

Woman in Physics: A personal journey



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 "CAREER: Constraining Parton Distribution Functions for New-Physics Searches"

Few Facts about Me...

§ I got my PhD at Columbia University working in lattice QCD

- ∞ I use high-performance supercomputers to study the properties of the quarks and gluons of nucleon
- ∞ I have been married since 2006 and have 2 daughters

§ Currently Assistant Professor at Michigan State University

§ Like many women in physics, I often find myself the only female in the office, group, author list, workshop, etc.

- ∞ I started a Women in Lattice QCD luncheon in 2008, which is now an annual event at the Lattice Conference



Outline

§ Some Statistics on Women in Lattice QCD

§ Many-Body Problems

⇒ How I navigated through them

§ Work-Life Balance

⇒ And how my kids help me in teaching and outreach





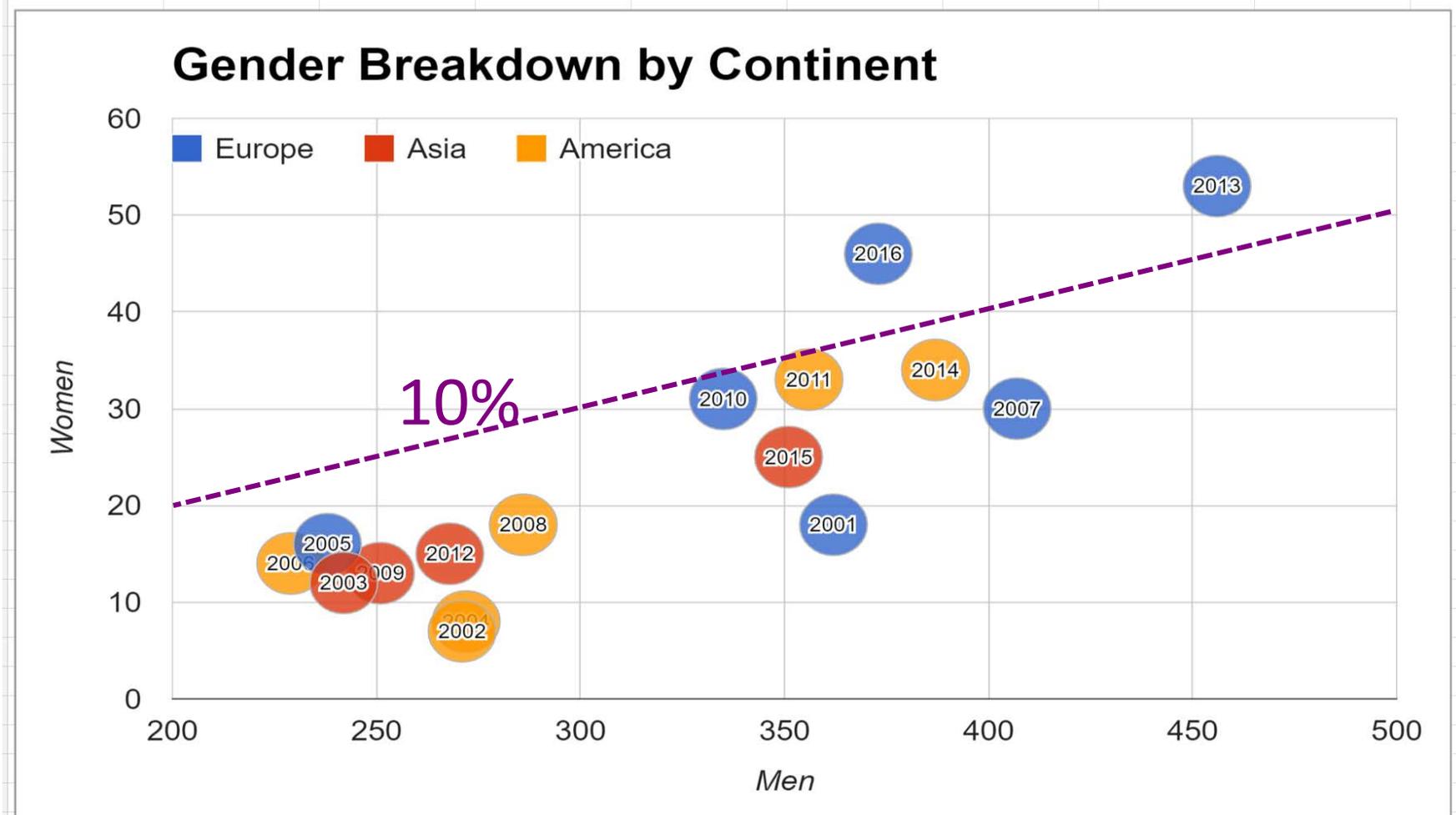
Some Statistics on *Women* in **Lattice** **QCD**



Lattice Conference Participation

§ Limited to the 21st century

§ Is female participation growing in our field?



Lattice Conference Speakers

§ Are women given opportunities for career preparation?

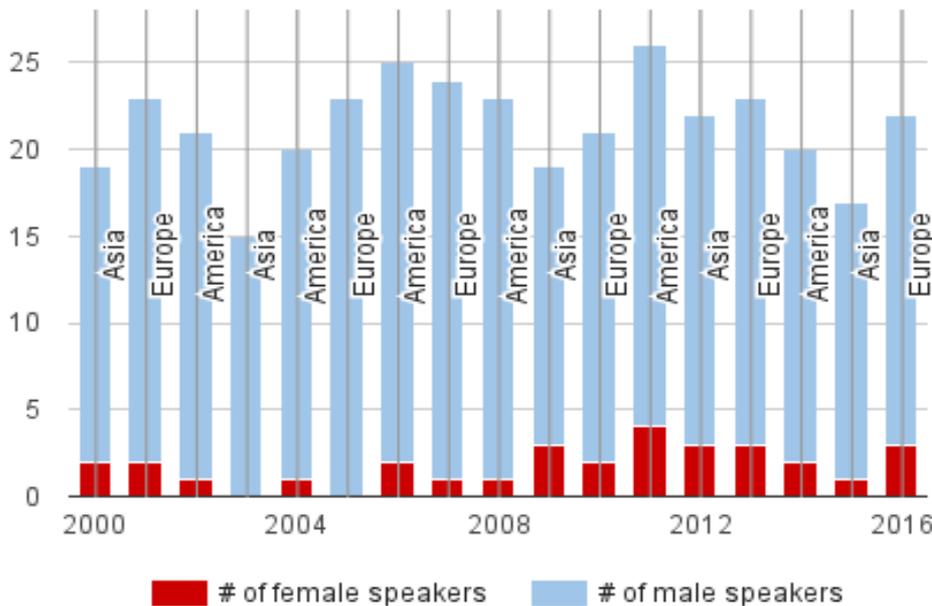
⌘ Consider the plenary-speaker gender distribution

§ Plenary speakers vs conference participation

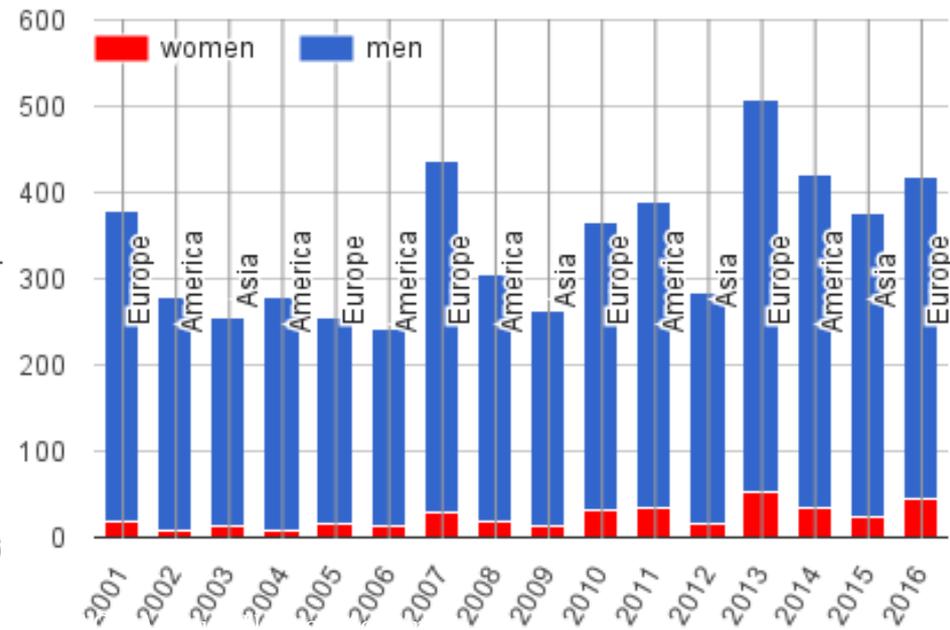
⌘ Does the fraction of female plenary speakers reflect the fraction of female participants?

⌘ Is female participation growing over time? Geo-dependent?

Lattice Conference Plenary Speaker Gender Breakdown



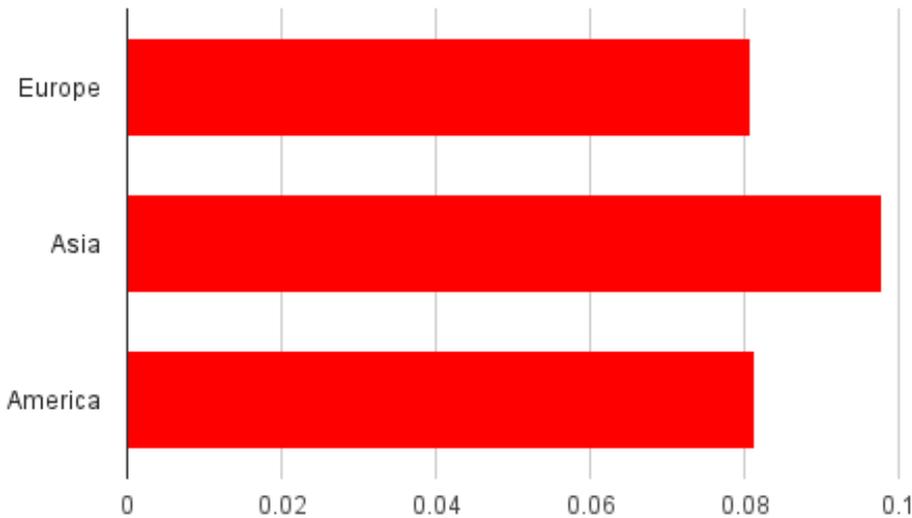
Gender Breakdown of Lattice Conference Participation



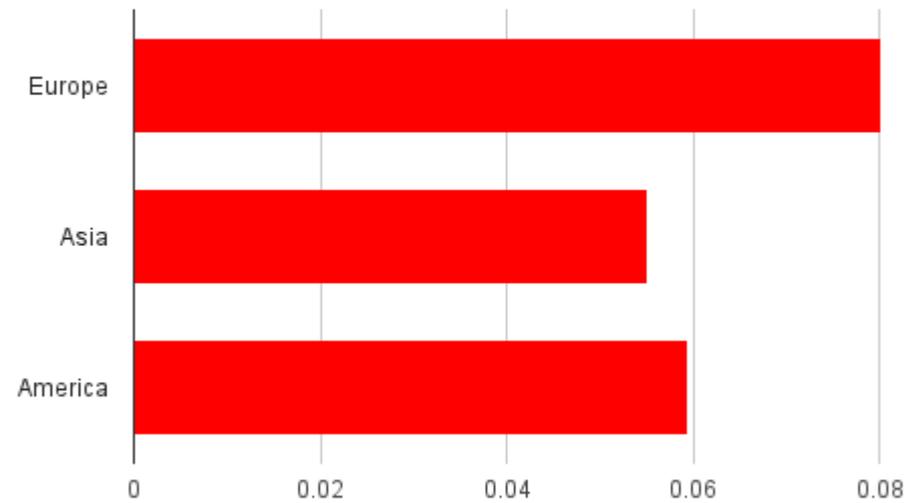
Breakdown by Conference Continent

§ Average fraction of female plenary speakers and conference participants by continent of the conference

Fraction of Women Plenary Speakers by Continent



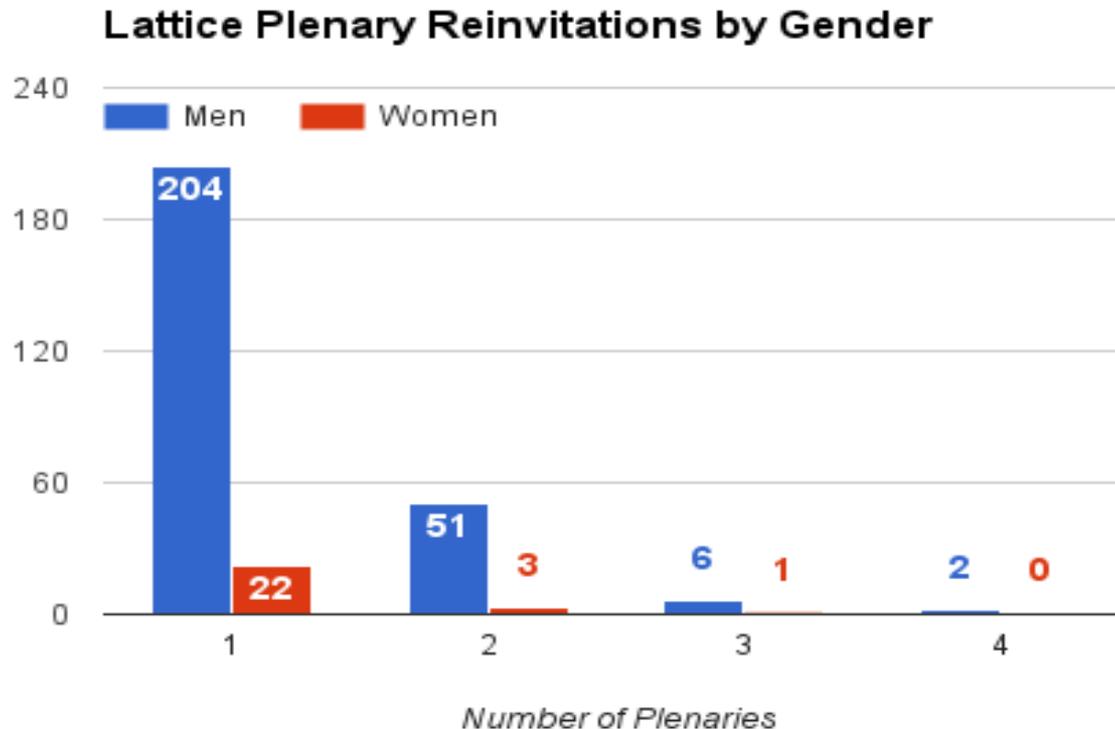
Fraction of Women by Continent



Not Enough Women?

§ Is the small number of plenary talks given by women due to lack of women in our field?

∞ Consider the number of speakers invited to give more than 1 plenary talk: the recall rate for men is double that of women



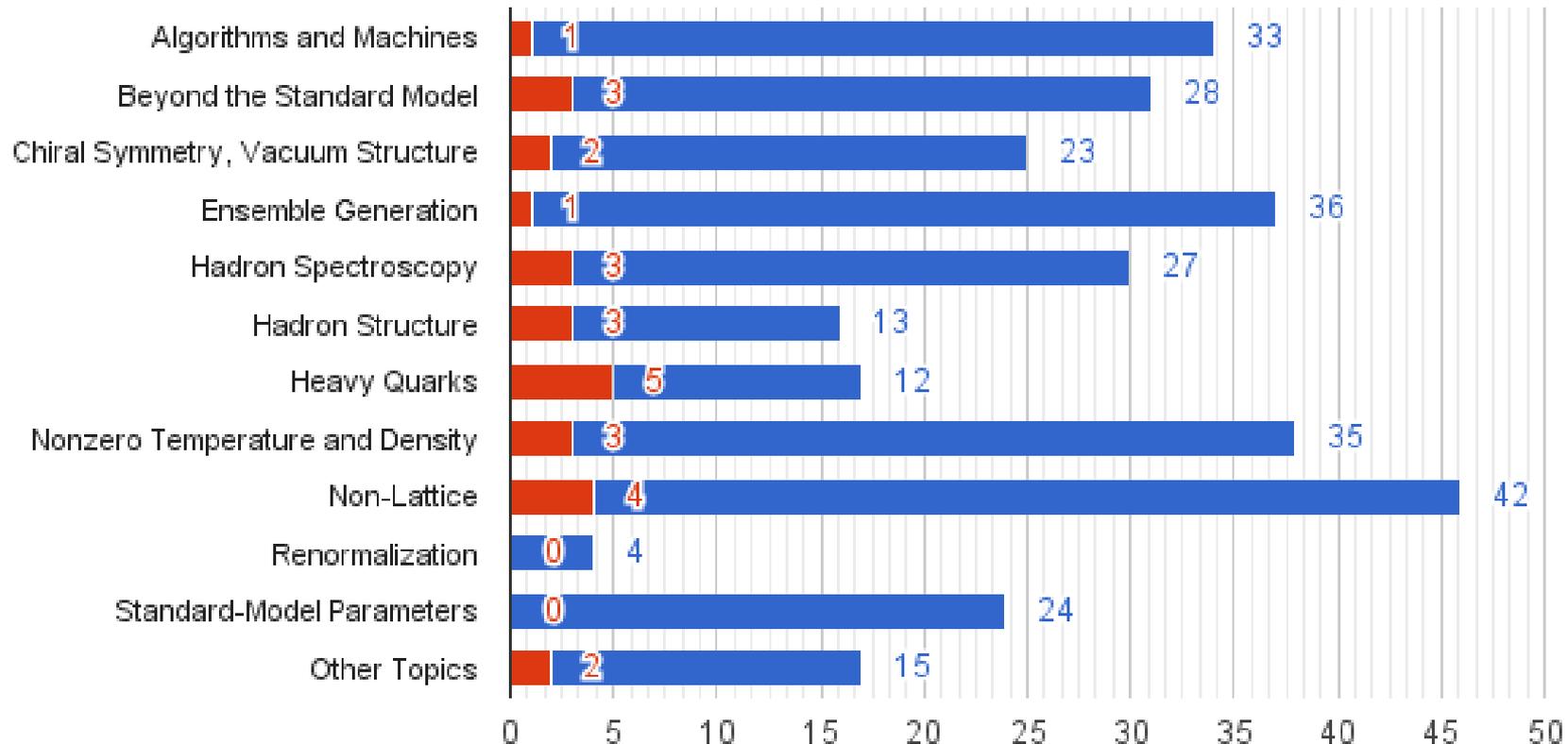
Segregated by Subfield?

§ Breakdown by topic

∞ Is there a correlation with female participation?

Gender Breakdown by Plenary Topic

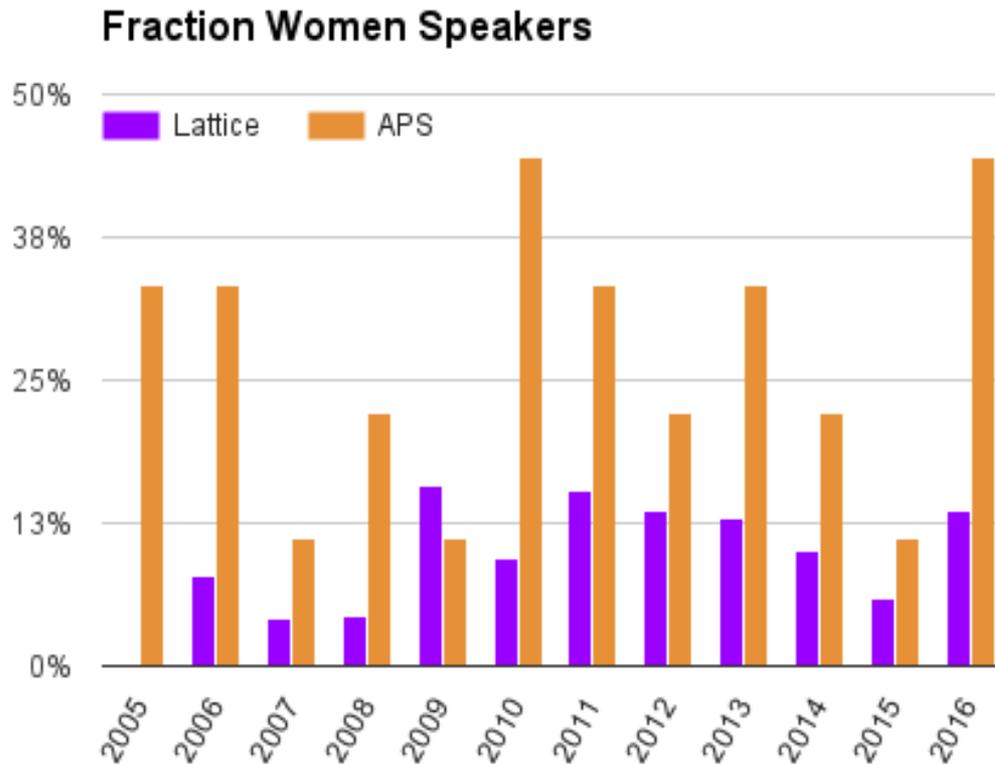
Female Male



LQCD vs APS April

§ Use APS April meeting as a baseline

- ⌘ Compared to them, we are not doing very well
- ⌘ Does monitoring by APS Women Committee make a difference?
- ⌘ Try comparing with other theoretical physics conferences?

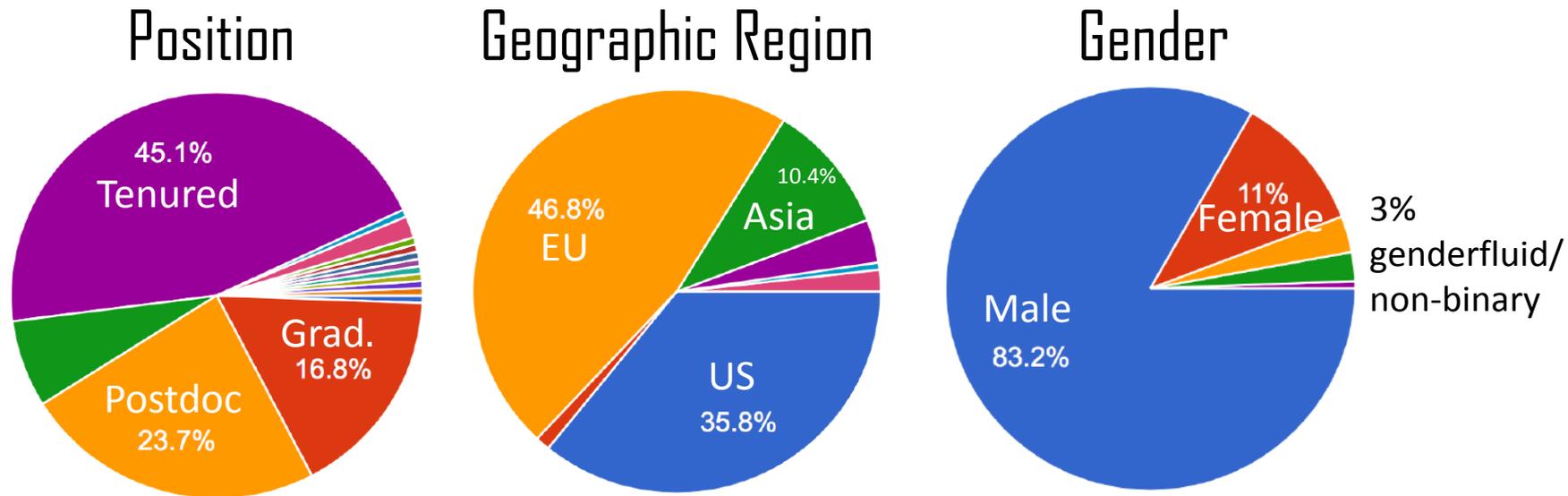


Diversity Effort in LQCD

§ This year, we assembled the first Diversity and Inclusion committee and just finished our first survey

∞ The committee is still analyzing the data we received

∞ 173 responses (a typical LQCD attendance is 300–500)



Diversity Effort in LQCD

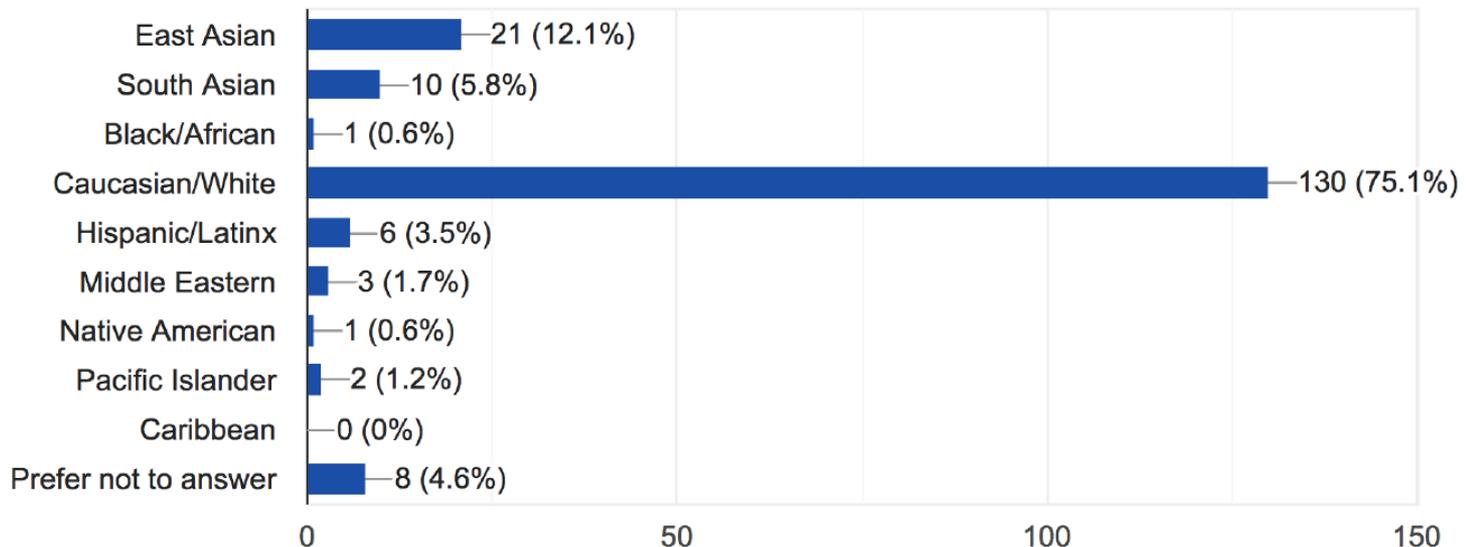
§ This year, we assembled the first Diversity and Inclusion committee and just finished our first survey

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What is your ethnicity? (Select all that apply.)

173 responses



Many-Body Problems



Get Help!

I hate to ask people for favors, but those few times I did ask for help, I always got more than I anticipated.

People are eager to help someone in a difficult situation.

So thank you very much to those helping hands.

Get Help!

§ Two-body problem: Let people know about it!

- ☞ My husband was also a lattice-QCD theorist
- ☞ We were lucky to not be apart for longer than one year
 - ☞ People in our field have been very helpful in coming up with soft money to make a second postdoc hire for him as I moved around the country
- ☞ Cons: Just as he spent a year getting up to speed to on a new research direction, he had to move again:
 - no time to build up a good academic CV
- ☞ We always knew getting 2 theorist academic positions was going to be an issue
 - ☞ Plan B was prepared well in advance

Get Help!

§ Three-body problem

- ∞ Help from family members was valuable
- ∞ Lucky to have my mom and sister-in-law with us when our first daughter was little
- ∞ Allowed me to work as “usual”

§ Four-body problem

- ∞ Things got more complicated when we had a second child
- ∞ Planned family help fell apart
- ∞ My husband left academia to work at Google
- ∞ Everything happened very last-minute, and I ended up a stay-home mom for a short period of time
 - ∞ Never an option that I thought about before

Get Help!

§ Visiting Assistant Professor at UC, Berkeley

- ∞ I reached out to a number of people in the Bay Area and started to visit Berkeley Lab
- ∞ Part-time appointment at UC, Berkeley
(Thanks to Wick Haxton!)

§ APS Blewett Fellowship

- ∞ Fellowship to help women getting back to physics due to career breaks <https://www.aps.org/programs/women/scholarships/blewett/>

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- ❧ Fellowship to help women getting back to physics due to career breaks <https://www.aps.org/programs/women/scholarships/blewett/>
- ❧ \$45,000/year and can be renewed for a second year
- ❧ Money helped a bit in putting kids into daycare when the youngest was old enough
- ❧ Surrounded by Silicon Valley pay rates and work hours, I wondered if I made the right choice staying in academia
- ❧ Blewett Fellowship gave me hope to continue
- ❧ The announcement in APS News brought many warming emails from people I knew from past workplaces and even from people I knew just a bit from past workshops and conferences

Work-Life Balance



Kids are Constraints

§ There is no doubt that kids take up huge amount of time

- ∞ At least 6 hours less work hours during work days
- ∞ Weekends are barely workable
- ∞ Juggle multiple travel schedules
- ∞ No time for leisure travel: airport-conference venue-airport
 - ∞ I pass by many exciting cities and never have the chance to see them
 - ∞ Need to hurry home when my husband has work deadlines to meet

§ Received many good suggestions

- ∞ Learn to be more efficient during work hours; time tracking
- ∞ Learn to politely say “no” to non-essential duties
- ∞ I used to like to do everything myself...now I assign more tasks to collaborators more to even out the workload.
- ∞ Seek more wisdom to find what works for you

§ I combined some work and family

Teaching

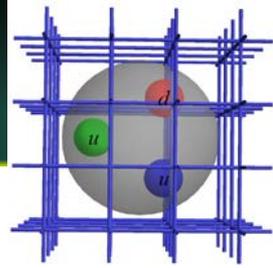
§ I volunteered to teach algebra-based “Introduction to Physics” for pre-med students

- ∞ Anticipated some bad student reviews
 - ∞ Well known bias against women and non-native speakers
- ∞ Practiced how to communicate with my students with my kids
- ∞ As I researched for more interactive ways to improve the transitional classroom teaching, I was able to share similar materials with my kids though YouTube, DIY, PhET simulation

§ Examples

- ∞ Replaced standard class demos with everyday items:
 - ∞ Many fun balloon-static demos that are kids appropriate
 - ∞ I used my kids’ hula-hoop to demonstrate the 1st right-hand rule
- ∞ I tried out demos over the weekend with my kids as audience

Outreach



§ “My research focuses on using high-performance supercomputers to study the properties of the subatomic particles which form the building blocks of atomic nuclei.”

∞ Great way to shut down a conversation on an airplane

∞ Hard to keep the general public engaged

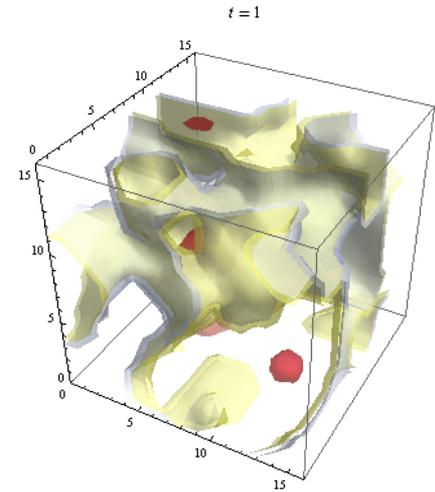
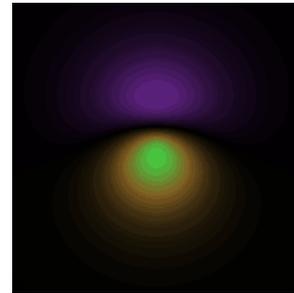
∞ No pretty pictures

∞ No cute animals

∞ Nothing explodes

∞ So small it's hard to relate

∞ Multidimensional spaces are hard to visualize



§ I have two curious girls who ask tons of questions

∞ I would like to talk to them about what I do (a bit)

Outreach: Quantum 3

§ The concept:

- ∞ How do we get young people, especially women, interested in and excited about what we do?
- ∞ We want more girls in science and computational fields
- ∞ Pipeline problem? Get them started early!

§ Match-3 genre is more accessible, attractive to girls

§ More girls in games \Rightarrow more career programmers

§ Portray QCD in this medium

- ∞ Public-friendly manner; no confusing jargon

§ NSF is the perfect agency to fund this effort

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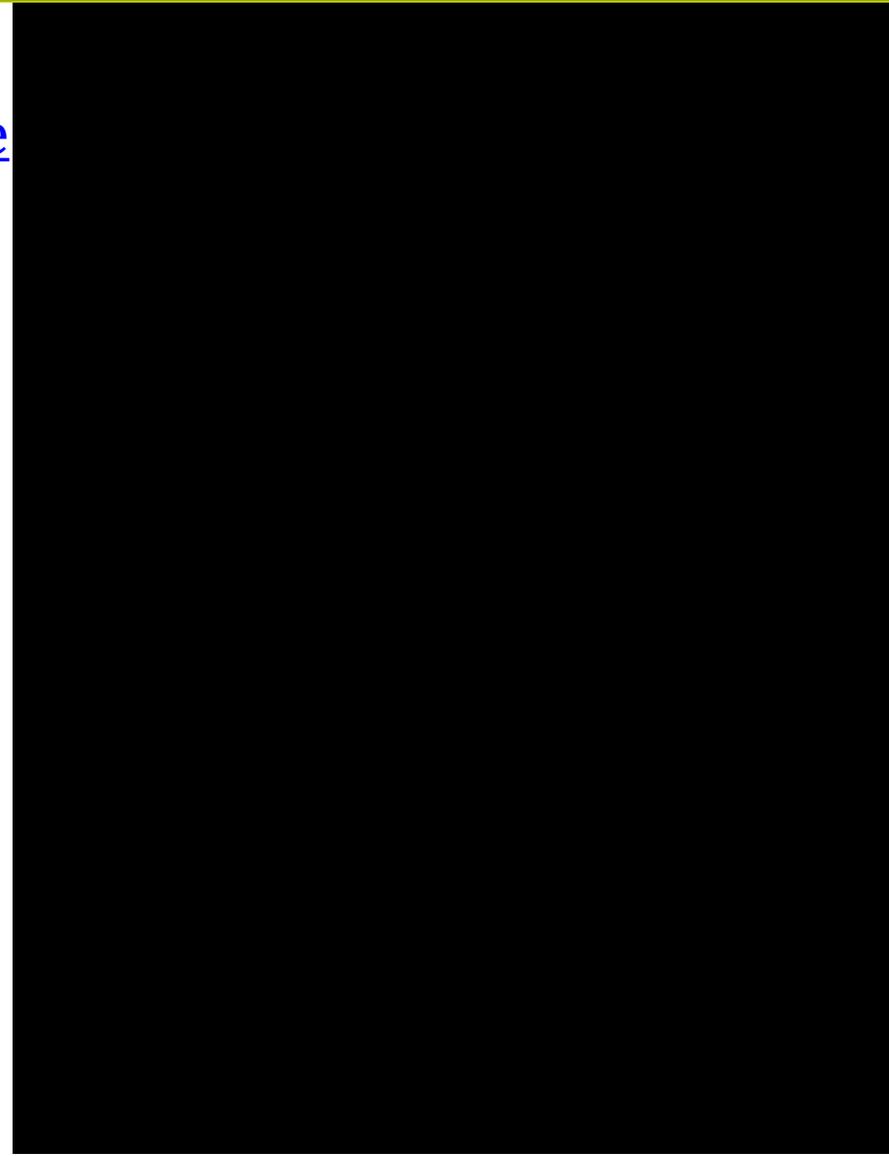
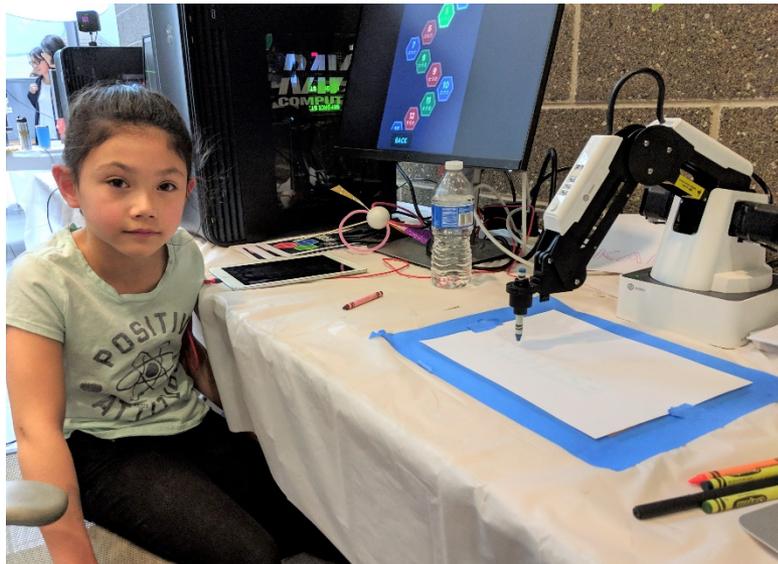
- ∞ My kids are more than happy to help and found many bugs

Outreach: Quantum 3

§ Learn QCD on your phone

[Google Play Store](#)

[Apple Appstore](#)





Questions?





Extra Slides



Quantum 3

§ Collaborating with Games for Education and Learning (GEL) Lab at MSU to recruit undergrads for this project

- ∞ Students learn/train with real working experience
- ∞ Good for the resume when they graduate
- ∞ It's pretty cool to tell your friends, "I made a game!"

§ MSU undergraduate students are the main force

- ∞ Team: Tristan Özkan,
Harrison Sanders,
Rebecca Roman,
Roman Firestone,
Colleen Little



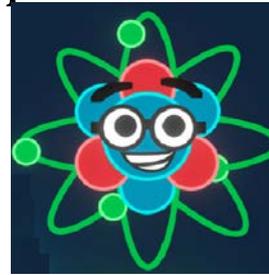
Design and Implementation

§ Have to keep it simple

- ↪ Like to cover a lot, but don't want players to lose interest
- ↪ There are some trade offs
- ↪ We hope people who get interested in quantum physics from our game move on to advanced apps like "Particle Adventure"

§ Only make baryons

§ Cute mascot is essential



- ↪ Googly eyes and friendly smile

§ Start from the simplest "color" degree of freedom, then add "flavor" and lastly introduce the hard "spin"

- ↪ Younger (4–5) kids can get to the flavor quantum number
- ↪ Spin depends on being comfortable with a little math; good for older kids and general public (adults)

Color-Blind Friendly

§ We checked our art design for color-blind friendliness

∞ Our three choices of color are distinguishable for them

Simulation of what
color-blind may see

Tetrachomat



Kids Become the Teachers

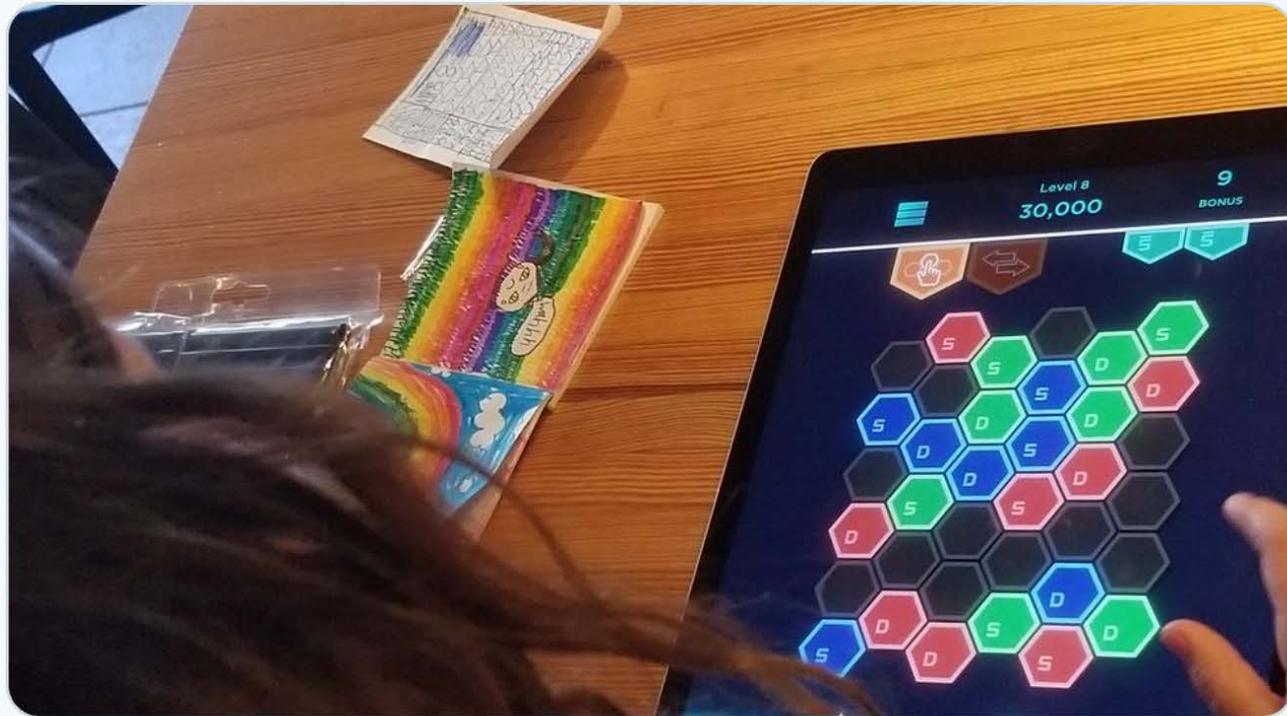
§ Love to see more tweets like this



Chris Oakley @DrPhysOaks · Mar 21

Replying to @NSF_MPS and @michiganstateu

...and my seven year old is explaining to me how to create Xi - ...



https://twitter.com/NSF_MPS/status/1106577806673264640