

EXECUTIVE SUMMARY
WSU Five-Year Program Review
Department of Physics
Fall 2018

SUMMARY PREPARED BY:

Dr. Colin Inglefield (Physics Department Professor and Chair)
801-626-6127
cinglefield@weber.edu

SELF-STUDY TEAM MEMBERS:

Dr. Colin Inglefield
Dr. Adam Johnston
Dr. Kristin Rabosky

The Department of Physics at Weber State University is a dynamic group of engaged faculty, staff, and students. We are active in scholarship, service to the profession and to the University, textbook-writing, undergraduate research, and community outreach. Undergraduate research in the department is a priority, with nearly all faculty acting as mentors in a given semester and all students participating by the time they graduate. The award-winning High-Altitude Ballooning (HARBOR) program is exemplary. All faculty participate in community-outreach activities and events such as the award-winning “Science in the Parks” summer program and the annual Physics Open House that regularly attracts an audience of 500 “k through gray” community members for an evening of physics in the fall. Relative to the College, we have a particularly active weekly seminar series that weaves together talks from regional and national experts, WSU faculty, and graduating seniors with a moderate amount of internal and external support. Faculty work together collegially and collaboratively and share a common vision congruent with the mission of the institution. The faculty have expertise in a broad range of physics specialties including astrophysics, condensed matter, particle physics, applied physics, physics education, space physics, nuclear medicine and astrobiology. Details of faculty scholarship can be found in the curriculum vitae made available along with this document and the full self-study. This expertise is well-matched to the mission of the Department “to provide high-quality instruction in physics at the undergraduate level.” Faculty have ongoing relationships with a long list of extramural entities including local schools and museums, larger research groups, and professional societies.

At the same time that we have solid foundations, the Department has undergone changes since the last program review in 2012. The curriculum is largely the same with some course changes. These changes include PHYS/ASTR 3040, *Principles of Observational Astronomy, Advanced* and PHYS 3420, *Data Analysis, Statistics, and Instrumentation*. Our recent Department assessment efforts have focused on General Education Physical Science (PS) goals, objectives, and outcomes. Our faculty have engaged in creative yet systematic approaches to teaching these courses to better serve students. Additionally, our faculty are preparing for new general education initiatives that will start in Fall 2019 with implementation of “Signature Assignments” and “Big Questions” central to course themes and physical science as a whole. Our faculty has long been committed to evaluating student learning and implementing effective

and innovative teaching practices and pedagogy in line with current physics education research and the bigger objectives of preparing citizens and scientists.

Our graduates follow the same paths as physics bachelors recipients nationally (see the American Institute of Physics (AIP) statistical data). These include graduate programs in physics and other fields, both in state and out-of-state. Other students find immediate success in the job market, with our most common regional employer being the defense contractor complex attached to Hill AFB. Our Applied Physics program has been adjusted to meet the needs of students seeking employment locally. Our Physics Teaching major boasts 100% job placement, effectively before the students graduate, and has helped us maintain an excellent relationship with regional K12 schools and teachers. Drs. Sohl and Schroeder have begun this year a major effort to contact our alumni and gather data on employment and feedback about our programs.

Significantly, we now reside in a new science building that provides great benefits to the Department in terms of new equipment, existing faculty lab space, and better common spaces for student interaction. We have used this opportunity to rewrite and update significant portions of our lower division and upper division laboratory manuals to include new pedagogies and course-based research experiences. A new public observatory and research observatory expand the types of astrophysics courses and experiences we can offer. We have acquired several pieces of major research instrumentation expanding the level and type of research both faculty and students can be involved with. The new building has a “Science on Display” theme making our labs more approachable and has increased the level of student traffic and tours through them.

The new building has also presented some new challenges to our Department. Our large lecture courses, which almost always fill to capacity and have a waitlist, exist in the old lecture hall across campus. No classroom in the new science building can accommodate these courses with these numbers. This situation has stretched our staff resources needed now in both buildings and hindered effective access to lecture demonstration equipment. Additionally, we have no new lab space available and no new office space available for new hires in the new building. Three years after the completion of the building, we are still overcoming some infrastructure and IT challenges in our labs and classes as well. New major instrumentation received with the new building, without any additional technical support, has also increased the technical pressure on faculty to resolve equipment failures, taking time away from teaching and research.

Dr. Inglefield, Department chair, is the primary source of academic advising in the Department for the Physics and Applied Physics majors, as well as general matters. Physics Teaching majors and minors are advised by Dr. Johnston. While there is no mandatory advising policy, students are required to meet with the advisor for major declaration and graduation signoff. Given the size of the program (~10 graduates per year) the general availability of advising seems to be adequate. Students appear to be satisfied by the availability and quality of advising as measured, for example, by our exit survey.

The majority of all instruction, including all upper-division instruction, is done by contract faculty. We currently have 8 tenured faculty members, 1 tenure-track faculty member, and one full-time (non-tenure-track) instructor. One of the tenured faculty (Dr. Walther

Spjeldik) is on $\frac{1}{2}$ time appointment. These total 9.5 FTE positions, a significant reduction from the previous program review of 12.25 in these same categories. Additionally, we employ two regular adjunct faculty members to teach evening courses and have several other adjunct faculty who teach lower-division laboratory courses. The significant reduction in contract faculty has made an impact on our course offerings. As our service load has increased from the College of Engineering, Applied Science and Technology, we shifted our offerings of PHYS 1010 Elementary Physics and our PHYS 1040 Introduction to Astronomy courses to more sections of our PHYS 2210 Physics I for Scientists and Engineers. These PHYS 1010 and 1040 courses were a place where we traditionally recruited new physics majors, so this potentially impacts the long-term recruitment of physics students. We have unmet demand for WSU students wanting those 1010 and 1040 courses that we've had to sacrifice in order to prioritize the 2210/2220 sequence that many WSU students need to progress toward graduation. Additionally, we have had to sever a long-standing teaching commitment to the WSU Honors Program.

Like the physics community in general, our contract and adjunct faculty do not fully match the diversity of the community we serve. The Department currently has 4 women full-time faculty members (out of 9.5 FTE positions), significantly outpacing the national trend (currently 17% by the American Institute of Physics 2017 Report on Women among Physics & Astronomy Faculty) and nearing gender parity. However, our student demographics do not match the faculty representation. The good news is that our more recent data show a historic high 31% of our current majors being female (Fall 2018 third week data, WSU). Our ten-year average of 21% female majors is much closer to our typical number. Time will tell if there is an increasing trend and if that will continue to graduate demographics.

The Department has made significant progress in confronting the issues raised in the last review as detailed in section H of the full self-study. We have continued to expand our repertoire for engaging students in classrooms, labs, and the community, but we also face challenges. The Department has (as mentioned above) experienced a significant decrease in the number of faculty at the same time that we work to recruit more diverse students to our program and support the needs of students in other expanding programs and general education.

In preparing this self-study, we have begun to look forward to meeting and working with the review team. We are particularly interested in feedback and recommendations regarding the following:

- Considering our faculty numbers and multiple demands, how can we strategically focus our efforts to meet the needs of students in our Physics program, other programs our courses serve, and our general education students? (We view these all as critically important.)
- With regard to trends not positive, e.g. reduction of number of faculty, reduction of general education and Honors offerings, how can we effectively work with the University to reverse undesirable trends?
- Research, while not as emphasized in our undergraduate institution as it is at other universities, is an important part of our faculty roles as well as in our work with students (e.g., undergraduate research). How do we both give this its due and also maintain our dedication to teaching and service at all levels?

- How can we effectively improve recruitment and especially retention of students in all of our programs, including our Physics Teaching program?
- Input on striking the right balance in our curriculum between theoretical rigor, skills-based instruction, and accessibility and value of our degrees.
- We acknowledge issues of work/life balance for faculty and staff, maintaining our collegial atmosphere, and dealing with pressures and demands on our time from outside the department. We welcome discussion about maintaining a positive environment in the department.
- Any advice or direction based on the addition of faculty members and research spaces in the department and college, particularly in the area of materials science. Are there specific suggestions for the department to lead or participate in interdisciplinary programs?
- Advice or feedback on the possibilities for 2-year degree programs that have found some success in other departments.
- The possibility of including Astronomy in the department name.

We are grateful for the opportunity to have this formal review, and we look forward both to the results of the program review and the next five years of our trajectory.