Department of Physics and Astronomy, Georgia State University
Academic Program Review Action Plan – 2018

Status of Action Items from Prior Review:
The last Academic Program Review (APR) for the department was completed in 2007 and the
last Action Plan was submitted in 2011. Goals from the latter were largely completed as follows.

1. Increase the number of physics majors and degrees. The number of B.S. in Physics
degrees tripled since 2012 to a level of about 20 per year, placing GSU in the top quartile of
U.S. universities offering the degree.
2. Train qualified physics teachers. GSU received the PhysTEC “5+ Club” award for three of
the last four years by producing >5 physics graduates with high school teacher certifications.
3. Enhance Introductory Courses. Faculty were awarded internal and external funding to
enhance intro physics, through studio courses, peer instruction, and flipped classrooms.
Calculus-based physics labs underwent a major redesign including the introduction of peer
learning assistants. A Gateway to Physics course was created to introduce new students to the
department, physics and astronomy research, and career opportunities.
4. Attract better quality graduate students. The number of graduate students (nearly all PhD)
has grown from 63 to 81 since 2012, matching the department’s growth in faculty and
funding. Both programs have become more selective. Low stipends remain a major concern.
5. Build upon existing research expertise. The University Center for Nano-Optics (CeNO)
was created to foster large-scale collaborative projects. The nuclear physics group was
expanded to pursue new instrumentation opportunities at large accelerators. CHARA was
awarded $4M in 2017-18 to upgrade the array and provide access to the astronomical
community. The department was awarded 2CI and Next Generation programs to build an
Astroinformatics Cluster with the Computer Science Department. From 2010 to 2017,
tenure-track faculty grew from 18 to 25 and external funding grew from $2.5M to $9.3M.

Major Findings in Current Review:
1. Graduate Programs: The graduate programs in physics and astronomy have each grown in
quantity and quality since the last review, but graduate student stipends ($20K to $21K per
year) are too low to remain competitive. Possible solutions include curbing further growth
and reducing time to degree. Procedures and policies should be formalized with a graduate
student handbook and orientation program that give clear expectations for student progress
and faculty advisement. The department should provide more career advice and training
opportunities, especially for students interested in non-academic careers.
2. Undergraduate Program: The rapid growth in physics majors and degrees should be
accompanied by more experiential learning activities, career training, and opportunities for
internships inside and outside of GSU. Underrepresented minorities receiving B.S. degrees in
our program already exceed national averages, and should be grown further to match GSU’s
diverse population. Improvements in teaching should include peer observations in
introductory courses and rotation of instructors in upper-level courses. Increasing retention
rates and smoothing the path from Georgia Perimeter can be accomplished by tracking
progress and obstacles for each student and intervening when needed. More faculty members
and staff should be involved in advising and mentoring undergraduate majors.
3. Research: The Department has successfully combined university initiatives, college support,
and external funding to build collaborative, interdisciplinary groups in astroinformatics, solar
and stellar astrophysics, nano-optics, and nuclear physics. Modest investments in new faculty
(total of 3-4 hires) through internal/external proposals would build critical mass for collaborative research in particle physics, extragalactic astronomy, and materials physics.

4. **Faculty Development:** A more formal procedure needed to mentor junior faculty in research, teaching, and work/life balance, which would offer a more uniform and organized experience and provide credit to faculty mentors. The department needs to continue hiring women faculty and increase efforts to recruit underrepresented minorities to match the diversity of our students. More diversity training needed in areas such as mentoring and hiring practices. The department needs a strategic plan and departmental bylaws.

5. **Community and Global Engagement:** The department should continue to sponsor public and K-12 lectures and other learning events and look for more opportunities to engage with the community. We need to build connections with GSU alumni and local industry leaders to encourage networking with students, visits to campus, and interest in philanthropic gifts. The department should continue to advertise and promote its research and educational accomplishments through the GSU website, publications, press releases, and other media.

**Action Steps for the Coming Cycle:**

1. **Graduate Programs:**
   a. Raise the quality of new graduate students by gradually increasing (over 5-year period) the graduate stipend of $20K to make it more competitive with that of other local physics research departments ($25K). In support of this and related goals, charge a committee to develop a graduate funding model that would increase individual stipends while reducing time to Ph.D., make this cost-neutral, and increase graduate funding from external research grants to 50% of all doctoral student funding. In addition, the model would include procedures for active recruitment of excellent doctoral students, and for annually assessing student progress after qualifier exams, encouraging a faster path to dissertation defense. Committee report by Fall 2019 and model implemented by 2020-21.
   b. Develop training seminars, starting Summer 2019, to encourage students to seek internal and external fellowships, with assistance from faculty and graduate fellowship winners.
   c. Adopt a graduate student handbook by completing the work started by a committee established in Summer 2018. Implementation of the handbook by Fall 2019.
   d. Build stronger ties to alumni and the business community to help develop career paths through counseling, seminars, field trips, and internships beginning in 2019.
   e. Enhance graduate courses and/or create new courses to include more intentional career preparation and skills development beginning in 2019-20.

2. **Undergraduate Program:**
   a. Refurbish introductory physics labs to enhance student learning, as has been done previously with other department labs. Projected sources of support include tech fee proposals, lab fees (for expendable items), and possible CETL and/or college contributions. We have three rooms (210, 222, and 226 NSC) for intro physics labs, originally equipped with long tables facing the front of the room; this design does not fit with new pedagogy adopted by the Department. Only 222 has been redesigned to suit our needs; the other two need to be refurbished within 1-2 years.
   b. Provide departmental support, in the form of course/teaching release, for faculty, staff, and graduate students working on upgrading associated lab activities and classroom demonstrations; some lab activities have been used for many years and need to be changed or redesigned to reflect more modern concerns/interests in Physics and Astronomy. This process will take place progressively over the next 4-5 years.
c. Provide new experiences and career opportunities to our physics majors by working with corporations and national labs and observatories to help them obtain internships. Enhance study abroad options. Formalize the application and selection process for departmental summer internships and develop structured activities (e.g. oral presentation training), with mentoring provided by grad students (Summer 2019). Increase the number of undergraduate summer interns to 10-12 by Summer 2021 and find sources of financial support for paid internships, e.g., through endowments, and a proposal for an NSF Research Experiences for Undergraduate (REU) program (submission August 2019).

d. Develop and implement a plan for rotating instructors in upper level courses and a system of observation, feedback, and support for all instructors. The plan will be developed in 2019-20, for implementation in 2020-21.

e. Extend physics education research-based active learning pedagogies to upper division courses. Enhance all courses for majors to include more intentional career preparation and skills development. Development in 2018-20, for implementation in 2020-21.

f. Develop and submit proposal for NSF Robert Noyce Teacher Scholarship grant to build the physics teacher preparation program. First application August 2019.

3. Research:

a. Establish department priorities among five critical research areas: theoretical particle physics, extragalactic astronomy, nano-optics and new materials, experimental solid-state physics, and remote sensing. Determine sources for funding for new hires in these areas (e.g. external fellowships, college faculty replacement, Next Generation proposals). Priorities determined by end of Fall 2018 semester.

b. Submit collaborative (e.g., NSF MRI) proposals, in the next 2-3 years, to build research infrastructure such as a condensed matter/nanophysics instrumentation core facility and a space sciences instrumentation shop. Funding may be leveraged by College and/or Department sources (such as IDC cost return).

4. Faculty Development:

a. In coordination with the Dean’s Office and University Office of Faculty Affairs (OFA), establish a working group to develop formal cluster mentoring for junior faculty members. Send new faculty to the AAPT Workshop for New Physics and Astronomy Faculty using existing Department travel budget, starting Fall 2019.

b. With the Dean’s Office and OFA, launch annual diversity training for all faculty members and staff in mentoring, hiring practices, social interaction, and harassment. Implementation by Fall 2020.

c. Charge committee to develop department bylaws and a strategic plan for consideration by the entire faculty. New bylaws should be adopted by Spring 2020.

d. Develop plan for reorganization of positions related to instructional laboratories and courses for future teachers in light of expected retirements in the next five years. A working group will be established in 2019, for implementation in 2020-22.

5. Community and Global Engagement:

a. Establish formal sign-up procedures for faculty members to visit K-12 schools for science outreach, and nearby universities (HBCU’s) for graduate recruitment beginning in 2019.

b. Continue public outreach programs (HLCO public nights, William H. Nelson Lecture, special events such as the 2017 solar eclipse). Expand the “public debates” to include topics in both Physics and Astronomy, holding them twice per year, and in coordination with other major Atlanta “geek” public events (DragonCon, MomoCon) and with
increased publicity efforts. Establish at least one new program (e.g., star parties, physics lab tours) to bring the wonders of physics and astronomy to the public.

Signatures:

Sebastien Lepine, Chair, Department of Physics and Astronomy  
9/24/18  
Date

Sara T. Rosen, Dean, College of Arts and Sciences  
9/24/18  
Date

Risa Palm  
10/2/18  
Date