Woman in Physics: A personal journey

This work is supported by NSF under grant PHY 1653405
“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?

**Gender Breakdown by Continent**

- Europe
- Asia
- America

![Graph showing gender breakdown by continent with data points and a trend line indicating increasing female participation.](image)
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?

![Gender Breakdown of Lattice Conference Plenary Speaker Gender](image1)

![Gender Breakdown of Lattice Conference Participation](image2)
§ Average fraction of female plenary speakers and conference participants by continent of the conference

**Fraction of Women Plenary Speakers by Continent**

- Europe
- Asia
- America

**Fraction of Women by Continent**

- Europe
- Asia
- America
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

作ったために女性の参加が関連していますか？

<table>
<thead>
<tr>
<th>Topic</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algorithms and Machines</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Beyond the Standard Model</td>
<td>3</td>
<td>28</td>
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<tr>
<td>Chiral Symmetry, Vacuum Structure</td>
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<td>23</td>
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<tr>
<td>Ensemble Generation</td>
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<td>Hadron Spectroscopy</td>
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<tr>
<td>Hadron Structure</td>
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<td>13</td>
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<tr>
<td>Heavy Quarks</td>
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<td>12</td>
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<tr>
<td>Nonzero Temperature and Density</td>
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<td>35</td>
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<tr>
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<td>Renormalization</td>
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<td>Standard-Model Parameters</td>
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</tr>
<tr>
<td>Other Topics</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>
§ 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)
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173 responses (a typical LQCD attendance is 300–500)

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

173 responses

- East Asian: 21 (12.1%)
- South Asian: 10 (5.8%)
- Black/African: 1 (0.6%)
- Caucasian/White: 130 (75.1%)
- Hispanic/Latinx: 6 (3.5%)
- Middle Eastern: 3 (1.7%)
- Native American: 1 (0.6%)
- Pacific Islander: 2 (1.2%)
- Caribbean: 0 (0%)
- Prefer not to answer: 8 (4.6%)
Many-Body Problems
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.
§ 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
§ 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
§ 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/
APS Blewett Fellowship

Fellowship to help women getting back to physics due to career breaks. [Link](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
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)
§ 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 ⇒ 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
§ 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)
§ We checked our art design for color-blind friendliness.

(web page)

Our three choices of color are distinguishable for them.

Tetrachromat

Simulation of what color-blind may see
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