Memorandum of Understanding
Department of Physics
Graduate Council Review 2006 – 2007

This memorandum of understanding is a summary of decisions reached at a wrap-up meeting on 7 April 2008, concluding the Graduate Council Review of the Department of Physics. David W. Pershing, Senior Vice President for Academic Affairs; Pierre Sokolsky, Dean of the College of Science; David Kieda, Chair of the Department of Physics; David S. Chapman, Dean of the Graduate School; and Frederick Rhodewalt, Associate Dean of the Graduate School were present.

The discussion centered on but was not limited to the recommendations contained in the Graduate Council review completed on 26 March 2007, which addressed the following issues:

At the wrap-up meeting, the working group agreed to endorse the following actions:

**Recommendation 1:** The department should increase its diversity; in particular, to hire and retain more female and ethnic minority faculty as well as recruit and support female and minority students and fill the currently empty lines.

The Department is taking several steps to increase diversity among faculty and students. As part of its expansion in the astronomy area, the Department is moving forward with hiring three women faculty: one professor, one associate professor, and one assistant professor. Assistant Professor Miguel Mostafa has been appointed Director of Undergraduate Studies and Chair of the Physics Department’s Diversity Committee. The Department has sought opportunities for minority participation in departmental and professional activities including the development of departmental support networks supporting minority student travel to conferences such as the McChA conference in Sacramento and the 2007 SACNAS Conference in St. Louis. The Department is also supporting the 2008 SACNAS conference in Salt Lake City. The Department plans to work with the Assistant Dean for Diversity in the Graduate School to publicize its increased minority and female representation on the faculty as a recruiting tool to attract a more diverse graduate student population.

**Recommendation 2:** The communication between the Department of Physics and the College of Science needs to be improved with respect to budgets, faculty hiring and retention practices, and sabbatical leaves.

The Department and new Dean of the College of Science are working toward more open communication with regard to planning, hiring, RPT issues, and budgeting.

**Recommendation 3:** The department should research the concept of a new building more completely in the context of the specific needs and the acquisition process.

The Department conducted a study of current and future space needs in December of 2007. The results of this study are being used by Space Planning to undertake an architectural study of ways to accommodate Department space needs within existing space. The study, funded by Senior Vice President for Academic Affairs Pershing is to be completed in late April, 2008.
Memorandum of Understanding
Department of Physics
page 2

Recommendation 4: The department should foster joint initiatives between science departments and collaboration with other colleges, although the lack of collaboration with chemistry is particularly acute.

The Department is pursuing several initiatives to address this recommendation. They have started new collaborative programs between Math and Physics and Biology and Physics. With Mathematics they have hired a joint post doctoral fellow and are pursuing a joint IGERT proposal. With Biology, they are in the process of hiring a faculty person in the area of biophysics have established joint teaching and research initiatives with the Departments of Biology and Chemistry in nanotechnology. The Chair reports that there are several collaborative projects between individual faculty in Physics and Chemistry. The Chair will continue to support such efforts through various incentives that will be coordinated with the Dean of Science and the Senior Vice Presidents for Research and Faculty.

Recommendation 5: The department should revise the content and timing of the common exam and should revise the graduate student handbook.

The Graduate Student Handbook revision was completed in December, 2007 and is available on the Physics Department web page. The Department continues to examine the content and timing of the common qualifying examination through discussions with faculty and graduate students and will make appropriate revisions in accordance with the pedagogic objectives of the qualifying examination process.

Recommendation 6: The department should make the path for undergraduates getting started in research easier and more accessible.

The Department has taken several steps to increase undergraduate access to research. The Chair has appointed an undergraduate research coordinator and secured funding to publicize research opportunities. The content of the Undergraduate Seminar (Physics 1980) has been modified to facilitate involvement in undergraduate research. The Department is exploring the possibility of developing an undergraduate Honors Thesis Program.

This memorandum of understanding is to be followed by annual letters of progress from the Chair of the Department to the Dean of the Graduate School. Letters will be submitted each year until all of the actions in the preceding paragraphs have been completed.

David W. Pershing
Pierre Sokolsky
David Kieda
Fred Rhodewalt

David S. Chapman
Associate VP for Graduate Studies
Dean, The Graduate School

7/21/08
## Department Review by Academic Year

### College of Science: Physics

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<tbody>
<tr>
<td><strong>Faculty Headcount</strong></td>
<td>Source: OBIA, Updated annually during Autumn term.</td>
<td></td>
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<tr>
<td>Full Professors</td>
<td>21</td>
<td>19</td>
<td>18</td>
<td>19</td>
<td>19</td>
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<tr>
<td>Associate Professors</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<tr>
<td>Assistant Professors</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Instructors</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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### Research Expenditures - Source: OBIA 'B' tables, Updated annually during Spring term.

| Research Expenditures (Department) | $4,947,220 | $5,769,014 | $5,472,520 | $5,634,863 | NA        |
| Research Expenditures (College)   | $29,197,529 | $32,373,556 | $31,456,325 | $31,467,436 | NA        |

### Student Credit Hours (Budget Model) - Source: OBIA, Updated annually during Summer term.

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<tr>
<td>Lower Division</td>
<td>12,121</td>
<td>12,561</td>
<td>12,593</td>
<td>11,960</td>
<td>0</td>
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<tr>
<td>Upper Division</td>
<td>2,806</td>
<td>3,309</td>
<td>3,876</td>
<td>3,592</td>
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<tr>
<td>Total Undergraduate</td>
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<td>15,870</td>
<td>16,469</td>
<td>15,552</td>
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<tr>
<td>Basic Graduate</td>
<td>516</td>
<td>389</td>
<td>391</td>
<td>238</td>
<td>0</td>
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<tr>
<td>Advanced Graduate</td>
<td>1,659</td>
<td>2,095</td>
<td>1,875</td>
<td>1,613</td>
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<tr>
<td>Total Graduate</td>
<td>2,175</td>
<td>2,484</td>
<td>2,266</td>
<td>1,851</td>
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### Course / Instructor Evaluations - Source: OBIA, Updated annually during Autumn term.

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<tbody>
<tr>
<td>Undergraduate Courses</td>
<td>4.89</td>
<td>4.95</td>
<td>5.33</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Undergraduate Instructors</td>
<td>5.06</td>
<td>5.15</td>
<td>5.36</td>
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<td>NA</td>
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<tr>
<td>Graduate Courses</td>
<td>4.98</td>
<td>5.27</td>
<td>5.10</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Graduate Instructors</td>
<td>5.07</td>
<td>5.34</td>
<td>5.75</td>
<td>NA</td>
<td>NA</td>
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### Enrolled Majors - Source: OBIA, Updated annually during Autumn term.

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<tbody>
<tr>
<td>Pre-Majors</td>
<td>52</td>
<td>44</td>
<td>45</td>
<td>33</td>
<td>43</td>
</tr>
<tr>
<td>Full Majors (including Intermediate)</td>
<td>136</td>
<td>148</td>
<td>171</td>
<td>170</td>
<td>149</td>
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<tr>
<td>Master's</td>
<td>25</td>
<td>26</td>
<td>20</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Doctoral</td>
<td>69</td>
<td>76</td>
<td>81</td>
<td>94</td>
<td>89</td>
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### Degrees Awarded - Source: OBIA, Updated annually during Autumn term.

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<tbody>
<tr>
<td>Bachelor's</td>
<td>19</td>
<td>28</td>
<td>30</td>
<td>35</td>
<td>NA</td>
</tr>
<tr>
<td>Master's</td>
<td>17</td>
<td>9</td>
<td>22</td>
<td>15</td>
<td>NA</td>
</tr>
<tr>
<td>Doctoral</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>10</td>
<td>NA</td>
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</tbody>
</table>

Office of Budget & Institutional Analysis (OBIA)
110 Park Building, 201 South President's Circle, Salt Lake City, UT 84112
Office: 801-581-6948 | Fax: 801-581-7541 | Email: info@obia.utah.edu
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The Graduate School – University of Utah

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

March 26, 2007

The Graduate Council has completed its review of the Department of Physics.

The External Review Committee included:

Jordan Goodman, Ph.D.
Professor, Department of Physics
University of Maryland

Sidney Nagel, Ph.D.
Professor, Department of Physics
University of Chicago

Jerome Christensen, Ph.D.
Professor, Department of Physics
University of Chicago

The Internal Committee of the University of Utah was composed of:

Michael Free, Ph.D.
Associate Professor
Department of Metallurgical Engineering

Sheryl Scott, Ph.D.
Professor
Department of Neurobiology and Anatomy

Elizabeth Tashjian, Ph.D.
Associate Professor
Department of Finance
This report by the ad hoc committee of the Graduate Council is based on the Department of Physics Graduate Council Review 2005-2006 Academic Year (2005), the Internal Review of the Department of Physics (2006), the Report of the External Review Committee (2006), the meeting with the external reviewers (2006), the Department of Physics Dean’s response to the internal and visiting review committees (2006), and the previous Graduate Council Report to the Academic Vice President and the University Senate (1998).

DEPARTMENTAL PROFILE

Overview

The Department of Physics is one of four academic departments in the College of Science. The department oversees 230 undergraduate physics majors in applied, pre-medical, and pre-professional Bachelor of Science degree tracks as well as 108 graduate students. An average of more than 18,000 student credit hours is generated annually. Departmental research is particularly strong in astrophysics and condensed matter physics and attracts approximately $5M in external funding each year. The department offers a range of degrees including Bachelor of Science, Bachelor of Arts, Master of Science, and Doctor of Philosophy. The faculty is comprised of an assortment of tenure track regular faculty and a small contingent of auxiliary faculty.

The overall trends for the department since the last review in 1997 have been positive with increased undergraduate enrollment and research support, improved faculty morale, and a clearer vision for future directions of the department.

The department has hired an excellent group of young faculty members who have taken on leadership roles and are driving the growth of the astrophysics and condensed matter programs in new directions. The department has developed a constructive and insightful plan to continue moving into astronomy and cosmology by hiring five astronomers over the next several years and to take advantage of the USTAR initiative in nanoscience.

Faculty

There are thirty-one tenured or tenure track regular faculty in the department. Of these, the self-study noted that three of these faculty members are part-time and another three are on leave but have actually accepted positions elsewhere. In addition to these, there are ten research faculty and four lecturing faculty. The faculty is currently all male, broadly international, and include one Hispanic member. The two female faculty members hired since the last review have resigned to accept positions at other institutions. The initiative to develop the astronomy program includes a concerted effort to hire a noted senior female researcher in that discipline.

Since the last review, several new younger faculty members have been hired to replace retiring faculty. This has resulted in a good proportional mix of junior and senior faculty. There are twelve faculty members who have been recognized as Fellows of the American Physics Society (an honor bestowed upon only two percent of its membership).
The faculty has also received more than 30 prestigious International, National, or University awards for research and teaching activities. Extramural research funding has steadily increased in the past decade and now regularly exceeds $5 million annually.

In addition to informal mentoring of junior faculty, the department has recently instituted a formal mentoring program where the mentor and the junior faculty member regularly meet to discuss progress and future strategies for success. There is also an annual informal review to assess progress. Faculty morale has improved since the last review although concerns of low salaries (when compared to other peer institutions) and salary compression were noted. While the tenor of the departmental morale was high, there are still frustrations with the administration, beginning with the College and continuing through the senior academic administration. Specific concerns include inadequate efforts to retain talented new faculty, insufficient incentives to hire senior (especially female) faculty, lack of transparency in budgeting, lack of recognition within the College, and the lack of faculty lines to demonstrate full College and University support in the move to becoming the Department of Physics and Astronomy.

Students

There are 230 undergraduate and 108 graduate students in the department. The undergraduate program ranks among the top five programs in student enrollment nationally. The diversity of the student population came into question in the internal review with the notation that the female population is well below the national average. In the 2005-2006 academic year the department generated over 18,000 SCH.

While the reviewers noted no serious concerns from students and faculty on the basic curriculum for either undergraduate or graduate program, it was noted that the department has been thoughtful in its developing programs of interest to students that include a new pre-med major and a new astronomy minor.

Specific commentary from the undergraduate students praised the opportunity to get involved in research work at the undergraduate level. The graduate students expressed concerns over clear communication of the program requirements and the examination process. Specific concern was noted over the outdated doctoral student handbook and the common and qualifying examination processes.

Curriculum, Programs of Study

The department offers Bachelor of Science, Bachelor of Arts, Master of Science, and Doctor of Philosophy degrees. The undergraduate degree has three principal tracks: pre-professional, applied, and medical. The graduate programs include specialization in instrumentation and computation and the doctoral program includes specialization in medical physics. The department also contributes toward two interdisciplinary graduate programs—the Master of Science in Computational Engineering and Science and the Professional Master of Science and Technology. In addition to these, the department offers a Physics Teaching major and minor in collaboration with the Department of Educational Studies while a Master of Science in Secondary Teaching program, convened by the College of Science, is available for teachers. Lastly the department provides a valued contribution to the University by providing service courses for many
departments, including engineering, architecture, science, mathematics, and students preparing for health-related careers such as medicine, dentistry, nursing, and pharmacy.

The two traditionally strongest disciplines within the department are the high energy astrophysics and condensed matter subject areas. The cosmic ray group is internationally preeminent. Other subfields include biomedical physics, quantum chemistry, applied physics, planetary and astrophysical particle physics, and gravitational and elementary particle theory.

**Program Effectiveness—Outcomes Assessment**

According to the self-study, the department uses several mechanisms to assess outcomes:

- Prerequisite system: student performance in advanced courses is used to assess the effectiveness of the preparation imparted within the prerequisite courses for the advanced course.
- Enrollment: the demand (and popularity) of courses and the degree programs is used as an indicator of the perceived value to the students.
- Student course evaluations: standardize numerical evaluations and qualitative narrative comments are solicited for each course.
- Advising sessions: advising sessions are used as informal means of assessment.
- Exit interviews: all undergraduate degree recipients are asked to comment on the strengths and weaknesses of their undergraduate preparation.
- Employment success: the ability to obtain employment or get accepted to a higher degree program is viewed as an indicator of success.
- Alumni survey: the department completed a survey for alumni of the past ten years.

**Facilities and Resources**

The department is located in four adjoining campus buildings. The primary space is in the North Physics Building (1968) and South Physics Building (1930) but the department also uses additional space in the NSCC building (1998) and the Mines Buildings (1929), which is slated for demolition. The age of most of these buildings and the limitations due to the buildings’ age has been an ongoing source of frustration in recent years. This frustration is particularly acute in light of the construction of new buildings, as well as additions and renovations made to infrastructure, for “each of the other departments in the College of Science.”

The department research facilities include two machine shops, a wood shop, an OptoElectronics Materials Laboratory, an electronics shop, a stockroom, thin film and single crystal preparation labs and associated characterization equipment and numerous individual investigator laboratories containing additional important research instrumentation equipment. The department has secured funding for a research grade optical telescope located at the Southern Utah Observatory. There is significant interest in acquiring more advanced instruments (e.g., a Field Emission Scanning Electron Microscope) that can be used as a shared campus resource.
The teaching facilities include access to two 200-seat, one 100-seat, and one fifty-seat lecture halls. The latter is considered one of the best lecture-demonstration halls in the nation. Other facilities include several small teaching laboratories, two computer laboratories, and a reading room with physics references for students and faculty. Since the last review, lecture spaces have been updated with overhead digital projection systems and the buildings now have wireless computer access.

Staff support includes twelve exempt staff lines and fourteen non-exempt/benefited hourly lines as well as significant teaching assistant support.

PROGRESS SINCE THE LAST GRADUATE COUNCIL REVIEW (1997)

The previous review defined five recommendations to which the department has responded in the following manner:

1. In response to concerns of faculty morale, the department chair has worked to elevate moral and departmental camaraderie through the involvement of faculty across the range of junior and senior faculty positions in the governance and management of the department.

2. Faculty growth in areas of expertise has been carefully aligned to take advantage of retirements and targeted new hires. Despite this, the number of faculty has remained at the levels of the previous review that were cited as minimal when compared to higher ranked programs of similar enrollment size. The external review committee specifically commended the efforts to correct concerns in the previously cited Medical Physics faculty.

3. The department has successfully remedied previous concerns over future teaching needs. Both the external and internal reviewers noted commendations in this regard.

4. While the student outreach program has been extended to numerous high schools throughout the state in efforts to enhance recruitment, recruitment and support of female and ethnic minorities is still an area of concern.

5. The concerns for the comprehensive review of the undergraduate teaching appear to have been well addressed since this was an area of commendation for both the internal and external review committees.

COMMENDATIONS

1. The chair has built a high quality, congenial department and is well-liked by both faculty and staff. As a result, the department has developed a broad and deep culture of excellence, an essential requisite for moving up in the rankings.

2. The department has created a well-organized process to plan future directions particularly in astronomy and nanotechnology.
3. The program organization works quite well. Major committees contain members that span the spectrum of ranks and interests, and junior faculty opinions are well regarded.

4. The department continues to bring in first-rate young faculty. Faculty morale, particularly among the junior members, is good with active participation and leadership by the junior members.

5. The undergraduate enrollment of 230 students places the program in the top five largest in the country. The department has introduced new programs that respond to student interests. Student morale is high and students agreed that the faculty took great care with teaching responsibilities and the students.

6. The department supports remarkable educational outreach programs in high schools across the state.

7. The support staff is excellent and committed to the department. The apparatus and staff involved with lecture demonstrations are world-class. The machine shops and their staffs are first-rate.

RECOMMENDATIONS

1. The department should increase its diversity, in particular, to hire and retain more female and ethnic minority faculty as well as recruit and support female and minority students and fill the currently empty lines.

2. The communication between the Department of Physics and the College of Science needs to be improved with respect to budgets, faculty hiring and retention practices, and sabbatical leaves.

3. The department should research the concept of a new building more completely in the context of the specific needs and the acquisition process.

4. The department should foster joint initiatives between science departments and collaboration with other colleges, although the lack of collaboration with chemistry is particularly acute.

5. The department should revise the content and timing of the common exam and should revise the graduate student handbook.

6. The department should make the path for undergraduates getting started in research easier and more accessible.

ACTIONS TAKEN SINCE INITIATION OF THE REVIEW

The internal and external review committees of the current review have offered a number of recommendations. The dean of the College of Science's response is summarized below:

1. The department has a plan in place between the Senior Vice-President for Academic Affairs, the Dean of the College of Science, and the Chair of Physics to move the astronomy program forward.
2. An initiative in the nanoscience and condensed matter physics will seek resources and support from central administration by the possible use of a USTAR position.

Submitted by the Ad Hoc Review Committee of the Graduate Council:

Robert A. Young (Chair), College of Architecture + Planning
John Hollerbach, School of Computing
Steven Krueger, Department of Meteorology
Katherine Poruk (Undergraduate Council)