Department of Physics

- State of the Department
State of the Department?

Obviously, the state of the department is GREAT!

Frankly, I do not really know 😐
Welcome to Matriculating PhDs

They are amongst the best

Big thank you to the Admissions Committee, Michelle Holland and Grad Student recruiters

100 Offers Made Out of 500 Applicants

29 Matriculating PhD Students of 2019

35 international
65 domestic

58 experiment
20 theory
22 undecided

31 women
69 men

Welcome to our most diverse PhD class in recent memory!!

We know they have had other options around the world

Congratulations to them for making the best possible choice!
MASTER OF SCIENCE IN PHYSICS-QUANTUM COMPUTING

THE UNIVERSITY OF WISCONSIN-MADISON
DEPARTMENT OF PHYSICS

- Starts September 2019
- Designed for completion in one calendar year
- Offers a blend of:
  - Classroom training
  - Independent projects
  - Laboratory experience
- Only MS-P-QC Program in the US
- Apply at https://grad.wisc.edu/
- Application Deadline: March 15, 2019

Be one of the first to take advantage of this unique opportunity!
Quantum computing and quantum information is a very rapidly growing field with fantastic career opportunities.

Learn more at https://www.physics.wisc.edu/mspqc
MS in Physics-Quantum Computing

Admissions & Incoming Class of 2019

Thanks to Bob Joynt for conceiving and implementing the plan with Michelle Holland and the quantum information science faculty.

Looking forward to a great start in Fall 2019.
Welcome to Matriculating Grads

Physics PhD: Class of 2019

[Images of graduates]

MS Physics-Quantum Computing Class of 2019

[Images of graduates]
We are a big group of people!

Our friends from 2018
We are a big group of people!
We are a big group of people!
Department of Physics Faculty

N_{\text{faculty}} = 44.25
# People Count!

<table>
<thead>
<tr>
<th>Role</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-major UG Students Served (&lt;300-level)</td>
<td>2867</td>
</tr>
<tr>
<td>Physics Majors (Including AMEP, AP, double majors)</td>
<td>~175</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>~186</td>
</tr>
<tr>
<td>Non-faculty Research Staff</td>
<td>~95</td>
</tr>
<tr>
<td>Faculty</td>
<td>44.25</td>
</tr>
<tr>
<td>Non-faculty Teaching Staff</td>
<td>11</td>
</tr>
<tr>
<td>Technical Staff</td>
<td>11</td>
</tr>
<tr>
<td>Administrative Staff</td>
<td>7</td>
</tr>
<tr>
<td>Emeritus Faculty</td>
<td>26</td>
</tr>
<tr>
<td>Affiliated Faculty</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total (Excluding Service course UGs)</strong></td>
<td>~3400 (~500)</td>
</tr>
</tbody>
</table>

I certainly can’t keep track of what 500 people are up to – some times I have trouble keeping track of what I am doing myself!

We do a lot of stuff!

9/6/19
Sifting and Winnowing since 1849
- Research and teaching in all disciplines (but dentistry)
  - 44000 students
  - Top 10 in Federal research funding for decades
- A land grant college

15% increase in UG students planned by 2020 – realized already this year!!

While general UG population is diverse, physics population is far from it.
The Soviet Atomic Project

How the Soviet Union Obtained the Atomic Bomb

https://doi.org/10.1142/10865  |  October 2018
Pages: 784
By (author): Lee G Pondrom (University of Wisconsin-Madison, USA)

Full Book View  Tools  Share
Pupa Gilbert wins David A. Shirley Award for Outstanding Scientific Achievement at the Advanced Light Source
Tuesday, October 16, 2018

The David A. Shirley Award for Outstanding Scientific Achievement at the Advanced Light Source has been awarded to Professor Pupa Gilbert for her development of Polarization-dependent Imaging Contrast (PIC)-mapping to image the orientation of carbonate nanocrystals in marine biominerals.

Prof. Victor Brar receives Moore Inventor Fellowship
Thursday, November 15, 2018

The University of Wisconsin–Madison physics professor has developed a light source to fill a niche where lasers are too expensive and LEDs inefficient, and the Gordon and Betty Moore Foundation has named him to its 2018 class of Moore Inventor Fellows.
UW Making Big Investments in Quantum Science
Tuesday, March 5, 2019

“UW–Madison awarded its first Ph.D. in physics in 1899 and has a strong tradition of research in physics and its subfields,” says Steve Ackerman, UW–Madison associate vice chancellor for research in the physical sciences. “And today, by the investments we are making in quantum science and technology, we are building on that tradition and leading the way in concepts and technology that may revolutionize computing, communication, security and more.”

UW-Madison joins Chicago Quantum Exchange research hub
Thursday, February 28, 2019

UW-Madison is joining forces with the University of Chicago, the U.S. Department of Energy’s Argonne National Laboratory and Fermi National Accelerator Laboratory, and the University of Illinois at Urbana-Champaign in developing a national leading collaboration in the rapidly emerging field of quantum information.
Sau Lan Wu featured in OnWisconsin
Thursday, June 27, 2019

In an article titled, "A Pioneer's Preserverence," Preston Schmitt describes the inspiring story of Physics Professor Sau Lan Wu:

The UW–Madison Vilas Professor’s story is a lesson in dichotomy. She grew up in dire poverty on the streets of Hong Kong as her wealthy father traveled the globe as the Ginger King, so named for his success in the preserved-ginger industry. She had $40 to her name when she arrived in the United States — 10 years later, she had a PhD from Harvard. And then she devoted her life to a rarely reciprocal field dominated by men.

Wu has played a core role in three major discoveries in particle physics, advancing what we know about the tiniest parts of matter — and therefore, the world around us. Along the way, she’s advised more than 60 UW graduate students and 40 postdoctoral researchers.

Fatima Ebrahimih PhD'03 featured in OnWisconsin
Thursday, June 27, 2019

In "A Driving Force," Stephanie Awe writes about Fatima Ebrahimih's quest with roots in the UW-Madison Physics Department:

Fatima Ebrahimih PhD'03 is determined to unravel one of today’s most pressing needs. Ebrahimih is a principal research physicist in the Princeton Plasma Physics Laboratory’s Theory Department and an affiliated research scholar in Princeton University’s Department of Astrophysical Sciences. She strives to fully understand what many believe could be the answer to unlimited, clean, and reliable energy: nuclear fusion. She mirrors the very subject she studies, driven by seemingly limitless energy to help direct the future of the field.
Chancellor’s Award for Excellence in Leadership: Susan Nossal
Tuesday, April 30, 2019

The university’s large introductory physics classes can be daunting to students, especially those who had limited exposure to the discipline in high school. In collaboration with others, Susan Nossal founded the Physics Learning Center 14 years ago to create a welcoming space for these students. The concept began as the Physics Peer Mentor Tutor Program, now the center’s core. Each semester, carefully trained undergraduates and staff members assist more than 150 students, many experiencing challenging circumstances inside and outside the classroom. The students develop confidence not only in physics, but in university life in general. Some go on to become tutors in the program themselves. Nossal sets a warm tone. Her caring demeanor and devotion to social justice foster powerful connections with students who may feel isolated or frustrated. Tenacious and resourceful, she’s grown the center into a forceful vehicle for student success.

Photo: Susan Nossal works on optical calculations with undergraduate students Matthew McAllister and Hanna Khan in a classroom at Chamberlin Hall.

Photo Credit: Jeff Miller

Duncan Carlsmith’s innovative smart phone dropping physics course
Monday, July 1, 2019

Smartphones get a workout in a two-semester accelerated introduction to physics for potential University of Wisconsin–Madison physics, astronomy, and applied math, engineering and physics majors.

Phones get dropped, says Duncan Carlsmith, a professor of physics. They get thrown like a football. They get strapped to a pendulum or lashed to a bicycle.

Later, the phones spew out the data gathered by a surprisingly broad array of sensors: accelerometers, gyroscopes, audio and light sensors, magnetometers, and a precise timer.
Prof. Francis Halzen awarded 2019 Yodh Prize
Friday, July 26, 2019

Professor Francis Halzen, PI of the IceCube Neutrino Observatory, was awarded the 2019 Kanwal & Gaurang Yodh Prize at the 2019 International Cosmic Ray Conference. He was honored for "his leadership and landmark contributions that cleared the path for the emergence of neutrino astronomy."

Keep up with ICRC2019 here

Multimessenger collaboration between the Dark Energy Survey and IceCube leads to sensitive search for cosmic neutrino sources
Friday, July 26, 2019

Over the past two years, scientists in the Dark Energy Survey (DES) have been following up realtime neutrino alerts from IceCube with deep optical telescope imaging in search of supernovae that might be the origin of high-energy astrophysical neutrinos.

Full story and submitted paper
Researchers recreate the sun’s solar wind and plasma “burps” on Earth
Tuesday, August 6, 2019

A new study by University of Wisconsin–Madison physicists mimicked solar winds in the lab, confirming how they develop and providing an Earth-bound model for the future study of solar physics.

The Big Red Ball was turned into a laboratory model of the Sun

Thad Walker elected to chair DAMOP
Tuesday, April 30, 2019

Professor Thad Walker has been elected to be vice-chair of the APS Division of Atomic, Molecular and Optical Physics (DAMOP). He will serve as the chair starting in 2021.
Thank You Wesley!

Your students, post-docs and colleagues will benefit from your passion for physics and teaching for years to come!
This is very important effort which funds student scholarships, visiting speaker funds, outreach and lately new faculty!
College Financial Position (Good News!)

• We are in a strong financial position
• Situation much different than 5 years ago
• Contributing factors
  • Revenue-generating (131/VISP) programs
  • Summer term
  • Philanthropy
  • Undergraduate enrollment expansion
Enrollment Expansion: Initial Plan

• Increase undergraduate population by 250 per year for four years
• Grow out-of-state undergraduate population
• In the new steady state:
  • 1,000 more students in entering cohort
  • 4,000 more undergraduates
  • About 13% increase overall
• Significant revenue implications
  • Out-of-state tuition differential
Enrollment Expansion Benefits (2)

- Fall salary exercises
  - Campus supplement for faculty raises
  - College supplement for staff raises
- TA rates
  - 9% increase for FY20
  - Cumulative 28% increase over past 3 years
- L&S minimum instructional rates
  - Increased by 15% or more for FY20
Departmental Spending Plans

- Many departments have resources
  - New budget through summer reallocation exercise
  - 131 revenues, summer revenues, and accumulated balances
- Strategic planning needed before spending!
- Engage your budget and/or executive committee in planning
- Discuss plans with your divisional associate dean

August 27, 2019

L&S Plenary Meeting
Long term strategic plan, Top priority

- Experimental neutrino physics
  - Department welcomed Brian Rebel in 2018
- Atomic, Molecular, Optics (AMO) and quantum physics
  - Department welcomed Shimon Kolkowitz in 2017
- Theoretical cosmology and astrophysics

Second priority

- Condensed matter experiment and theory
- High energy particle experiments
  - Department welcomed Kevin Black and Tulika Bose in 2018

Additional targets

- Computational physics and high performance computing
- Biological physics, nonlinear physics & soft matter
- Exoplanets

2018-19 hiring plan – continuing to 2019-20

- Multidisciplinary cluster proposal for Quantum Computing
- Martin L Perl Endowed Professorship
The Strategic Planning Committee of the Physics Department met on April 16, 2019 with Baha Balantekin, Victor Brar, Dan Chung, Cary Forest, and Sridhara Dasu present. Mark Saffman could not join, but sent his input. Prior to the meeting all the members of the committee carefully read previously submitted contributions from individuals or groups describing where their field is going and how a hire in their area is good for the department. After careful deliberations the Committee listed the proposed hires in two groups. The committee did not priority order within each group, the lists given below are alphabetical.

2019-20 Searches

Hires expected for the next one or two years (not a priority ordered list):

- Computational/Theoretical Cosmology
- Computational Plasma Theory
- Condensed Matter Experiment
- Particle Astrophysics Experiment (IceCube)
- Quantum Information Theory

Hires expected within two-to-four years (not a priority ordered list):

- Accelerator-based neutrino experiment
- AMO experiment
- Astrophysics experiment
- Plasma experiment
TOP Update

• L&S nominated 37 candidates; 17 offers were authorized:
  • 6 acceptances, 6 declines
  • 2 cases in which the department voted not to make an offer
  • 3 cases still pending

• There will be another round of TOP hiring this year with somewhat modified rules and expectations
  • Instructions will be forthcoming from Bascom
  • Expect more clarity on the two different pathways for TOP hires

• What can you do?
  • Continue to seek out and identify candidates
    • Use your colloquia/seminars to bring in potential candidates
    • Attend disciplinary meetings of diverse populations where applicable
    • Build research relationships with minority-serving institutions
  
• Be able to answer the questions:
  • What is your overall diversity plan?
  • What is your approach to creating an environment that will retain the TOP hire?
  • What is your strategy for recruiting a diverse pool of candidates?”

Danielle Speller did not accept
Nevertheless, we should try again
Size of Physics Faculty

Faculty FTE

2015-16 includes 3 new faculty: Arnold, Levchenko, Palladino

2016-17 includes 2 new faculty: Brar and Ioffe, Arnold → UCSD

2017-18 includes Kolkowitz, but one retirement in Lin

2018-19 includes Bechtol, Black, Bose, Rebel, but two retirements (Smith & Winokur) and one death (Westerhoff)

Note: Coppersmith & Ioffe are on long term leave
Size of Physics Faculty vs Research Expenditures

Faculty Count or Research M$ vs year

- Faculty FTE
- Extramural Research Expenses
Total Expenditure in AY2017-18: $30.3M

Overhead larger than salaries of all faculty combined
Another Slice of Expenditure Pie

Amount

Extramural Research Funds
- 144 (64%)

UW Base Support
- 101 (23%)

FUNDING SOURCES AND ASSOCIATES:

101- State tax, Federal indirect cost, and UW-administered non-revenue
104- Funding from UW-Extension used for UW research
128- Cost recovery funding used by units
131-Tuition generated by self-supporting institutes
133- Non-Federal grants and contracts
135-VCRGE (aka Grad School)
136- Cost recovery outreach funding mec
144- Federal grants and contract funding
150- Federal indirect cost reimbursement
161- University administered trust funds
233- Gift funding
402- Minority and disadvantaged programs
Astro-particle / Neutrino-astrophysics (WIPAC)
  • Halzen, Hanson, Karle, Vanderbroucke

Astrophysics & Cosmology (Cosmo)
  • McCammon, Timbie, Bechtol

AMO and Quantum Computing with Neutral Atoms (AMO)
  • Saffman, Walker, Yavuz, Lawler, Kolkowitz

Biophysics (Bio)
  • Gilbert

Condensed Matter, Quantum Computing & Nanostructure Experiment (CMP-E)
  • Brar, Eriksson, McDermott, Rzchowski

Condensed Matter, Quantum Computing Theory (CMP-T)
  • Coppersmith, Levchenko, Joynt, Vavilov, Ioffe

High Energy Physics Experiment (HEP-E)
  • Black, Bose, Dasu, Herndon, Palladino, Rebel, Wu

Nuclear, Particle, Astro-particle, Cosmology & String Theory (NPACS-T)
  • Bai, Balantekin, Barger, Chung, Everett, Hashimoto, Shiu

Wisconsin Plasma Physics Laboratory, Plasma-astrophysics (WiPPL)
  • Boldyrev, Egedal, Forest, Sarff, Terry, Zweibel

Broad groupings, trying to put one faculty in one group (not perfect!)
Reasonably well balanced across various research areas
As expected, experimentalists are better funded, and support more people
As expected, “centers” and “clusters” are better funded than remote/small groups
Intra Departmental Funding Opportunity

“The purpose of this discretionary fund is to promote excellence in all areas of the UW physics department: research, teaching, and outreach. Awards will be decided via a yearly review of proposals from faculty and academic staff of the department.”

Submit up to 2-page proposals (https://www.physics.wisc.edu/auth/RayMacDonaldProposals)
Deadline: October 6, 2019
Target budget: $30 K per proposal
Top 2-3 proposals will be selected for funding by the Alumni and Board of Visitors Committee
Sifting and Winnowing since 1849
- Research and teaching in all disciplines (but dentistry)
  - 44000 students
  - Top 10 in Federal research funding for decades
- A land grant college

While general UG population is diverse, physics population is far from it.

15% increase in UG students planned by 2020 – realized already this year!!
About 15% take Physics 103+104

About 10% take Physics 202, but 201 is split between physics and engineering

About 6% take Physics 207+208

About 2% take Physics 115

So, about a third of the UG class goes through physics!
From UW DataViz: https://dataviz.wisc.edu/views/TrendsinStudentEnrollments/Homepage?%3Aiid=1&%3AisGuestRedirectFromVizportal=y&%3Aembed=y

My selection includes all Undergrad Majors in the programs:

Physics
Astronomy-Physics
AMEP
We ought to be able to attract more Physics majors, Double majors & especially AMEP

Perhaps, create a new major Math-CS-Physics
Involving Young Minds in Research ...

Research opportunities for undergraduates

Badgerloop team develops maglev technology and wins 3rd place in the SpaceX Hyperloop competition featured on international news
... Training Next Gen of Scientists
Success across divisions
More than $1B annual investment
New centers in growing fields (data, genomics)
- IceCube upgrade $37M
- Cluster hires
- Faculty support (Artist in Residence, data security/storage)

WARF Investments
$76.5M annual gift all university & affiliates
- New competitions (Library Collections, Core Enhancements)
- 7th greatest source U.S. patents (157 in 2018 for UW inventions)

Graduate School
- Over 9,200 master’s and doctoral students
- Improvements/efficiencies in admissions processing
- About $463,000 in travel awards
- Six consecutive years of stipend increases
- New services for graduate students facing academic/personal issues
- Support for students from underrepresented or marginalized identities
Increasing Support for Mental Health

- Students struggling more with stress, anxiety, and depression
- Mental Health Task Force submitted report in May
- UHS has added 10 new positions for this fall
- Extended evening hours
- Appointments always available for students in crisis
- Support for underrepresented students – 4 staff providing services in Mandarin or Spanish
- Increasing wellbeing support for students including new peer coaching model
- Available for consultations and resources
Prohibited Conduct

- UW Madison Policy on Sexual Harassment and Sexual Violence (2018) prohibits:
  - Sex Discrimination
  - Sexual Harassment
  - Sexual Assault
  - Dating Violence & Domestic Violence
  - Stalking
  - Retaliation
UW Ombuds Office

- 5 emeriti faculty, academic staff, and university staff hired 25% time for (staggered) 3-year terms.
  - Collectively, we have over 150 years of UW-Madison experience.
- Each Ombuds is “on call” for 1 of every 5 weeks and handles all the new requests coming in that week.
  - Returning “visitors” maintain contact with the same Ombuds unless they request a change.
- We serve faculty, academic staff, university staff, post-docs, and graduate (and undergraduate) student employees of the University
- Visitors can contact us through our Ombuds email or our Ombuds phone.
- The Ombuds work collectively and frequently seek advice from one another.
Ombuds.....We Listen

Contact us:
608-265-9992
uwombuds@mailplus.wisc.edu
Mission:
To improve the well-being and success of graduate students in the department.

Specifically:

- Facilitate communication with the department and advocate on behalf of the graduate students,
- Assist the department in welcoming new students and recruiting prospective students,
- Promote social cohesion among graduate students, and
- Provide resources to help prepare students for post-graduate careers.
Physics Graduate Student Council Organizational Chart

President
Susan Sorensen

Vice President
Kayla Leonard

All officers can be found on PGSC website: pgsc.physics.wisc.edu

Committee Chairs

Recruit & Welcome
Megan Tabbutt

Professional Development
Rob Morgan

Peer Mentoring
Brent Mode

Social Activities
Trevor Oxholm & Urvashi Gupta

Advocacy Team

1st Year Rep
TBD

2nd/3rd Year Rep
Ben Harpt

4th/5th+ Year Rep
Leslie Taylor

International Rep:
Leah Tom
Physics Graduate Student Council Organizational Chart

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Leslie Taylor

International Rep:
Leah Tom

New position this year!
PGSC : Last Year

**Communication / Advocacy**
- Students on Department Committees
  - Climate & Diversity
  - Graduate Program (advised on minor requirements and faculty mentoring)
- First year study sessions

**Social Cohesion**
- Welcome Picnic
- Cookie Time
- Pizza Nights
- Ping pong tournament
- Pi day bake-off

**Recruit & Welcome**
- Q&A Panels during First-Year Orientation
- Meals with current grad students during Prospective Student Weekends

**Professional Development**
- Invited speaker seminars
  - Rock Mackie
  - Crystal Bailey
PGSC: New/Upcoming This Year

Communication / Advocacy
- Climate Survey
- International Student Nights

Recruit & Welcome
- PGSC-hosted lunch & evening activities during orientation
  Congrats to Team Heisenbergers for placing 2nd at League Trivia last week!

Social Cohesion
- Fall Welcome Picnic!
  - 6PM today
  - James Madison Park
    - All grad students invited (including MSPQC)
- Grad lounge remodel

Peer Mentoring
Designed to work in tandem with faculty mentoring

Professional Development
- Bi-weekly workshops (Starting September 19th)
- Resources and info here: https://rmorgan10.github.io/UWMadisonPGSC-PD/
Questions? Comments? Get involved?

**Grads**
Get involved! Join a committee!

**Recruit & Welcome** - Help out with prospective student weekend and orientation

**Social Activities** - Brainstorm, organize, or help run events like the picnic

**Professional Development** - Assemble resources and events to help students prepare for future jobs

**Peer Mentoring** - Help make sure peer mentoring gets off to a great start

**Faculty**

Alumni reaching out wanting to mentor or support students? Get in touch with Susan or an appropriate PGSC chair.

Want graduate student input on a committee? We’re happy to help.

Curious about other ways to help here and there? Let’s talk.

[pgsc.physics.wisc.edu](https://pgsc.physics.wisc.edu)  
(comment box, officer list, signup forms)
What does Sarah do?

Social Media
@UWMadPhysics

News + stories
Press releases
Physics and WQI websites
news.wisc.edu
Newsletter

Outreach
Mostly organizational/managing role for now

Web content
WQI website
Adding news to Physics site + screens

Very basic design
Department tablecloth, banner, lanyards, etc.
Ad design (e.g. MSPQC)
Photography
How to follow UW brand guidelines
Communications

Social Media
- Provide me with photos from your research
- Let me know when you’re presenting at a conference
- I can help with lab/individual scicomm

News + stories
- Exciting new studies?
- Awards/honors?
- Any fun/exciting/intriguing personal stories about you as a scientist?
- Is there a news story about someone in the department that needs to go on our site?

Outreach
- Wonders of Physics
- Outreach events on campus
- STEM conferences
- Activity development

Web content
- Basic Wordpress site layout and content
- Adhering to web accessibility guidelines

“External” media
- When should news be pushed to higher levels? e.g. L&S, UComm, external media
- Commentary on “physics in the news”
- Profiles in Experts Databases
"Never has there been a time when an understanding of science has been more important to the well-being of individuals and to the nation than the present"

—CLINT SPROTT - FOUNDER, PROFESSOR EMERITUS

Scheduled presentations of The Wonders of Physics and a Physics Fair are given on the UW-Madison campus for the general public in mid-February each year. Free tickets are recommended and are available after January 1st using the On-Line Ticket Form. Alternately, you may call (608) 262-2927 or e-mail wonders@physics.wisc.edu. The next public presentations of The Wonders of Physics are scheduled as follows:

- **Saturday February 8, 2020** 1, 4, and 7 pm
- **Sunday February 9, 2020** 1 and 4 pm
- **Saturday February 15, 2020** 1, 4, and 7 pm
- **Sunday February 16, 2020** 1 and 4 pm

These presentations will be held in 2103 Chamberlin Hall, 1150 University Avenue, Madison, WI. The presentations last a bit over an hour and are suitable for all ages.
Enjoy the Reception!