

Strategic Plan

for the

Department of Physics and
Astronomy

(2018 – 2023)

Guiding Principles

A set of shared values and principles form the basis of our mission and guide our vision for the future of the department.

- A diverse and inclusive working and learning community with faculty and staff of the highest quality is essential for a first-rate department.
- The department expects that faculty, students and staff adhere to the highest standards of personal and professional behavior in all aspects of the department's activities and act with honesty and integrity.
- We value a working and learning environment that is collegial, where all are treated fairly and with the utmost respect, where faculty, staff and students work together in a cooperative and collaborative manner, and each person is motivated to reach their full potential.
- The department recognizes the growing importance of research that cuts across traditional disciplinary boundaries and will invest its resources in initiatives in multi- and interdisciplinary opportunities.
- The department expects all faculty members to vigorously pursue extramural funding in support of research and related scholarly activities.
- We are committed to provide all of our students with learning experiences that are state-of-the-art and of the highest quality, with emphasis on critical thinking, conceptual understanding, problem solving, and ethical issues related to science and fostering intellectual curiosity.
- Modern, well-maintained cutting edge physical facilities and core instrumentation resources that enhance our research, teaching and outreach missions together with an excellent support staff are essential to meet our research and educational objectives.
- Our faculty, staff and students will enthusiastically share their knowledge of physics and astronomy with the greater community, including K-12 students and teachers of Indiana, our alumni, and the general public.

Mission and Vision

The mission of the Department of Physics and Astronomy is to serve the local community, the citizens of Indiana, the United States, and the world through discoveries that expand knowledge in the field of Physics and Astronomy. We facilitate this mission through leadership in research and conveyance of this knowledge to our students in an excellent learning environment. Our knowledge is widely shared to enhance the public's understanding of Physics and Astronomy through engagement. We share our skills, knowledge, and enthusiasm with diverse communities beyond the University through community outreach, support of K-12 education and commercialization. We carry out this mission in accordance with the principles of inclusion, equity and diversity.

The vision of the Department of Physics and Astronomy is to advance its national and international reputation for both the quality of its undergraduate and graduate instruction and its diverse and innovative research programs.

The goal of the department for the years 2018–2023 is to have the quality, resources, and recognition to rank in the top 5 Physics departments among the 14 Big Ten Universities. Our faculty will have a broad array of coherent, cohesive, interdisciplinary programs based on fundamentally strong core research areas. The department will foster a vibrant, innovative, intellectual community of high quality faculty, staff and students focused on inclusiveness, diversity, shared governance, and respect. Our undergraduate program will provide a substantive research experience for all physics majors and provide exposure to state of the art scientific and measurement techniques for all students studying physics. Quantitative metrics of increased stature will be 1) establish/participate in one or more nationally recognized externally funded centers, 2) increase the external funding to \$15M/year, 3) increase the number of graduate students on RA's to 100, and 4) increase the number of incoming degree seeking undergraduate students in physics and applied physics to 120/year.

Research and Discovery

Goal 1: Improve the visibility and standing of the department to rank in the top 5 Physics/Astronomy departments among the 14 Big Ten Universities

Strategic initiatives:

1. Increase external research funding; increase research expenditures to at least \$15M/year.
2. Increase the fraction of faculty with external research funding.
3. Establish a departmental committee to identify on a regular basis senior high-profile (e.g., NAS level) and diversity candidates to refer to the Dean as targeted hires.
4. Increase RA/faculty ratio to above 2.
5. Diversify funding: E.g. increase NIH funding through stronger collaboration with NIH funded groups at Purdue, and regular strategic planning/discussions within the biophysics group.
6. Increase the number of on-campus physics and astronomy conferences.

Goal 2: Establish one or more nationally recognized externally funded centers

Strategic initiatives:

1. Make faculty aware on a regular basis of opportunities for large collaborative national center proposals (e.g. NSF Physics Frontier Center) and encourage them to apply; a center should provide a continuous source of external funding after an initial start-up period.
2. The department should provide incentives for individuals to take initiatives and apply for major center proposals. A regular departmental internal competition for center grant proposals, (e.g., two-page white paper submissions) should be established. Chosen proposals would receive potential (department or college-backed) seed funding and/or other incentives such as teaching release.

Goal 3: Strengthen network and establish leadership of the department in interdisciplinary and collaborative research

Strategic initiatives:

1. The department should provide incentives to increase the number of faculty leading and engaged in funded interdisciplinary research.
2. Foster collaborations inside and outside the department through activities such as regularly scheduled short research talks by faculty to advertise their research.
3. Facilitate interdisciplinary research, joint proposals and synergies with other departments (Biophysics with Chemistry, Astro/HEP with Statistics, etc.).

4. Build clusters within the department and actively participate in University-wide activities:
 - Quantum Information Science and Data Science clusters
 - Chemical Physics in collaboration with Chemistry
 - Astro Data Science cluster in collaboration with Statistics

Metrics:

1. Ranking of the department as determined by ARWU, WSJ/THE, U.S. News & World Report, etc.
2. Total research funding (research expenditures).
3. Number of graduate students supported as research assistants.
4. Faculty awards and recognitions.
5. Number of publications and citations.
6. Success of junior faculty as measured by research funding and promotion rates.
7. Center grants submitted or awarded.
8. Number of grant applications and funded proposals.
9. Number of Physics-led large, interdisciplinary/collaborative research grant proposals that are submitted and awarded.
10. Participation in campus-wide grants.
11. Number of disciplinary and interdisciplinary hires.
12. Affiliations with campus-wide initiatives.

Teaching and Learning

Goal 1: Increase the number, quality and diversity of our graduate students

Strategic initiatives:

1. Review and improve graduate student recruitment, admission and retention.
 - a. Create a committee for recruitment of grad students.
 - b. Conduct exit interviews to gather data for improving PhD program.
 - c. Ask students who don't accept our offer, where they go.
 - d. Acquire data about other programs acceptance rates.
 - e. Review the requirement of physics GRE for admissions.
 - f. Encourage more graduate students to seek NSF/NIH/DOE/NASA funding which would allow them to work for the group of their choice.
2. Review the need of a written Qualifier and decide whether to keep it.
3. Broadly advertise graduate research opportunities within the US.
 - a. Survey what other departments do.
 - b. Improve presence on the web for advertising pre-eminent groups.
4. Increase the number of graduate-level physics courses.
5. Review the rigor of preliminary exams and thesis defenses.
6. Re-introduce a graduate level "hands-on" lab course.
 - a. Graduate curriculum committee will study feasibility of graduate lab course.

Goal 2: Increase the number, quality, and diversity of physics majors

Strategic initiatives:

1. Review the applied physics program and take the lead in establishing a new undergraduate engineering physics program.
2. Improve recruitment and retention of undergraduates; compete for recruiting top undergraduates.
3. Review coherence of the curriculum for our physics majors.
 - a. Undergraduate curriculum committee will review the order of the physics courses and the timing of math courses.
 - b. Set up an internal wiki page for institutional memory of each course, resources, interconnectivity; with periodic summarization to prevent emphasis on last entry.
 - c. Survey student experience, especially sophomore and juniors.

Goal 3: Revisit and improve lab courses

Strategic initiatives:

1. Review and modernize the undergraduate laboratory curricula.
 - a. Undergrad curriculum committee will review all lab courses.
 - b. Undergrad curriculum committee will identify new lab courses.
 - c. Engineering physics lab course will be developed.
2. Update and replace old physics lab equipment for undergraduates.

Goal 4: Improve undergraduate service courses

Strategic initiatives:

1. Work with client departments to guide topics in our service courses.
 - a. Create a new committee for service course guidance.
 - b. Survey students for guidance on topics.
 - c. Gather data on the population of each service course by major.
2. Infuse evidence based pedagogical practices in service courses.
 - a. Recitations will be improved and better adopted to student needs.
 - b. Review student evaluations for improvement.
 - c. TA preparation will be systematized.
3. Improve facilities for labs and teaching.
 - a. Write a proposal to repurpose library space for creative teaching.
 - b. Each semester identify demos for upgrades or replacement.

Metrics:

- 1) Number of graduate students admitted.
- 2) Success rates for graduate students.
- 3) Enrollment of physics majors.
- 4) Number of improved lab courses.
- 5) Enrollment of engineering physics majors.
- 6) Retention rate of undergraduate students.
- 7) 4, 5 and 6-year graduation rates.
- 8) Student evaluation of service courses.

Diversity and Climate

Goal 1: Increase the diversity in our faculty, staff, and student body to reflect our social environment and culture

Strategic initiatives:

1. Review and improve strategies to increase the diversity in our faculty, staff, and student body.
2. Develop and implement a plan to increase the number of URM, especially African-Americans, Hispanic, and Native American students that graduate with a Ph.D. from our department.
3. Dedicate one colloquium per year to a speaker to discuss diversity and equality issues.
4. Develop a mentoring program for incoming URM students involving pairing of students with faculty or post-docs.
5. Encourage faculty to work with prospective minority graduate students in summer research projects.
6. Require all faculty to take Implicit Bias workshop (not just search committee members).

Goal 2: Foster interaction between faculty and improve recognition of faculty, student and staff achievements

Strategic initiatives:

1. Establish an annual department achievements banquet.
2. Create a symposium with short presentations by Physics honor students about their 593 theses.

Metrics:

1. Number of faculty from underrepresented groups.
2. Recruitment and retention numbers of women and underrepresented minorities in graduate program.
3. Success rate of URM students.
4. Number of colloquium on diversity and equality issues.
5. URM enrollment in undergrad physics major.
6. Number of social events for faculty, students and staff.

Engagement and Resources

Goal 1: Improve the quality of office and lab space

Strategic initiatives:

1. Make the case for a new building since a renovation in place is not practical; identify lead donor(s).
2. Create a modern learning space in the Physics Library.
3. Improve appearance of building (at modest cost).
4. Maintain the overall excellent level of administrative and technical support the department currently enjoys.

Goal 2: Enhance alumni relations and interactions

Strategic initiatives:

1. Create a strategic (alumni) advisory board and utilize the board members as advocates for the department.
2. Work with the College of Science to raise more private and industrial donations for the department.

Goal 3: Review and improve outreach activities

Strategic initiatives:

1. Improve communication of research breakthroughs.
2. Develop over the next 1-2 years a bold strategic vision for outreach.
3. Identify a sustainable source of funds for outreach (~\$18k/year).
4. Devote some level of funds to produce quality videos of faculty/students describing research breakthroughs for posting on department website.
5. Encourage faculty to participate in President's Colloquium and Breakfast series.
6. Increase faculty, staff, and student participation in local community educational activities.
7. Provide professional help to improve the web presence of the department.
8. Encourage faculty to partner with Outreach Coordinator to solicit funds to support the outreach component of NSF and other grants.

Metrics:

1. Funds raised by department.
2. Improved areas in the department.
3. Renovation of Physics library concluded.

4. Number of faculty invited to President's Colloquium, etc.
5. Number of outreach events facilitated by Physics department members.
6. Number of attempted and successfully funded outreach efforts.
7. Number of research videos produced.
8. Number of participants present at outreach events.
9. Satisfaction of faculty as assessed in surveys. Level of funding for staff.
10. Identify and recruit members to the advisory board. Number of meetings, written reports.
11. Numbers of patents, and start-up companies.