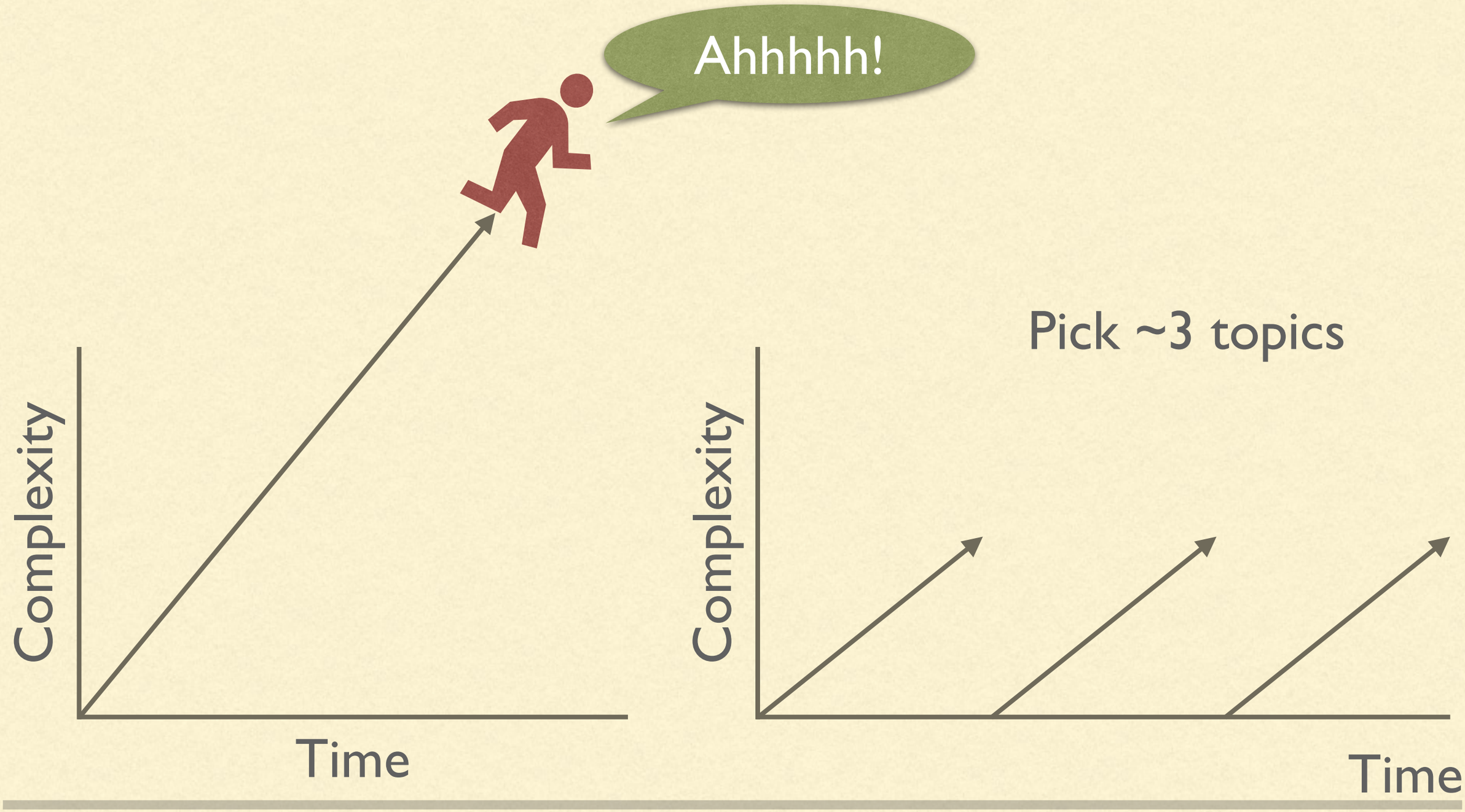
Have questions ready, you want to make sure you'll be happy there too!

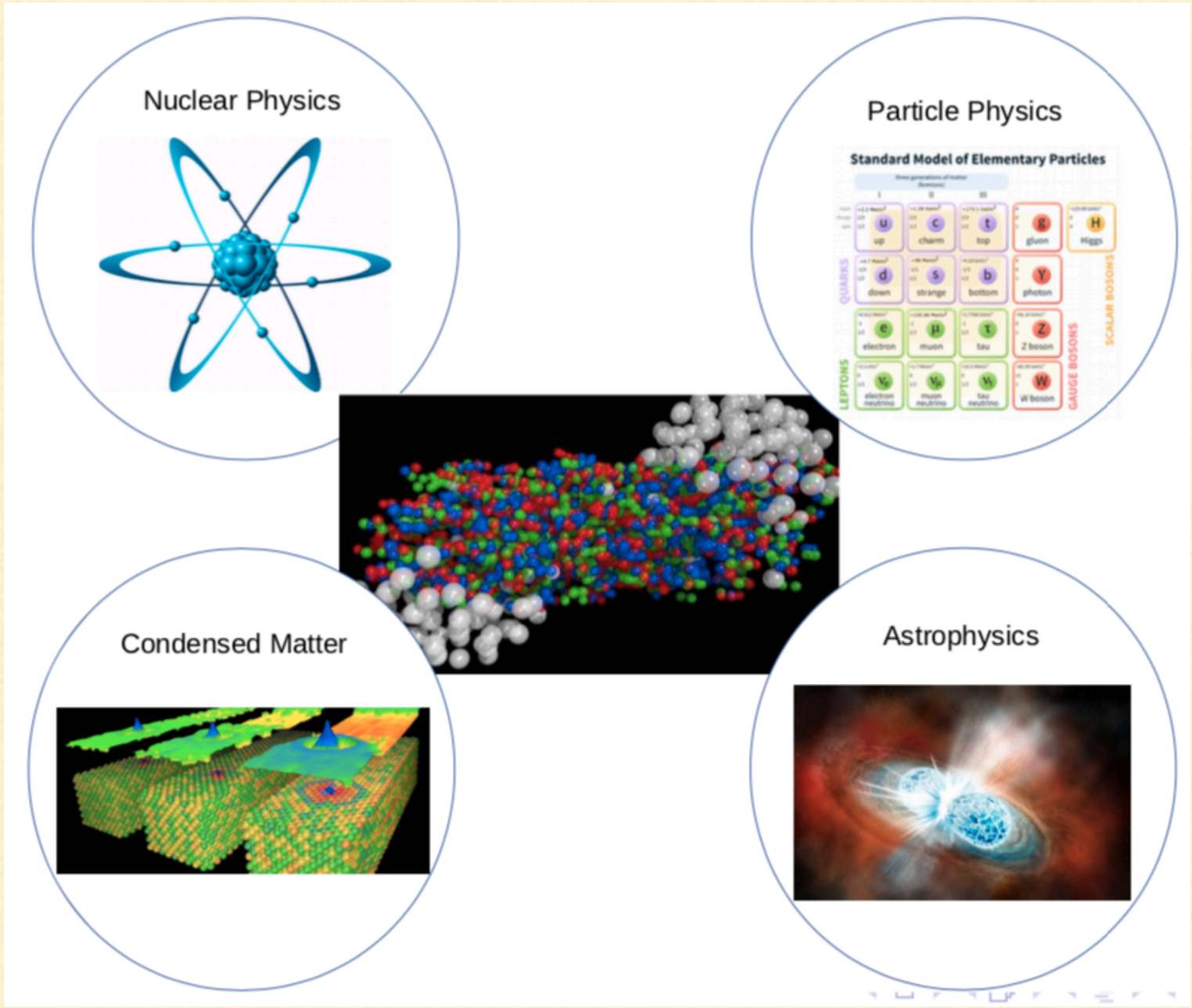
Read the their latest papers, see how you would fit in

Compatibility over prestige

GIVING A GOOD TALK



INTRO: SHOW CONNECTIONS



INTRO: SHOW OFF YOUR FIELD

They're hiring both **your field** and your work

SHOW OFF **YOU**

Rule of thumb: don't get 20 minutes into a 60 minute talk without citing yourself

Focus on published work, preliminary results haven't gone through the same vetting process and may seem scattered

Part of this is picking your BEST work, not possible to show everything

Tell a story!

AVOID THE DREADED "WALL OF EQUATIONS"

From an early talk of mine…

$$\epsilon^{HG}(T) = \sum_i \frac{g_i T^4}{2\pi^2} \int_0^\infty \frac{\left(\frac{p}{T}\right)^2 \sqrt{\left(\frac{p}{T}\right)^2 + \left(\frac{m_i}{T}\right)^2}}{e^{\frac{E}{T}\left(\frac{p}{T}\right)_i}} d\left(\frac{p}{T}\right)$$

$$p^{HG}(T) = \sum_i \frac{g_i T^4}{6\pi^2} \int_0^\infty \frac{\left(\frac{p}{T}\right)^3 \left(\frac{p}{T}\right)_i}{\frac{E}{T}\left(\frac{p}{T}\right)_i \left[e^{\frac{E}{T}\left(\frac{p}{T}\right)_i}\right]} d\left(\frac{p}{T}\right)$$

$$n_i^{HG}(T) = \frac{g_i T^3}{2\pi^2} \int_0^\infty \frac{\left(\frac{p}{T}\right)^2}{e^{\frac{E}{T}\left(\frac{p}{T}\right)_i + \theta}} d$$

$$s^{HG}(T) = \frac{\epsilon^{HG}(T) + p^{HG}(T)}{T}$$

$$\frac{T}{2\pi^2} \int_{M0}^{MM} dm\ \rho(m) m^3 K_1\left(\frac{m}{T}\right) + \frac{3T^2}{2\pi^2} \int_0^{MM} dm\ \rho(m) m^2 K_2\left(\frac{m}{T}\right)$$

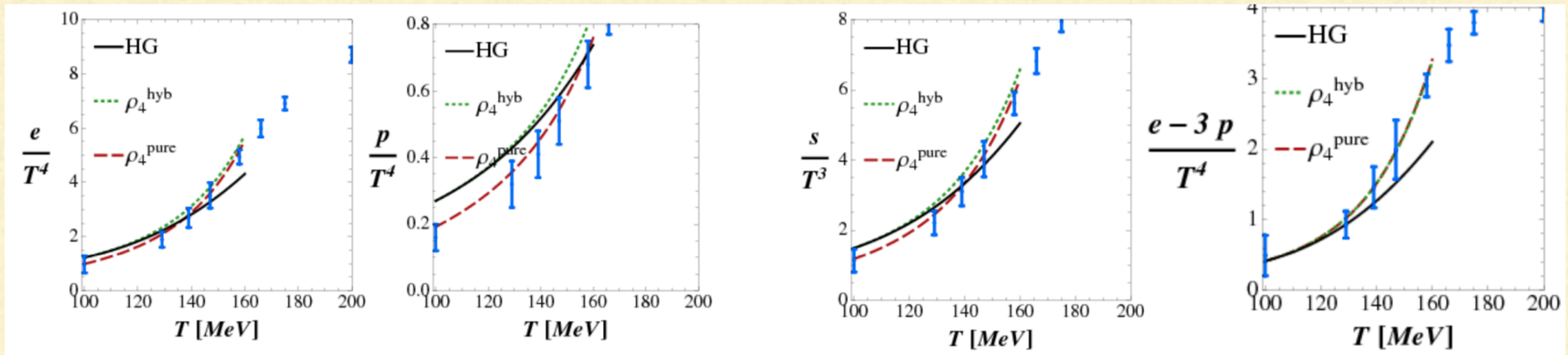
$$p^{HS}(T) = \frac{T^2}{2\pi^2} \int_{M0}^{MM} dm\ \rho(m) m^2 K_2\left(\frac{m}{T}\right)$$

$$n^{HS}(T) = \frac{T^2}{2\pi^2} \int_{M0}^{MM} dm\ \rho(m) m K_2\left(\frac{m}{T}\right)$$

$$(T) = \frac{\epsilon + p}{T}$$

AVOID TOO MANY & TOO SMALL PLOTS

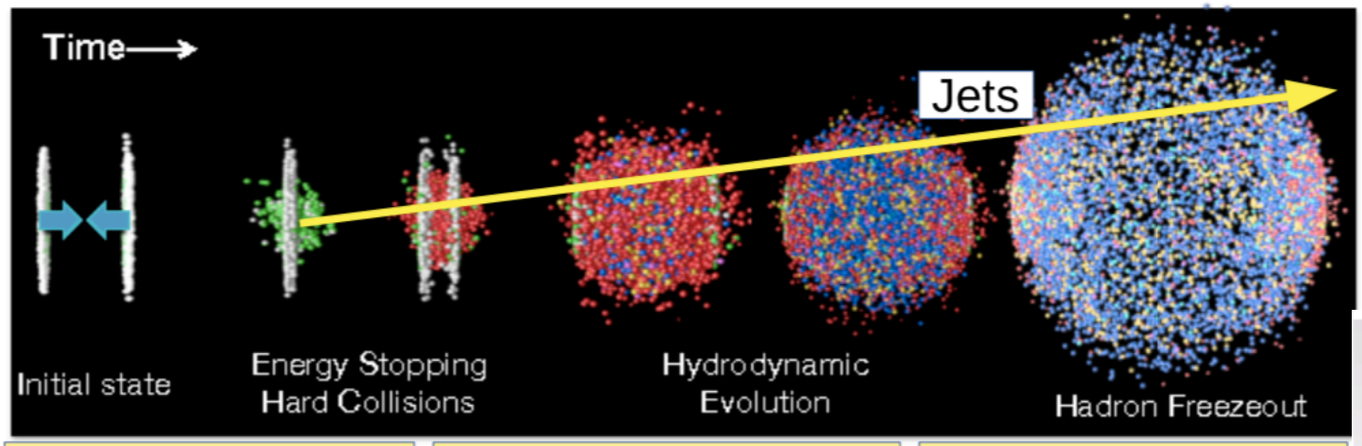
My visions not that bad but there's no way I can see that



- Make sure labels are large font and clear
- Explain what is on your axes
- One slide/minute rule should be thrown out the window
- Time yourself!
- Say "I don't know"

MAKE THE FUTURE OF YOUR FIELD CLEAR

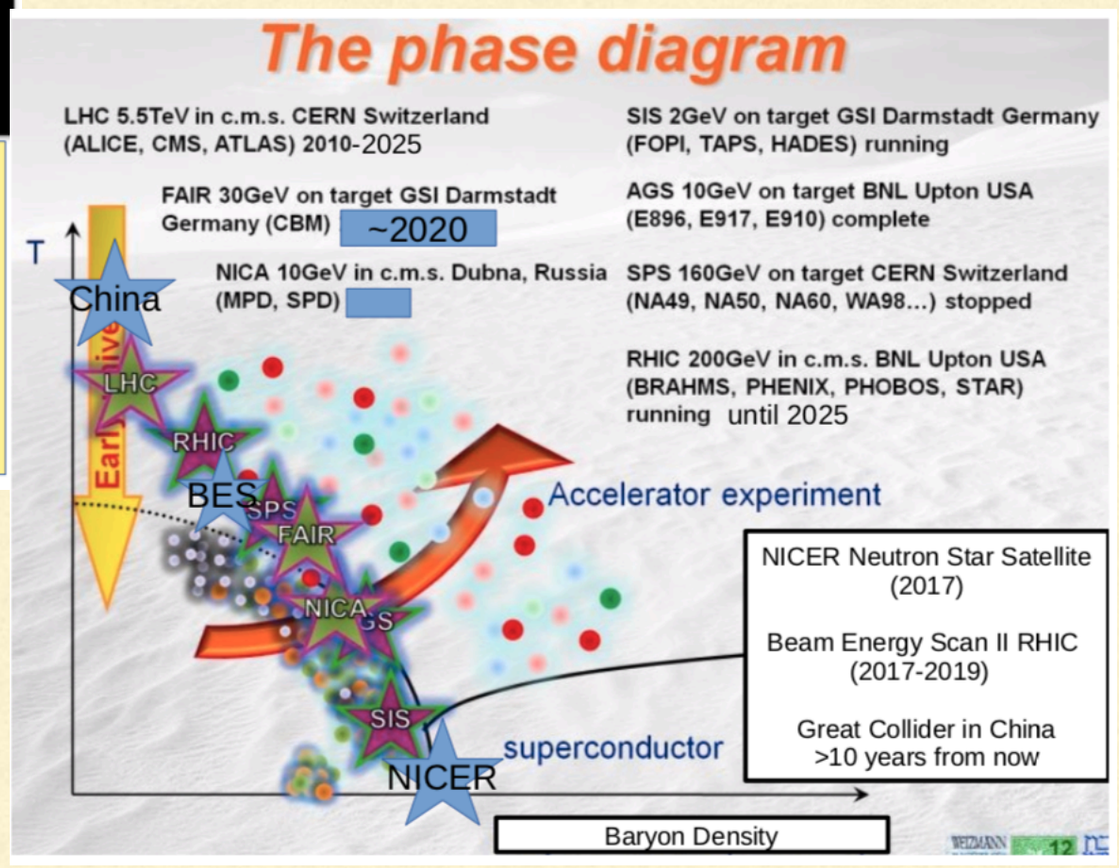
RHIC/LHC up until 2025



Electron Ion Collider (EIC) - Nucleon/Nuclei Structure affect the initial state (important for small systems) >2025

sPHENIX/LHC - Jets probe shorter scales i.e. a QGP microscope 2018-2025

Jefferson Lab - K0L Beam/Hall D Missing resonances affect dynamical Variables - being proposed(2020)



Include dates, future milestones, and lots of pictures

WHAT IS A JOB TALK?

Job talk $\neq$ Proving that you're smart

Job talk $\neq$ Super specific details of your work

Job talk = Showing that you're an effective communicator and will be good professor someday

Job talk = Explaining your work to people outside your field

Job talk = Showing them how you would fit into their department and contribute

CAREER ADVICE SUMMARY

- Physics shouldn't be all consuming, maintain hobbies and friendships
- Do great physics but also think about science communication
- Prepare for job interviews by thinking about questions, stalking the department, read the **Professor is In**
- Collaborate with people outside your comfort zone

IMPROVING THE ENVIRONMENT

Caveat: I can mostly speak to being a woman in the field/parental issues

GRAD SCHOOL+BABY

- Supportive supervisor is the most important thing in the world (thank you Carsten Greiner!)
- Know health insurance/parental leave policies
- Always ask for child care (subsidized)
- Pre-tax dollar plans
- Find other parents!

CHILD CARE IS GREAT, BUT

- Many care for elderly, older kids in schools etc
  - Fun fact. Many school districts call Child Protective Services if your kid misses more than 10 days of school.
- I've estimated I pay thousands in local child care costs/year just to attend conferences (Initial Stages >$1,000 out of pocket)
- Child care doesn't cover entire schedule/evening discussions
- European hotels not always family friendly (QM2014)

POSTDOC SALARY+KIDS

Average postdoc salary nation wide $47,500

After taxes, benefits etc: ~$2,500/month

$2,700

-$1,000 Rent

-$1,200 Childcare

-$100 

-$100 Internet

-$100 Car Insurance

-$200 

$0

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Loans

STATISTICS, STATISTICS, STATISTICS

How many female theorists do we have in the field?

How many underrepresented minorities do we have in the field?

What is the breakdown of our community by country of origin?

What is the breakdown of our field by current country?

What is the native language of most of the physicists in our field?

Who submits abstracts to conferences, what % of those get talks?

What % of students continue, % of underrepresented physicists?

What % of women have kids? 2 body problem?

Established statistics can help guide universities/labs hiring policies

CONFERENCE STATISTICS

- Include questions on gender, theory vs. experiment, race/ethnicity, job status, location etc
- Make sure that your % in abstracts submitted is reflected in abstracts accepted
- Consider your own bias
- Super specific topics lead to fewer underrepresented physicists

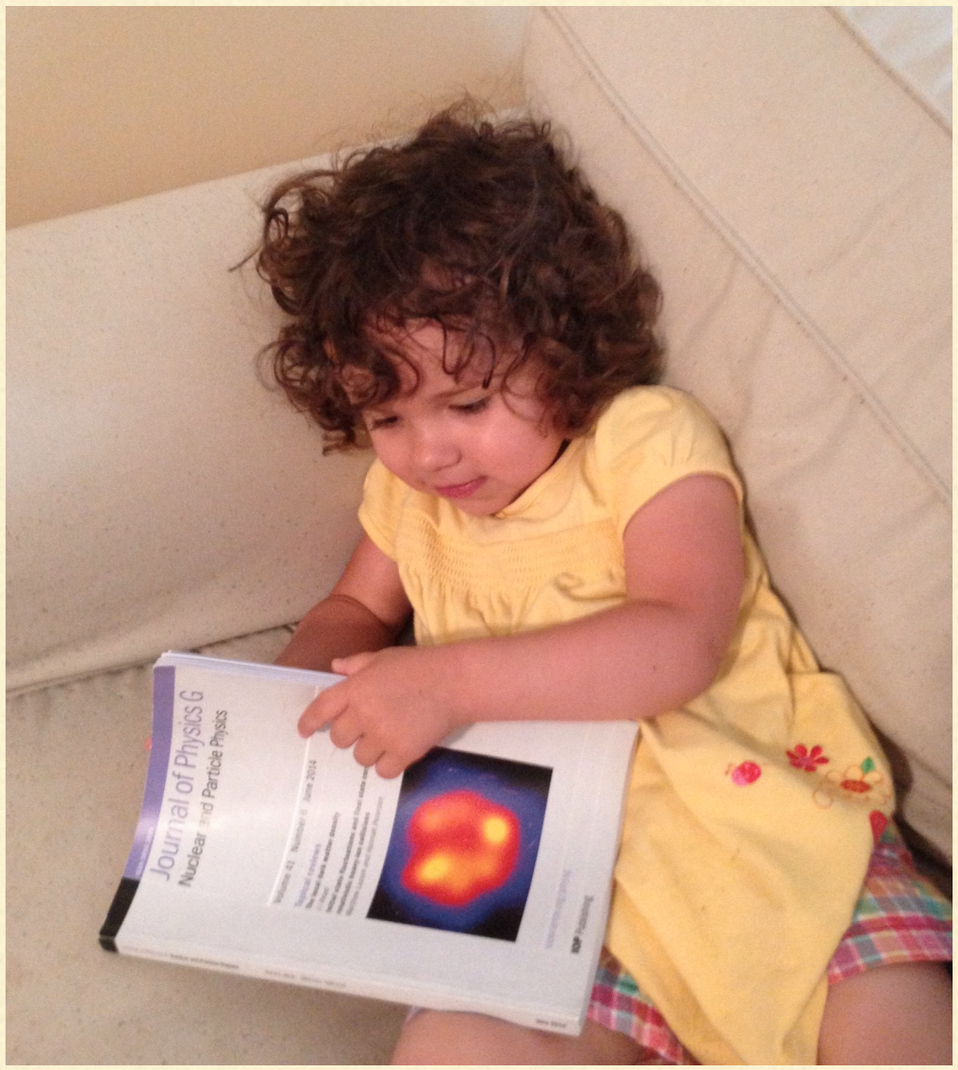
ALLIES PROGRAM

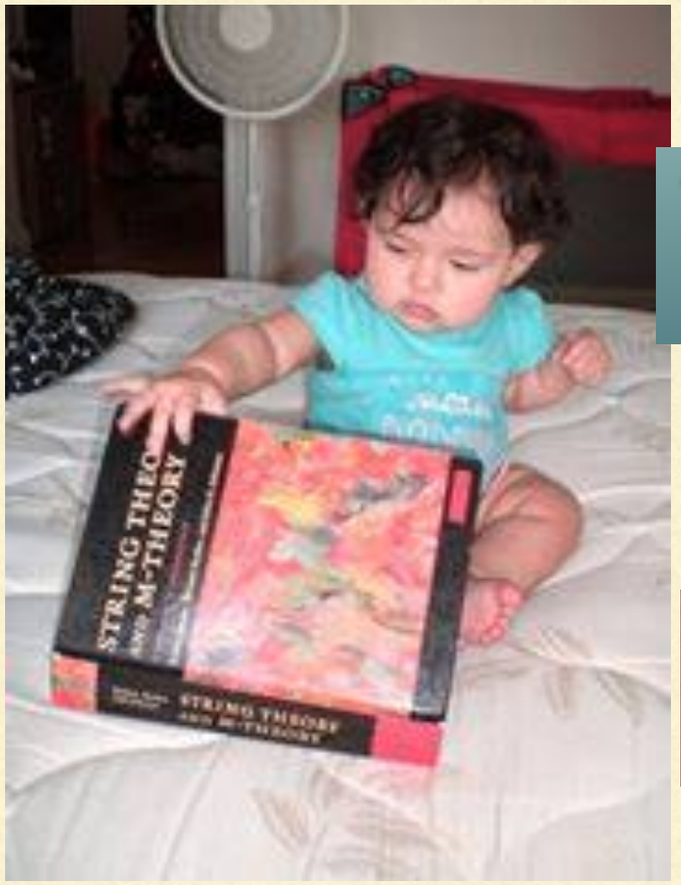
- DNP Committee on Harassment Prevention identifies members showing a strong commitment to promoting an inclusive environment
- Selected candidates are asked to respond to a questionnaire
- Followed by 30 min Skype interview
- A subset is selected to participate in training at the next DNP meeting.

https://www.aps.org/units/dnp/allies/index.cfm

GETTING THE KIDS INVOLVED

Kids of academics tend to "click" easily, try to organize playdates





Try out physics demos on your kids

Parental efficiency is a thing!

My office has a number of kid friendly activities

PRACTICALITIES

- If it's not in my google calendar, it doesn't happen
- Strict daycare/school schedule
- Early mornings are my best friend, give yourself a bedtime
- Live either close to work or close to friends who will babysit
- Never plan to work on weekends
- Always have a plan B, C, D, E, F, G…
- Complaining is OK, find friends who will listen and support you
- Just say No

SAFETY WHILE TRAVELING

- Sometime issues arise not just in field but while traveling for work.
- I've been scared for my life as a woman traveling alone (scariest experience was at 10pm in Paris on the subway), other experiences in Frankfurt, Germany, Sao Paulo, Brazil, and Jaipur, India.
- Conference hotels are much appreciated (I try to travel "home" with others)
- Options for group travel to/from airports helps
- Taxi ride to BNL yesterday, was called "sweetheart" and "honey" throughout the trip

BIGGEST TAKEAWAYS ON DIVERSITY

- Serious thought needs to be given when it comes to postdoc pay, supporting travel+kids/elderly
- Would like to see allies program implemented are our conferences as well
- Statistics at each conference should be the **default**