Physics Department 2013 Annual Assessment Update
September 30, 2013
Chair: Kenneth Kihlstrom

Introduction: The main focus of this report will be on the external departmental review carried out by Drs. Ken Krane (Oregon State University) and Alma Zook (Pomona College) April 22-23, 2103. The entire report is included as Appendix A but sections will be quoted in the body of this report. Other assessment activities took place (such as our seniors taking the MFT exam in physics and revising the faith/learning paper prompt) and these will be discussed as well. Note, in our original six year assessment plan (from the Six Year Report of 2011, the Departmental Review was to take place in 2014-5 but we decided the best time was as soon as possible as we would have all current data from the six year report.

I. External Departmental Review:

A. What the Westmont physics department does well: The reviewers described Westmont physics as: "…a smoothly functioning department operated by dedicated faculty with a more-than-critical number of very satisfied students. There is very little about this department that needs fixing." They went on to compare the program to the characteristics of well run physics departments across the country as determined by a task force formed jointly by the American Association of Physics Teachers, the American Institute of Physics, and the American Physical Society. These characteristics were:

1. Departmental Leadership: they saw shared responsibility and strong sense of collegiality.
2. Mission and Vision: both the College and the department have clear statements of mission.
3. Engaged Faculty: "all were totally engaged in and committed to the undergraduate program."
4. Administrative Support: Westmont administrators showed strong support and pride in the program.
5. Advising: "Westmont students praised the openness and availability of the faculty"
6. Career Mentoring and Alumni Relations: Alumni are supportive but not tapped for career advice. Suggested bringing alumni back for talks and establishing a database.
7. Flexible majors, 3-2 Programs: Westmont has physics, engineering/physics and 3:2. "It is clear that the existence of these programs is responsible for the large physics enrollments at Westmont."
8. Undergraduate Research: "There is an active and successful program to promote and support undergraduate research at Westmont."
9. Physics Clubs and Commons Rooms: "The layout of the new physics building provides a "commons room" in the entire physics wing, as students seem to congregate between class in the common area just outside the faculty offices. This appears to lead to frequent informal interactions between students and

faculty which help to build the supportive and welcoming atmosphere maintained by the department."

The report goes on to speak in general of the department discussing the roles physics departments play in small colleges (support for other majors, GE courses and running a physics major):

"Westmont fulfills these roles admirably and does so with the absolute minimum of instructional staff necessary to accomplish its mission. We are particularly impressed with the number of physics (including engineering physics) baccalaureate degrees awarded by Westmont in comparison with its peer group (see Appendix A). Westmont awards an average of 7-8 degrees per year, which places it among the first rank in the peer group, along with nationally recognized leaders Occidental and Pomona (both of which have significantly larger total undergraduate enrollments and numbers of physics faculty). Westmont awards nearly twice as many physics baccalaureates per year as the average of its peer group and also nearly twice as many as the national average for four-year institutions. It is especially instructive to normalize the baccalaureate awards by the number of tenure line faculty: Westmont awards an average of 2.33 degrees per tenure-line faculty position, compared with 1.05 in the peer group and 0.84 nationally. These data suggest the faculty are extraordinarily effective in preparing physics majors, but it also suggests the possibility of underlying difficulties for such a small faculty to provide meaningful mentoring and research experiences for so many majors. In searching for comparable colleges that offer the same diversity of degree programs (physics, engineering physics, and 3/2 engineering) we find none with as small a faculty as Westmont; for example, Juniata College (8 degrees per year, 4 instructional faculty plus a lab coordinator), Augustana College (6 degrees per year, 5 instructional faculty plus a lab coordinator), and Point Loma Nazarene (4 degrees per year, 5 instructional faculty)."

B. Suggested changes: The main changes have to do with creating a "more diverse and contemporary curriculum". We will list the suggestions and our preliminary response to each. Any curricular changes would need to go through the Academic Senate. So any responses in this report presupposes Senate approval.

1. Drop optics as a requirement and perhaps require and additional lab. **Response: We'll propose reducing optics from a requirement to an option among several courses.**
2. Offer separate mechanics courses for Physics and engineering (currently only the engineering version is offered). **We will propose offering the physics version in alternate years (alternating with optics). (The engineering version will continue to be offered every year).**
3. Offer separate courses for electricity and magnetism. **Our E&M course PH 150 will be Physics or Engineering depending on who teaches it. It might make sense to give the two versions different course numbers and alternate years.**

4. Add electronics to the physics major (maybe just the lab?). **We will include Circuits and Electronics in the choices (along with optics) for the physics major (it is already required for Engineering/physics).**
5. Add computing packages to our courses**. We are adding Matlab to our Gen. Phys. Lab and Spice to the Circuits lab. In addition we will replace the CS 10 requirement (which is taught in Scheme, a pretty impractical language) with a computational physics course.**
6. Reduce the chemistry requirement to one semester or a one semester complementary science lab course. **We will propose replacing the two semester chemistry requirement with a series of science lab choices (Chem 5, 5L, Bio 6,6L, etc.)**
7. Be more aggressive in promoting internships**. We will. Ken will meet with Jennifer Taylor to brainstorm ideas.**
8. Keep updated on modern pedagogical methods. Attend AAPP meetings every other year. **Under advisement.**
9. Hire a woman faculty member:
10. Library improvements. Add books such as textbooks.
11. Add a tenure track position in astronomy**. Our seed grant proposal was for an astronomy position.**

II. Assessment Findings:

A. MFT Exam: Each year we have our seniors take the Major Field Test in physics. This is not part of any course so the inducement is to provide Amazon gift cards upon completion of the exam. Because there was concern of students not taking the exam seriously there are performance bonuses to encourage best effort. This year (unlike last year) all the graduates took the exam. The results are below:

2013Scores

Student #	**Intro**	**Percentile**	Adv	**Percentile**	Total	**Percentile**
1	64	**79**	47	**38**	157	**67**
2	75	**92**	61	**72**	170	**88**
3	21	**1**	20	**1**	120	**1**
4	45	**35**	65	**77**	154	**58**

Three of the four we above the 50th percentile overall but one of the grads could hardly have done worse. These scores will be combined with the results of other years in the six year report.

B. Redo Faith/Learning Paper prompt: In our inaugural assignment asking students in the senior seminar to reflect on how their field of student (or science in general) and their faith relate to each other, the student papers were disappointing to say the least. Most did little more than give a personal testimony which had little to do with the interplay of faith and science. In the

six year assessment plan, 2012-13 was the year to revise the prompt for the assignment. This is the revised prompt:

> A 2-3 page paper reflecting on how your faith has developed in interaction with your education in physics and more broadly in science during your time at Westmont, Think of this along three lines: 1) How has your faith evolved during your years at Westmont, as a function of your education in physics and engineering, 2) What is your current world view, and how do faith and science contribute to this current view, and 3) name any particular individuals (authors, speakers, mentors ...) who have been influential in your faith development, and describe how.

This (at least qualitatively) did result in better quality faith/learning papers.