THE UNIVERSITY OF UTAH

July 28, 2014

Ruth V. Watkins
Senior Vice President for Academic Affairs
205 Park Bldg.
Campus

RE: Graduate Council Review
Department of Physics and Astronomy

Dear Vice President Watkins:

Enclosed is the Graduate Council's review of the Department of Physics and Astronomy. Included in this review packet are the report prepared by the Graduate Council, the Department Profile, and the Memorandum of Understanding resulting from the review wrap-up meeting.

After your approval, please forward this packet to President David Pershing for his review. It will then be sent to the Academic Senate to be placed on the information calendar for the next Senate meeting.

Sincerely,

David B. Kieda
Dean, The Graduate School

Encl.

XC: Carleton DeTar, Chair, Department of Physics and Astronomy
Henry S. White, Dean, College of Science

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The Graduate School – The University of Utah

GRADUATE COUNCIL REPORT TO THE SENIOR VICE PRESIDENT
FOR ACADEMIC AFFAIRS AND THE ACADEMIC SENATE

March 24, 2014

The Graduate Council has completed its review of the Department of Physics and Astronomy. The External Review Committee consisted of:

Rachel S. Somerville, PhD (Committee Chair)
Downsbrough Chair in Astrophysics
Department of Physics and Astronomy
Rutgers University

Mark A. Eriksson, PhD
Professor, Department of Physics
University of Wisconsin-Madison

Myriam P. Sarachik, PhD
Distinguished Professor of Physics
Department of Physics
City College of New York

The Internal Review Committee of the University of Utah included:

Theresa A. Martinez, PhD
Associate Professor
Department of Sociology

Feng Liu, PhD
Professor and Chair
Department of Materials Science and Engineering

Wayne McCormack, JD
E.W. Thode Professor of Law
S.J. Quinney College of Law

This report of the Graduate Council is based on the self-study submitted by the Department of Physics and Astronomy, conversations with the external review committee, the reports of the internal and external review committees, and the Department Chair's letters in response to the internal and external review committee reports.

DEPARTMENT PROFILE

Program Overview

The Department of Physics and Astronomy (hereafter referred to as "the Department" or the "DP&A") aims to expand the limits of knowledge in Physics and Astronomy; prepare students for technical careers in Physics, Astronomy, and other related STEM (Science, Technology, Engineering, and Mathematics) fields; and increase public awareness of and interest in science, including improving K-12 science education.

Following the Graduate Council review in 2005-2006, the then-Department of Physics expanded its astronomy group and added Astronomy to the departmental name. Since the last review, the Department has also strengthened its cosmic ray group and begun a biophysics initiative. In 2011, the Department obtained a portion of a six-year grant from the National Science Foundation to establish, along with other departments, a Materials Research Science and Engineering Center.

With respect to educating students, the Department offers undergraduate degrees with three concentration tracks as well as graduate degrees with a variety of specializations. The DP&A has approximately 400 undergraduate majors and 100 graduate students, the vast majority of whom are seeking PhD degrees.

Like the universe studied by physicists and astronomers, the Department has been expanding (but not cooling). Since the Graduate Council review, the DP&A has added 10 new faculty members. The Department has taken advantage of this opportunity (afforded by a significant investment by the University) to increase faculty diversity, especially with respect to women. The Department faces important challenges, especially with respect to its physical facilities, but otherwise seems well positioned to further enhance its national and international stature.

Faculty

There are currently 39 faculty members in the Department of Physics and Astronomy. The Department has a healthy blend of accomplished scholars (including an impressive number of fellows of the American Physical Society) and younger and promising researchers. According to the internal and external reviews, faculty relationships are collegial and constructive, with little evidence of friction. Externally-funded grant activity by the faculty is robust, with five-year averaged grant funding of $6.6 million per year. The publication record of the faculty is also impressive. For example, the Department's 21 full professors have amassed 527 publications since 2007, or an average of 25. In addition, one associate professor and four assistant professors had 40 or more publications during this time period.

Students

Undergraduates. The DP&A offers undergraduate Bachelor of Science and Bachelor of Arts degrees in Physics and Astronomy with three concentration tracks: pre-professional, for students preparing for careers in science and engineering; applied, for students preparing for other careers; and pre-medical, for students anticipating careers in the medical profession. At the time of the review, there were approximately 295 declared undergraduate majors and pre-majors. Three things are clear regarding the DP&A's undergraduate population:

1. The number of SCH is extremely large, with huge enrollments in General Physics I and II and Physics for Scientists and Engineers I and II;
2. The number of SCH has grown substantially (24% between 2008 and 2012); and
3. The number of undergraduate degrees conferred is very low, averaging about 30 per year or less than one per tenured or tenure-track faculty member.

Both the Internal and External Review Committees reported meeting with a small number of undergraduate students and distilled some important observations and recommendations. The strongest students are well served by the Department and, according to the External Review Committee report, find ample opportunities to get involved in research. Other students conveyed a sense that undergraduate Physics majors experience a "sink or swim" environment. (Both documents use this colorful expression.) According to the Internal Review report, the general Physics courses were extremely demanding yet "unpredictable in terms of content and overwhelming to navigate." The External Review team, in contrast, received student feedback indicating that "the difficulty level for introductory physics increases abruptly in year two." The messages common to the two reports are that (1) greater standardization and coordination within the undergraduate curriculum would be helpful and (2) peer mentoring and advising might help increase student retention while also building a stronger sense of community.

The External Review Committee noted the disparity between the high number of undergraduate Physics majors and the low number of undergraduate degrees awarded (a ratio of about 10 to 1). If the high number of declared majors is the result of strong outreach and aggressive recruiting, the Department should be commended. To the extent that the low graduation rate reflects an absence of strong support for students, however, it would be a source of concern. Undergraduate scholarships are small in number and size for a department of this stature and whose students often maintain high grade point averages. Specifically, only one scholarship (other than the scholarships provided by the University) is worth more than $500. The External Review Committee noted that, regardless of the reason, it might be "worthwhile for the department to examine what is happening to the very large number of students who declare as physics majors but do not graduate as such."

Graduate Students. Graduate students play a crucial role in the research and teaching missions of the Department of Physics. In 2012-2013, there were 105 graduate students, 90 of whom were pursuing a PhD. Despite this high number, the External Review Committee reported a sentiment (largely articulated by assistant professors) that the number of graduate students is too small to support the rising research aspirations and increased faculty size of the Department. The quality of graduate students applying does not appear to be the problem. Applications are numerous, and admissions standards appear to be high. (The average GPA for students admitted in 2012 was 3.64.) Rather, the External Review Committee received

comments that funds that could otherwise support teaching assistantships were sometimes used instead to support more senior graduate students and even postdoctoral students.

Discussions held by the Internal and External Review Committees yielded both positive and critical comments. Morale appeared to be high, but like the undergraduates, graduate students believed that greater standardization in the graduate student experience was desirable. Both committee reports conveyed a view held by graduate students that the Common Exam (referred to as the comprehensive exam in many departments) varied in difficulty depending on the professors who wrote the exam in a given year. This created a sense of unpredictability and arbitrariness for some students.

A final concern involves the issue of compensation – in particular, health insurance coverage – for graduate students. Like many graduate programs in Physics, a substantial proportion of incoming graduate students arrive from abroad and are required to take a course in English as a second language. Until these students pass a language proficiency test, they are categorized as graduate assistants rather than teaching or research assistants. Graduate assistants do not receive health care coverage. The situation is complex, and even the DP&A self-study notes that classifying students as graduate assistants is a "slight abuse" of the category (p.76). The Department recognizes the situation as unfair and is working toward correcting it.

Diversity

The DP&A takes great and justifiable pride in the recent recruitment of four female faculty members. At the time of the previous review, the Department had no female faculty members. Of the core faculty, five are women and seven are men. There are also two women among the Department's six people at the lecturer rank. Overall, the Department now approximates national averages in terms of female faculty representation due to these recent hires.

Despite the commendable success of the Department at active recruitment of female faculty members, the External Review Committee found that there are "some serious climate issues affecting women in the department." Specifically, "[s]ome female faculty members said that they felt they had experienced discrimination based on their gender." Examples of discrimination included "not securing adequate help from department members in securing laboratory space after being hired" and "administrative staff refusing to perform requested tasks that they routinely perform for male faculty."

The External Review Committee also commented on climate issues as they pertain to female graduate students. In this case, however, the source of the reported problems was not faculty or staff members, but fellow students. While the External Review Committee's conclusions are based on the comments of a small number of student interviews, the Committee believed it was worth reporting that female graduate students "were frequently the targets of disparaging remarks from male students (e.g., that females received "unfair advantages" or females only survived in the program "because male students were helping them with their homework"). A faculty member who was interviewed by the External Review Committee viewed the situation as even more grave, reporting that female graduate students had come to her with reports of "bullying," and that "it seems to be common."

The Department has taken a number of significant steps to address this issue of departmental climate for female faculty and graduate students. The Department Chair's response to the review committee reports states: "We will arrange for visits by outside experts in gender-climate sensitivity training. To reinforce our own in-house faculty role models, we will continue to invite a generous number of female and minority colloquium speakers. We will continue to highlight research accomplishments of our female and minority faculty members. We will continue to sponsor our in-house support groups, such as Women in Physics."

With respect to recruitment of minority faculty members, the Department's self-study document states: "Currently the department has 44 tenure-track/lecturing faculty with eight minority faculty members." The specific information about race and ethnicity is not provided in the self-study, but it does not appear that any of the Department's tenured or tenure-track faculty members are African-American, Hispanic, or Native American – groups that are extremely underrepresented among Physics faculty members nationwide.

In terms of diversity among undergraduate and graduate students, the Department self-study notes "small but notable increases," particularly for Hispanic students. Nevertheless, the Department recognizes that a great deal of improvement is still possible. The same holds true for female undergraduate students, who are steadily increasing in number. The Department participates in the ASPIRE program (an NSF-funded activity operated by the Telescope Array group), which provides outreach activities throughout the state of Utah (and nationally) aimed at stimulating interest in science. In the long run, this program should boost enrollment in science classes by women and members of historically underrepresented groups. It is noteworthy that ASPIRE staff travel to Native American reservations in Utah and neighboring states to offer science enrichment courses.

Program Effectiveness -- Outcomes Assessment

Like many programs at the University of Utah, the DP&A is still in the process of developing optimal methods of assessing learning outcomes. The Department has taken the first and invaluable step of articulating learning objectives for its undergraduate and graduate programs. In addition, the Department: tracks student information and trends, conducts an initial assessment of student preparedness, carries out mid-program and end-of-program assessments, gathers feedback from alumni, and informally follows student employment after graduation. The members of the External Review Committee concluded, based on the Department's self-study report, that none of the assessment procedures "actually measure the extent to which learning goals are being achieved by the department." For undergraduates, the GRE subject test in Physics would be an ideal metric of outcome success, but only a subset of graduating undergraduates take the test and no formal tracking of test results is performed. For graduate students, the DP&A uses the master's final exam and PhD dissertation as its main assessment tools.

Facilities and Staff Support

The DP&A is housed in three buildings on campus: James Fletcher Building (JFB), South Physics (PHYS), and Intermountain Network and Scientific Computation Center (INSCC). The External Review Committee focused on the lack of space available for offices and research laboratories. These reviewers "got the impression that this [space] crunch has reached a crisis point." The Internal Review Committee concentrated more on the quality of space, describing the Department's physical facilities as "atrocious."

While the Internal Review Committee was apparently referring to the physical condition of the facilities (e.g., safe and rapid egress; insufficient electrical supply), the separation of faculty and laboratories across three buildings may have negative social and psychological consequences as well as in terms of faculty cohesion and morale.

With respect to staffing, the Department's self-study document states there are "five full-time secretaries, two part-time office assistants, two lecture demonstrators, four full-time technical staff members for the machine shop, two computer professionals, and four accountants." Most other campus units would describe this level of staff support as stellar. It falls short, however, of meeting the needs of a department that has grown substantially in size, is heavily engaged in obtaining and carrying out externally-funded research, and provides both undergraduate and graduate students with laboratory-based educational experiences. The Internal Review Committee referred to the problem of adequate staff support at four points in its report. The report of the External Review Committee noted that administrative staff felt overworked, pulled in multiple directions, and underpaid. One staff member expressed the belief that "the only way to get a raise was to threaten to leave for another department." Staff continuity is integral to department success, and the External Review Committee recommended that the Department find ways to reward its most loyal and competent staff members.

COMMENDATIONS

1. The quality of the DP&A's faculty is a major department strength. The faculty ranks include large numbers of people who have been recognized for the excellence of their research and/or teaching. The Department is well balanced in terms of its full, associate, and assistant professors. Having hired 10 new faculty members during the recent recession when job openings for PhD graduates in Physics were scarce, the Department has a strong cohort of relatively young faculty members and is well positioned to increase its national and international stature. Faculty morale is generally high, as reported by both the Internal and External Review Committees.

2. The Department has made important, recent strides in terms of gender diversity. At the time of the last Graduate Council Review, the faculty was all-male. Today, there are four female tenure-track assistant professors. There have been less notable gains in the gender and ethnic composition of the student population.

3. The DP&A has developed new programs in Astronomy and Biophysics, and it is now leading a prestigious interdisciplinary Materials Research Science and Engineering Center grant, supported principally by the National Science Foundation.

4. While the Department faces a serious long-term challenge in terms of the quantity and quality of its physical facilities, it has taken important short-term steps to shore up these facilities.

5. The Department appears to be well aware of needed improvement with respect to areas such as curriculum standardization, health insurance for graduate assistants, and "climate" for female faculty members and graduate students, and it is approaching these challenges forcefully and openly.

RECOMMENDATIONS

1. The Department's most pressing need is the improvement of its physical facilities. In the long run, the DP&A needs a single building that allows it to fully realize its scholarly potential, including synergies among groups that are currently housed separately. The Department should continue its efforts to find public and private funding for a new building.

2. Having substantially increased the size of its faculty, the Department needs to find ways to recruit, admit, and fund additional graduate students. The DP&A urgently needs to resolve the issue of graduate assistants who lack health benefits.

3. Faculty members report a lack of adequate staff support, and the current staff members feel overworked and underpaid. Accordingly, the Department needs to obtain and allocate additional funding for staff support. This support is particularly important for the development of its galaxy of assistant and associate professors.

4. The Department should develop a deeper understanding of the extreme gap between the number of declared undergraduate majors and the number of students who actually obtain a degree. The gap may be reduced by paying additional attention to the issue of standardization in the experiences of undergraduate and graduate students and by creating a more nurturing environment for students. In addition to adding to the Department's professional advising staff, expanded use of peer advisors and peer mentors may be helpful.

5. The Department should develop improved measures of program effectiveness and the achievement of its specified learning outcomes for students.

6. The DP&A should continue its efforts to enhance faculty and student diversity, both in terms of gender and race/ethnicity. It should make every effort to fulfill the opportunity it has created for itself by hiring four female assistant professors by developing a departmental climate that embraces and advances diversity among faculty and students.

Submitted by the Ad Hoc Committee of the Graduate Council:

Robert N. Mayer (Committee Chair)
Professor, Department of Family and Consumer Studies

Laura Kessler
Professor, College of Law

Hong Yong Sohn
Professor, Department of Metallurgical Engineering

Sylvia Torti (Undergraduate Council Representative)
Dean, Honors College

Physics and Astronomy

	2006	2007	2008	2009	2010	2011	2012
FACULTY: With Doctoral Degrees Including MFA and other terminal degrees							
Full Time Tenured Faculty	18	18	18	21	21	21	21
Full Time Tenure Track	9	9	7	9	9	11	12
Full Time Auxiliary Faculty	10	10	8	9	11	12	11
Part Time Auxiliary Faculty	2	1	2	0	0	0	0
With Masters Degrees							
Full Time Tenured Faculty	0	0	0	0	0	0	0
Full Time Tenure Track	0	0	0	0	0	0	0
Full Time Auxiliary Faculty	1	1	1	1	1	1	1
Part Time Auxiliary Faculty	0	0	0	0	0	0	0
With Bachelor Degrees							
Full Time Tenured Faculty	0	0	0	0	0	0	0
Full Time Tenure Track	0	0	0	0	0	0	0
Full Time Auxiliary Faculty	0	0	0	0	0	0	0
Part Time Auxiliary Faculty	0	0	0	0	0	0	0
Total Headcount Faculty							
Full Time Tenured Faculty	18	18	18	21	21	21	21
Full Time Tenure Track	9	9	7	9	9	11	12
Full Time Auxiliary Faculty	11	11	9	10	12	13	12
Part Time Auxiliary Faculty	2	1	2	0	0	0	0
FTE from A-1/S-11/Cost Study Definition							
Full-Time Salaried	28	32	28	29	34	35	41
Part-Time or Auxiliary Faculty	1	0	1	1	3	1	2

Physics and Astronomy

	2006	2007	2008	2009	2010	2011	2012
Number of Graduates							
Bachelor's Degrees	35	31	29	30	33	25	38
Master's Degrees	15	14	5	12	7	9	9
Doctoral Degrees	10	10	14	11	9	11	13
Number of Students Based on Fall Third Week Semester Data							
Enrolled in Masters Program	12	16	12	13	14	12	15
Enrolled in Doctoral Program	98	97	92	100	87	93	90
Department FTE Undergrad	520	519	509	527	547	638	649
Department FTE Graduate	93	81	82	78	75	78	78
Department SCH Undergrad	15,585	15,579	15,277	15,814	16,420	19,141	19,458
Department SCH Graduate	1,854	1,614	1,645	1,570	1,502	1,568	1,570
Undergraduate FTE per Total Faculty FTE	18	16	18	17	15	18	15
Graduate FTE per Total Faculty FTE	3	2	3	3	2	2	2
Cost Study Definitions							
Direct Instructional Expenditures	5,757,470	6,186,236	6,078,417	6,250,672	5,322,903	0	8,036,056
Cost Per Student Fte	8,457	10,876	9,856	10,312	9,460	11,457	11,030
Funding							
Appropriated Funds	5,566,017	6,009,030	6,143,931	6,614,426	6,619,462	6,532,499	7,072,385
Teaching Grants	4,721,883	4,728,990	4,400,774	3,888,733	4,668,515	5,543,283	7,371,808
Total Grants	4,721,883	4,728,990	4,400,774	3,888,733	4,668,515	5,543,283	7,371,808

Faculty Degrees represent highest degree awarded per faculty member

FTE Cost Study Definitions are the number of faculty FTE's supported by Apprropriated Instructional Funding. Faculty with Administrative appointments are excluded.

Student FTE per Total Faculty FTE excludes Teaching Assistants

Teaching Grants are Fund 5000 Grants classified as Teaching per General Accounting

Total Grants are all of the Fund 5000 Grants

Memorandum of Understanding
University of Utah - Department of Physics and Astronomy
Graduate Council Review 2013-14

This memorandum of understanding is a summary of decisions reached at a wrap-up meeting on June 13, 2014, and concludes the Graduate Council Review of the University of Utah Department of Physics and Astronomy (DP&A). Ruth V. Watkins, Senior Vice President for Academic Affairs; Pierre V. Sokolsky, Dean of the College of Science; Henry S. White, Incoming Dean of the College of Science; Carleton DeTar, Chair of the Department of Physics and Astronomy; David B. Kieda, Dean of The Graduate School; and Donna M. White, Associate Dean of The Graduate School, were present.

The discussion centered on but was not limited to the recommendations contained in the review summary report presented to the Graduate Council on March 24, 2014. Corrections made in the Chair's response to the report are noted and have been incorporated into the summary report. At the wrap-up meeting, the working group agreed to endorse the following actions:

Recommendation 1: The Department's most pressing need is the improvement of its physical facilities. In the long run, the DP&A needs a single building that allows it to fully realize its scholarly potential, including synergies among groups that are currently housed separately. The Department should continue its efforts to find public and private funding for a new building.

A feasibility study was completed under the leadership of the Department's former Chair. For many reasons, including the necessity for seismic upgrades and other safety and health concerns, it was recommended that a new facility is the most feasible solution to improving physical facilities. Efforts to realize this goal are continuing. The Sr. VPAA is aware of the importance of improved facilities and is working with the new Dean of the College of Science, along with Campus Planning, to formulate strategies for funding a new building, including private/public partnerships. These efforts will include an upcoming study of the Science Corridor for the campus master plan.

Recommendation 2: Having substantially increased the size of its faculty, the Department needs to find ways to recruit, admit, and fund additional graduate students. The DP&A urgently needs to resolve the issue of graduate assistants who lack health benefits.

In the response from the current Chair, four strategies to recruit, admit, and fund additional graduate students are articulated. Included in the 2014/15 budget is an increase in financial support for the Department to implement these strategies. The Graduate Dean, in partnership with University-, College-, and Department-wide development efforts, is offering increased funding for graduate assistantships. The Chair will follow up on this opportunity. It was determined that the issue of the lack of health benefits for graduate assistants is a result of miscommunication between The Graduate School and the Department. A

meeting will be arranged as soon as possible with the Graduate Dean, the International Teaching Assistant program director, and DP&A staff who administer tuition/health insurance benefits in order to resolve this issue so that health benefits can be available to all those who qualify for them. The Department will initiate a program in Fall 2014 for incoming graduate students to apply to the National Science Foundation and Graduate Research Fellowship Program for research funding.

Recommendation 3: Faculty members report a lack of adequate staff support, and the current staff members feel overworked and underpaid. Accordingly, the Department needs to obtain and allocate additional funding for staff support. This support is particularly important for the development of its galaxy of assistant and associate professors.

According to the Chair, an excellent new staff member was hired in January 2014. The addition of this staff member has relieved some of the burden on the other staff. The DP&A is using any budgetary flexibility it has to remedy staff wage levels and equity. As funds allow, the Department will continue to add staff when necessary to support its "galaxy" of assistant and associate professors. The Dean of the College of Science agreed to review the current staffing of the DP&A with the Chair, and develop a plan that ensures a balance of Department objectives and staff support.

Recommendation 4: The Department should develop a deeper understanding of the extreme gap between the number of declared undergraduate majors and the number of students who actually obtain a degree. The gap may be reduced by paying additional attention to the issue of standardization in the experiences of undergraduate and graduate students and by creating a more nurturing environment for students. In addition to adding to the Department's professional advising staff, expanded use of peer advisors and peer mentors may be helpful.

The Chair has obtained new data from OBIA and noted that the 10:1 ratio between enrolled undergraduate declared majors and the number of degrees awarded is not a correct reflection of what is actually taking place. The new data indicate that DP&A graduation numbers and rates are not out of line with the campus demographic. Even so, the Chair does acknowledge that the Department can do a better job and has started a process to revise the undergraduate program (including re-examining learning outcomes); track student progress more effectively; and, with the aid of the new undergraduate advisor, create clear roadmaps to degree with the possibility of transcriptable emphases. Other strategies may include creating "learning communities," possibly with peer mentors.

Recommendation 5: The Department should develop improved measures of program effectiveness and the achievement of its specified learning outcomes for students.

The Chair noted that student grades are always used as indicators to measure program effectiveness and achievement but also acknowledged the Department can do a better job of tracking student career outcomes post-graduation. Additionally, measures such as tracking conference presentations and updating Expected Learning Outcomes (ELOs) will assist with overall efforts to comply with the mandate from the Northwest Commission on Colleges and Universities to improve the assessment of program effectiveness and learning outcomes. The Department will complete its revision of their curricular "Red Book" in Fall 2014. The Red Book is a Departmental working document with Expected Learning Outcomes for all course curricula.

Recommendation 6: The DP&A should continue its efforts to enhance faculty and student diversity, both in terms of gender and race/ethnicity. It should make every effort to fulfill the opportunity it has created for itself by hiring four female assistant professors by developing a departmental climate that embraces and advances diversity among faculty and students.

The Chair expressed a commitment to continue the Department's efforts to recruit students from underrepresented groups. To this end, the DP&A and the Center for Science and Mathematics Education share a career-line faculty member who is engaged in minority student outreach and recruitment. The Chair also stated that the DP&A will continue to recruit students from the ACCESS program for women, and will consider participating in the American Physical Society bridge program. Since the review took place, the Chair has already hosted the Director of OEO to provide training on legal issues related to gender diversity and inclusion, and also has engaged members of the Theatre Department to enact skits to educate the faculty on issues of workplace climate. Due to a high number of international graduate students, attention is being given to resources necessary for them to understand cultural norms at this institution.

This memorandum of understanding is to be followed by regular letters of progress from the Chair of the Department of Physics and Astronomy to the Dean of The Graduate School. Letters will be submitted until all of the actions described in the preceding paragraphs have been completed.

Ruth V. Watkins
Pierre V. Sokolsky
Henry S. White
Carleton DeTar
David B. Kieda
Donna M. White

David B. Kieda
Dean, The Graduate School
July 28, 2014