



# Career Mentoring for Postdoctoral Researchers at Fermilab

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Presentation on receipt of 2023 Meenakshi Narain Mentoring Award  
American Physical Society Meeting, Sacramento CA, April 4, 2024

# Outline

- **Introduction**

award, need and program

- **Beginnings**

discussions, plans and mentors

- **Events**

meetings, evaluations and presentations

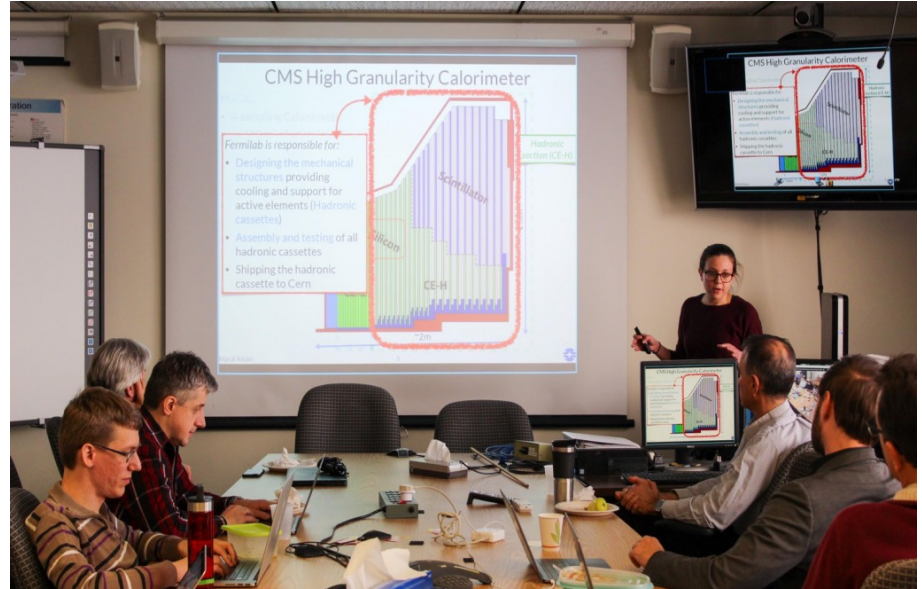
- **Careers**

applications, practices and results

- **Conclusions**

Lots of photos of our postdocs in action !

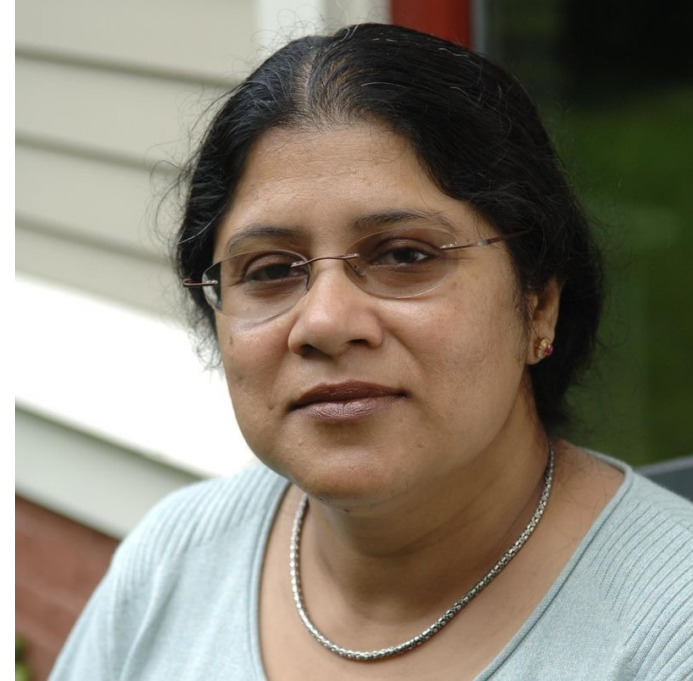
## CMS postdocs and scientists at a mentoring meeting in 2020



(L to R): Hannsjoerg Weber (2015-21), Sergo Jindariani (2007-12), Frank Chlebana, Maral Alyari (2017-20), Robert Harris, Matteo Cremonesi (2015-21), Daniel Elvira

# Meenakshi Narain Mentoring Award

- **Formerly the DPF Mentoring Award**
  - David Salzberg (2022), Rafael Lang (2021), Tesla Jeltema (2020), Tim Tait (2019), Bonnie Fleming (2018), Thomas Devlin (2017), Howard Georgi (2016), Heidi Schellman (2015)
- **Dedicated in honor of Meenakshi Narain in 2023**
  - Particle experimentalist and inspirational leader
  - Dedicated to mentoring, diversity and inclusion
  - I personally recall her commitment to science and her care for young scientific colleagues in my interactions with her at the Tevatron and CMS
- **It's an honor to be among these scientists, and receive this award bearing Meena's name**



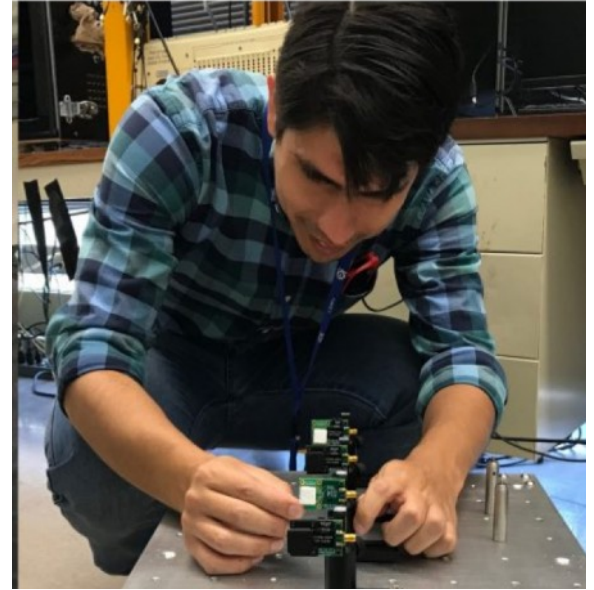
# Introduction

Why I am here



# Postdoctoral research is great

- **There is nothing like being a postdoc**
  - You have been trained as a grad student and you know what you are doing
  - You get to focus on research without the responsibilities of faculty or staff
  - You get to develop cutting edge technologies and explore science deeply
- **You enjoy in the pure scientific delight of this exhilarating stage of your career**
- **What could you possibly be worried about ?**



Cristián Peña (2017-21)

# Career Mentoring

*“The job of a postdoc, is finding their next job ! ”*

- **Postdoctoral research is a critical juncture in the career of a physicist**
  - A postdoc is very often the last position in the academic career of a researcher
    - ~20% of all postdocs in high energy physics will eventually obtain tenure-track research positions
- **Fermilab has developed and implemented a career mentoring program for postdocs**
  - To prepare postdocs to compete for scarce tenure-track positions at a university or laboratory
  - To support them in obtaining the best possible position in whatever career track they choose

Former Postdocs at  
“Fast ML for Science”  
workshop, S.F., 2023



L to R:

Nhan Tran (2011-17)

Mia Liu (2015-20)

Ben Kreis (2013-19)

Andrew Whitbeck (2013-18)

Javier Duarte (2016-19)

# Fermilab / CMS Postdoc Mentoring Program

- **Fermilab's most formal postdoc mentoring program\* insures that postdocs**
  - Acquire skills and produce achievements expected of a leading physicist
  - Are coached to increase their chance of obtaining a great position in their career track
- **The mentoring program has three basic elements**
  1. Postdoc research plan formed after extensive discussions
  2. Personal mentoring team of supporting scientists for each postdoc
  3. Regularly scheduled mentoring meetings and mentoring events

Current Postdocs in  
CMS Remote Operations  
Center at Fermilab in 2023



L to R:

Jennet Dickinson (2020 -)  
Grace Cummings (2022 -)  
Cristina Mantilla Suarez (2020 -)  
Irene Zoi (2021 -)

\* Other mentoring programs at Fermilab, including one that I run which is less formal, are not discussed in this talk

# Great Beginnings

The first months



# Postdoc Research Discussions

“Look before you leap”

- **Postdocs choose their research**

- Postdocs spend at least one month talking to CMS scientists and postdocs before beginning research
- Discussions with the scientists leading the technical research groups and physics analyses
- Learning about the department and choosing research topics: technical and physics
- Encourage postdocs to behave as independent researchers, responsible for research of their choice

- **Postdocs choose their mentors**

- Identifying team of scientists who will support them and their plan (next slides)

## Current Postdocs Teaching at CMS Data Analysis School 2024



Top row (L to R):  
Irene Zoi (2021-)  
Aidan Grummer (2021-)  
Yongbin Feng (2020-)



2<sup>nd</sup> row  
Irene Dutta (2022-)  
Cristina Wang (2024-)  
beginning soon



3<sup>rd</sup> row  
Grace Cummings (2022-)  
Chris Madrid (2020-)



Bottom row  
Martin Kwok (2020-)  
Oz Amram (2022-)

# Postdoc Research Plan

*“Plans are useless, but planning is indispensable”*

- **Research plan essentials**
  - **Balance:** timely and appropriate physics and technical research
  - **Milestones:** physics publications and technical accomplishments for first 3 years, prior to job market
  - **Visibility:** paths to leadership positions and other visibility for advancement
- **Planning is crucial mentoring**
  - Plan written by postdoc and their team is the first mentoring event for a good start
  - Plans change, but writing the plan, owned by mentoring team, is indispensable.
  - Reviewed and commented on by mentoring committee and management

Current and former postdocs conducting technical research



Clockwise from Top: Jennet Dickinson, Caterina Vernieri, Irene Zoi, Andrew Wicklund, Ryan Heller, Jim Hirschauer mentoring Nadja Strobbe, Maral Alyari.

# Postdoc Mentoring Teams

*“We get by with a little help from our friends”*

- **Every postdoc has a mentoring team of scientists**
  - **Trusted scientists:** chosen by the postdoc, to support postdoc’s career and research
  - **Symbiotic relationship:** team benefits from postdoc’s research, postdoc benefits from team’s mentoring
- **Each postdocs chooses 2-4 scientists to fill 4 roles**
  1. **Technical guide**
    - Guides postdoc on technical research that scientist leads
  2. **Analysis guide**
    - Guides postdoc on physics analysis
  3. **Supervisor**
    - Responsible for overall day-to-day activity of postdoc
  4. **Mentor**
    - Advises on research and career decisions

CMS scientists that mentored the most postdocs

(# of mentees)



and 29 other Fermilab scientists not shown

# In the Trenches

Mentoring in the first 3 years



# Postdoc Pizza Meeting

*"It takes a village . . ."*

## • Open Session

- Each postdoc shares their research strategy annually with the CMS department
- Two high quality talks per meeting, focused on postdoc accomplishments and future plans
- Postdocs practice CV-like presentations in a supportive and social monthly forum
- Exiting postdocs brief their colleagues on their experience on the job market
- Pizza encourages everybody to attend !

## • Closed Session

- Mentoring committee discusses career plan and any issues with the mentoring team
- Advises teams, holds team accountable

Light-hearted moment at a CMS Postdoc Meet in 2020



(L to R): Hannsjoerg Weber (2015-21), Sergo Jindariani (2007-12), Frank Chlebana, Ryan Heller (2018-23), Robert Harris, Matteo Cremonesi (2015-21), Daniel Elvira, Doug Berry, Allison Hall (2018-21)

# Annual Checkups

## • Postdoc Annual Evaluations and Mentoring Discussions

- Includes the postdoc, their team, and management, for this annual review and discussion
- Focuses on mentoring aspects needed to insure each postdoc is on track for their career choice
  - **Breadth and Depth:** Are you acquiring the right expertise for your chosen field ?
  - **Presentations:** Have you presented both physics and technical research both locally and at conferences ?
  - **Publications:** Are you publishing your technical and physics research ?
  - **References:** Are you known by respected scientists, who can serve as good references for your next job ?
- Focus on the future as much as possible, in addition to reviewing performance.
- Prepare the postdoc to enter the job market as early as possible.

## Current and Former Postdocs Teaching at CMS Data Analysis Schools (2019 – 2024)



Nick Smith  
(2018-)

Karri DiPetrillo  
(2019-23)

Christian Herwig  
(2019-)

Chris Madrid  
(2020-)

Ryan Heller  
(2018-23)

Cristina Mantilla Suarez  
(2020-)

Murtaza Safdari  
(2022-)

Daniel Guerrero  
(2022-)

# Postdoc Presentations

*"Every talk is a job talk . . ."*

- **Postdocs refine the art of presentation**
  - At experiment meetings, collaboration wide
  - Annually at postdoc meetings
  - At conferences, workshops, schools
  - Seminars and colloquiums at labs and universities
- **Postdocs practice their important talks**
  - In front of their mentoring teams and others
  - Getting general guidance on art of speaking
  - Very specific advice about slides and points
- **A culture of excellence in presentation**

## Current Postdocs Presenting at Moriond 2023



Abhijith  
Gandrakota  
(2021-)

Nick  
Smith  
(2018-)

Oz  
Amram  
(2022-)

# On the Market

Mentoring in the final years



# Tenure Track Jobs

*"Time has come, the walrus said . . ."*

- **Postdocs start applying for tenure track jobs by end of 3<sup>rd</sup> year**

- Postdoc positions last up to ~ 5 years, to allow three job searches
  - End of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> years.
- Allows time for opportunities to arise, and to perfect their search.

- **References are critical !**

- Senior professors and scientists
- Outside references mainly
  - A letter from the home institution is required, but often viewed as biased
- Discussed annually, finalized for 1<sup>st</sup> job search, changed if needed

Next positions at Universities: **Asst. Prof. starts in 2010s**



**Top Row (L to R)**

Francisco Yumiceva (2006-12) → Florida Inst. Tech  
Ben Hooberman (2009-14) → U. Illinois

**2<sup>nd</sup> Row (L to R)**

Andrew Jung (2010-15) → Purdue U.  
Verena Martinez Outschoorn (2011-14) → U. Illinois  
→ U. Mass Amherst

**3<sup>rd</sup> Row (L to R)**

Ketino Kaadze (2013-14) → Kansas State  
Raphael Lopes De Sa (2013-17) → U. Mass Amherst

**Bottom Row (L to R)**

Andrew Whitbeck (2013-18) → Texas Tech → FNAL  
Caterina Vernieri (2014-18) → SLAC / Stanford

# Tenure Track Applications

*"Apply early, apply often !"*

- **Mentoring team and others review/advise on postdoc's tenure track job applications**

- **Curriculum Vitae**

- Organized, clear, to the point.
- Significance of accomplishments, not just a listing

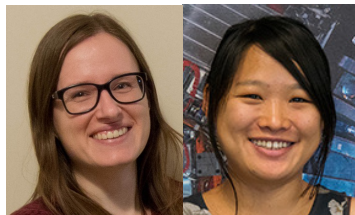
- **Research Statement**

- High level story of research goals and significant accomplishments
- Tailored to each institution
- Focused on future research there

- **Teaching and Diversity Statement**

- Demonstrating enthusiasm and commitment

Next positions at Universities: **Asst. Prof. starts in ~2020s**



**Top Row (L to R)**

Nadja Strobbe (2015-19) → U. Minnesota  
Mia Liu (2015-20) → Purdue



**2<sup>nd</sup> Row (L to R)**

Matteo Cremonesi (2015-21) → Notre Dame (PD)  
→ Carnegie Mellon U.  
Javier Duarte (2016-19) → U. C. San Diego



**3<sup>rd</sup> Row (L to R)**

Aram Apyan (2016-21) → Brandeis  
Allison Hall (2018-21) → US Naval Academy



**Bottom**

Karri DiPetrillo (2019-2022) → U. Chicago

**Not Shown:** 5 current postdocs that have been offered Asst. Prof. positions at U.S. universities

# Practice Sessions

*"Practice makes perfect"*

- **Job Talk Seminar**

- An interesting story focused on science
- Featuring postdoc's unique contributions

- **Colloquium**

- Pedagogical, inspirational research talk
- Demonstrates ability to teach as well

- **Miscellaneous**

- Research program talk, teaching demo

- **Practice job talk often**

- Twice to start, mentoring team & others
- At institutions: first "friendly", then for jobs

## Next positions in HEP abroad: Scientists, Professors, Fellows



### Top Row (L to R)

Ingo Bloch (2006-11) → Scientist (DESY)

Kostas Kousouris (2007-11) → Scientist (CERN)  
→ Asst. Prof. (Athens)



### 2<sup>nd</sup> Row (L to R)

Seema Sharma (2008-14) → Asst. Prof. (Pune)

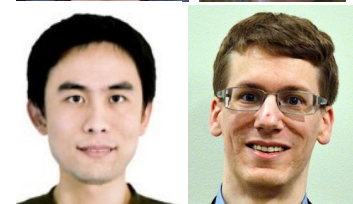
Yan Yan Gao (2009-13) → Postdoc (U. Edinburgh)  
→ Lecturer (U. Liverpool)



### 3<sup>rd</sup> Row (L to R)

Hang Yin (2010-15) → Asst. Prof. (Wuhan)

Jacob Linacre (2011-16) → Fellow (RAL in UK)



### Bottom Row (L to R)

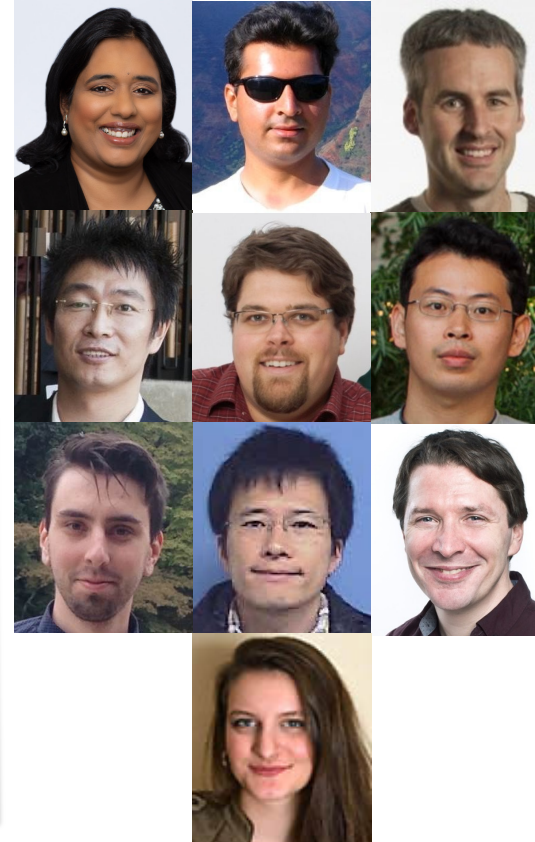
Zhen Hu (2014-18) → Asst. Prof. (Tsinghua U.)

Hansjorg Weber (2015-21) → Asst. Sci. (Berlin)

# Professional Careers

- **Not everyone wants tenure track**
  - Some prefer private industry to teaching
  - Pure technical work without a need to publish
  - Scientific research is great training for industry
- **We tailor the final year to help**
  - Focus on topics that are sought by industry
    - Data science in the past
    - Machine learning / artificial intelligence now
  - Support taking targeted training programs
- **Support postdocs in their career choice**
  - Help them get the best positions in their track

## Next positions in Industry / Government : Data Scientists, Engineers, Leaders



Top row (L to R):

Vasu Chetluru (2008-13)  
Kalanand Mishra (2008-14)  
Jacob Anderson (2009-14)

2<sup>nd</sup> row

Fan Yang (2009-14)  
Daryl Hare (2011-15)  
Sho Maruyama (2011-16)

3<sup>rd</sup> row

Benjamin Kreis (2013-19)  
Satoshi Hasegawa (2014-18)  
Basil Schneider (2015-19)

Bottom

Lesya Horyn (2020-23)

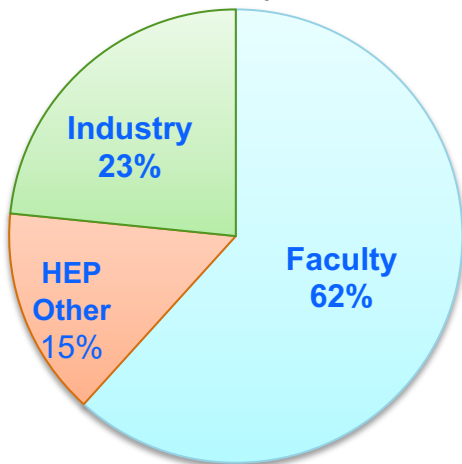
Not Shown: 1 current  
postdoc soon to leave



# Postdoc Placement

- **Majority of CMS postdocs became faculty**

- 47 have completed their postdocs
- 29 took a tenure track position in HEP at a university (19) or lab (10): 62%
  - Compared to ~ 20% of physics postdocs (APS)
- 7 took a 2<sup>nd</sup> postdoc or other position in HEP: 15%
- 11 started a career in private industry: 23%



## Next position at Fermilab: Scientists and Application Physicists



Top row (L to R):  
Oliver Gutsche (2005-9)  
Lorenzo Uplegger (2005-11)  
Dave Mason (2006-13)



2<sup>nd</sup> row  
Sergo Jindariani (2007-12)  
Jim Hirschauer (2009-13)  
Nhan Tran (2011-17)



3<sup>rd</sup> row  
Lindsey Gray (2012-15)  
Kevin Pedro (2015-19)  
Maral Alyari (2017-20)



Bottom row  
Cristián Peña (2017-21)  
Fabio Ravera (2018-21)

Not Shown: 1 current  
postdoc moving up soon

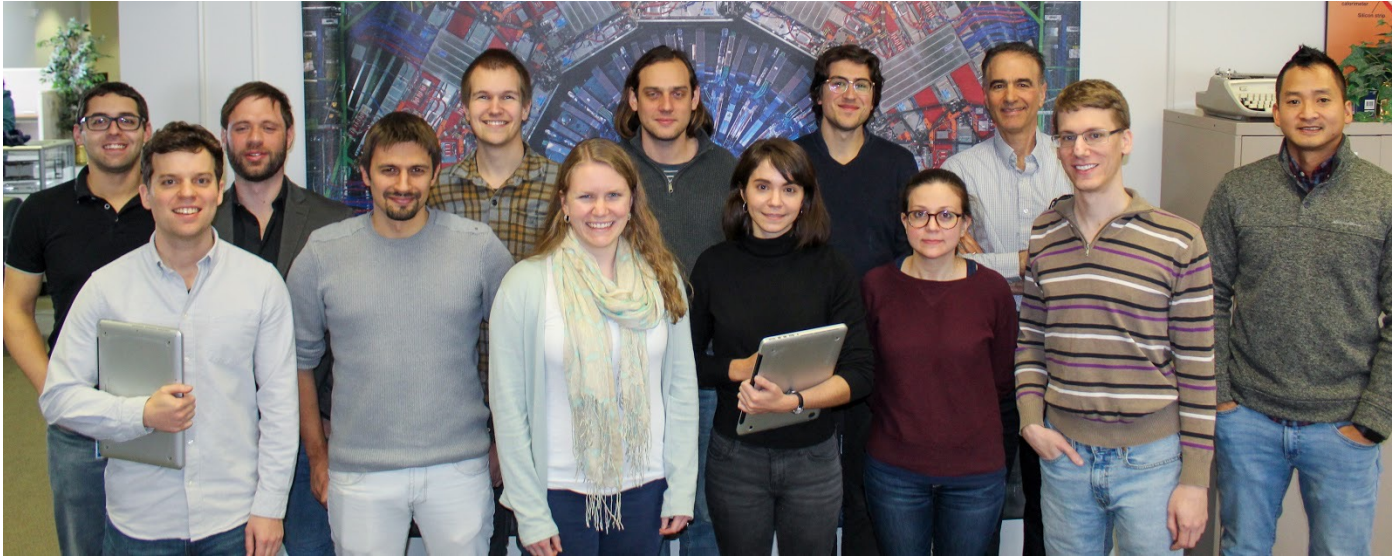


# Conclusions

- **Career mentoring at Fermilab has significantly benefited postdocs**
  - Document: “Guidelines for Fermilab CMS RA Supervisors, Mentors, and Guides”, 2017
  - <https://drive.google.com/open?id=1GqQ1huqJwvqm7CkIZQlu3Ptkyec5AmiO>
- **APS has recognized this with the 2023 Meenakshi Narain Mentoring Award**
  - *“for implementing and leading a postdoctoral mentorship program that has greatly enriched the scholarly and professional lives of junior scientists at Fermilab”*
- **Thanks to:**
  - The division of particles and fields of APS for this recognition
  - The conscientious Fermilab scientists who serve on postdoc mentoring teams and committee
  - The past and current Fermilab postdocs: it has been my honor to lead their mentoring !

# Thank you !

## Current and Former CMS Postdocs at the Fermilab LHC Physics Center in 2020



### Front Row (L to R):

- Ryan Heller (2018-23) → Applied Research Scientist (LBNL)
- Fabio Ravera (2018-21) → Associate Scientist (FNAL)
- Allison Hall (2018-21) → Asst. Prof. (U.S. Naval Academy)
- Karri DiPetrillo (2019-23) → Asst. Prof. (U. Chicago)
- Maral Alyari (2017-20) → Applications Physicist (FNAL)
- Hannsjorg Weber (2015-21) → Assoc. Scientist (Humboldt U.)
- Nhan Tran (2011-17) → Scientist (FNAL)

### Back row (L to R):

- Kevin Pedro (2015-19) → Associate Scientist (FNAL)
- Matteo Cremonesi (2015-21) → Assistant Professor (CMU)
- Christian Herwig (2019 - )
- Nick Smith (2018 - )
- Thomas Klijsma ( 2019 - )
- Robert Harris ( 1989-1994) → Senior Scientist (FNAL)