Alumni Survey

In response to our Physics and Engineering Alumni Survey administered in the summer of 2008 we received 15 replies representing 54% of the surveys extended to our majors who graduated between the years of 2000 and 2008. Of those who responded, 60% earned a degree in Engineering Physics and 40% earned either a BA or BS in Physics; 80% were male and 20% female. These degree and gender percentages are roughly representative of our graduates during these years. (The total group has a slightly higher percentage of Engineering Physics majors and slightly lower percentage female graduates.)

The survey was administered electronically. Alumni had the option to provide their name or remain anonymous. The survey consisted of questions that asked for general information about the respondent, their employment, and specific questions regarding the Department of Physics and Engineering at PLNU. In particular, questions focused on attitudes and feelings that could help indicate our degree of success at "teaching, shaping and sending." A combination of Likert item questions, multiple choice questions and open-ended questions were used.

A summary of some of the key data is presented, categorized into: Department Curriculum (a focus on teaching with some aspects of shaping interwoven), Abilities and Values (a focus on shaping with some aspects of teaching interwoven), and employment with an emphasis on how we prepared our students for Employment and Graduate School (a focus on sending). A more complete summary of Alumni responses can be found in Appendix A. Also, like many undergraduate programs around the country, females have been underrepresented in the physics and engineering department. To begin to address this issue, a second survey was extended to our female graduates to gain some of their perspectives. A summary from those surveys are presented.

Teaching: Department Curriculum

Alumni were asked about their satisfaction with various aspects of the department and courses offered. Of particular note was the very high level of satisfaction with the general level of instruction, personal interest of the professors and professor accessability (see Table 1). Generally lower division instruction received more "Very Satisfied" responses, while upper division tended slightly more toward "Satisfied" to "Neutral." On the ranking of specific courses this general trend seemed to follow. In a free response question one individual commented on that she felt the order in which she took the classes was not ideal and made them more difficult (an issue that faces our department in upper division curriculum).

The lowest ranked courses were electronics courses; these were the only courses to receive significant numbers of "dissatisfied" rankings, particularly Analog Electronics. The courses of Robotics and digital electronics were grouped together and received a mix of "Very Satisfied" and "Dissatisfied." This was one of the few courses that received such a mix (see Table 2).

Table 1: Satisfaction with Aspects of the Department. 1=very satisfied, 2=satisfied, 3=neutral, 4=dissatisfied.

	1	2	3	4
Personal interest of Professors	73 %	20 %	7 %	0 %
Professor accessibility	100 %	0 %	0 %	0 %
Academic advising	33 %	40 %	27 %	0 %
Integration of faith and learning	36 %	29 %	29 %	7 %
Professors displayed Christian example	50 %	50 %	0 %	0 %
General level of instruction	73 %	13 %	7 %	7 %
Level of laboratory experience	27 %	47 %	20 %	7 %
Use of computers	27 %	40 %	33 %	0 %

Table 2: Satisfaction with Physics and Engineering Courses. 1=very satisfied, 2=satisfied, 3=neutral, 4=dissatisfied. Percentages given do not include N/A (such as a physics major who did not take an engineering course.)

	1	2	3	4
The Physics curriculum	40 %	40 %	20 %	0 %
Lower division Engineering courses	43 %	36 %	21 %	0 %
Upper division courses	43 %	36 %	21 %	0 %
Electronics courses	8 %	38 %	38 %	15 %
Computational Methods I (Excel)	73 %	7 %	13 %	7 %
Computational Methods II (MATLAB)	33 %	44 %	22 %	0 %
Engineering Drawing (AUTOCAD)	33 %	33 %	25 %	8 %
Engineering Statics	71 %	29 %	0 %	0 %
University Physics	46 %	38 %	15 %	0 %
Modern Physics	40 %	60 %	0 %	0 %
Nuclear Physics	31 %	62 %	8 %	0 %
Analytical Mechanics	40 %	50 %	10 %	0 %
E&M	29 %	43 %	29 %	0 %
Thermodynamics	38 %	8 %	46 %	8 %
Quantum Mechanics	14 %	36 %	50 %	0 %
Solid State Physics	0 %	36 %	64 %	0 %
Analog Electronics.	8 %	25 %	42 %	25 %
Digital Electronics and Interfacing Robotics	55 %	18 %	9 %	18 %

Overall, over 80% of the respondents were either satisfied or very satisfied with the physics curriculum, and those who ranked the engineering curriculum, 78% of those who responded (some physics majors responded with a N/A for this question) were satisfied or very satisfied with the engineering curriculum. All others considered themselves "neutral."

We also asked our alumni about potential changes to the curriculum such as adding or dropping specific courses or types of courses. There were a significant number that would be dissatisfied with dropping the statics course, a relatively neutral to negative response about cutting back on electronics and robotics courses. There was a more neutral to positive response to dropping the engineering drawing course. There was a positive response to adding more courses in mechanics, solids, or structures.

Some alumni made additional comments about the curriculum. Suggestions included: more or improved courses in electronics, a course in digital signal processing or computer programming, circuit design, a course in 3D modeling, a course in scientific writing and communication. Another suggested an increase the breadth in the engineering courses. Two individuals suggested courses in astronomy or astrophysics. There were also suggestions for an increased emphasis on internships, increased information about research opportunities, and increased information about the process of applying to graduate school.

Shaping: Impact on Abilities and Values

Alumni were asked if the courses offered by our department developed certain abilities that are important in the fields of physics and engineering as well as in a wide variety of vocations (see Table 3). The respondents indicated that their ability to think analytically and logically, problem solve, integrate knowledge, and use computers were "very much enhanced" or "much enhanced." The ability to think analytically and problem solve were mentioned in several free responses as one of the top strengths of the department's curriculum. The ability to use Excel and MATLAB were also mentioned as positives by several individuals in open-ended questions.

A significant number of respondents indicated that their ability to write effectively in the discipline and oral communication was not enhanced through the departmental courses. One individual suggested that a course focused on scientific writing and communication would be beneficial.

Alumni were also asked how their undergraduate experience impacted various values (see Table 4). Responses indicated that all of these values were "enhanced." There were slightly more positive responses for "a strong commitment to Christ" and "taking action on moral and ethical issues", while there was a slightly lower response to "demonstrating sensitivity toward and concern for others."

Table 3: Self-Perceived Enhancement of Abilities from Departmental Courses. 1=vey much enhanced, 2=much enhanced, 3=enhanced, 4=not enhanced

	1	2	3	4
Think analytically & logically	73%	20%	7%	0%
Problem solving	73%	20%	7%	0%
Integrate knowledge	60%	20%	20%	0%
Use of a computer	40%	40%	13%	7%
Working in groups	13%	20%	53%	13%
Write effectively in discipline	7%	33%	33%	27%
Effective oral communication	7%	27%	27%	40%

Table 4: Self-Perceived Enhancement of Values from Undergraduate Experience. 1=very much enhanced, 2=much enhanced, 3=enhanced, 4=not enhanced

	1	2	3	4
A strong commitment to Christ	29 %	21 %	43 %	7 %
Engaging in a life of service to society	13 %	33 %	53 %	0 %
Demonstrating sensitivity and concern for others	13 %	20 %	60 %	7 %
Affirming the equality of all people	20 %	20 %	53 %	7 %
Taking action on moral and ethical issues	27 %	13 %	53 %	7 %

Sending: Employment and Graduate School and ABET accreditation

The majority of alumni indicated that the PLNU department did either an "outstanding" or "good job" in preparing them for work in their field as well as for graduate school, while remaining alumni said we did an "okay" job. No alumni said we did a poor or very poor job in these areas. Multiple free responses indicated that problem solving skills and analytical thinking were some of the most useful skills they utilize in their employment (see Table 5).

In response to how alumni felt about PLNU seeking ABET accreditation,

Table 5: Preparation for Employment and Grad School. 1=outstanding, 2=well, 3=okay, 4=poorly

	1	2	3	4
How well did the undergraduate curriculum at PLNU prepare you for work in the field?	7 %	64 %	29 %	0 %
How well did the undergraduate curriculum at PLNU prepare you for graduate school?	30 %	50 %	20 %	0 %
How well did the undergraduate curriculum at PLNU prepare you for teaching?	20 %	20 %	60 %	0 %

Table 6: Summary of Women's Survey. The scale: very satisfied, satisfied, neutral, dissatisfied, or very dissatisfied.

	Graduate #1	Graduate #2	Graduate #3
Treated by Physics Faculty	neutral	very satisfied	very dissatisfied
Treated by Male Physics Students	satisfied	very satisfied	dissatisfied
Number of women majors	very satisfied	neutral	dissatisfied
Benefit of Female Faculty Member	very beneficial	beneficial	very beneficial
Graduate School	MS/MA	Ph.D	MS/MA
Current Employment	high school teacher	Academic physicist	law

nearly all responded with very favorable, or favorable response (one neutral response, and several physics majors, did not respond to this question) and no negative responses. When asked if they had a choice between adding more mechanics, solids and structure courses or ABET accreditation, there was an even split between these two choices, and about half of the alumni had no response to this question. Generally those in a very direct engineering job tended to have a stronger positive opinion about seeking ABET accreditation. Some free responses indicated that they felt ABET accreditation would provide an easier transition to an engineering job or graduate school, while others indicated that it would have little impact.

Women in Science Survey

An additional survey was sent out to women graduates, to which we received three responses. The survey consisted of a few Liekard questions and free responses questions. All three of these students attended PLNU at a similar time, starting their undergraduate work just before 2000 and completed their degrees after 2000. Information from these individuals is somewhat helpful, though it is somewhat anecdotal evidence due to our lack of statistics. The three seemed to hold very different opinions about their experiences, one basically neutral, one positive and one negative. They will be referred to as Graduate #1, Graduate #2, and Graduate #3.

A summery of some of their responses are shown in Table 6. All three are currently employed, and went on to graduate school after PLNU. Two individuals earned an MA or MS and the third earned a Ph.D. One of these individuals went on to teach, one is currently in law school, and one received her Ph.D. in physics and is in academia.

When asked how they were treated by the Physics faculty as a woman and how they were treated by male physics and engineering majors one indicated that they were very dissatisfied, one indicated they were neutral and one indicated they were very satisfied, there seemed to be slightly higher level of satisfaction toward their peers than toward faculty. The most verbose responses came from Graduate #3, who wrote "I feel that the overall culture at Point Loma is

one that does not foster women in the sciences." She further indicated "During my time there, I felt that the professors with the exception of one were either ignorant of the struggles faced as a woman in the physics department or were outright hostile." "I remember numerous instances of either sexist comments made by the faculty or faculty ignoring sexist comments made by the other students. For example, 'I can imagine being in physics for you as a woman is how I would feel if I was in a home ec class as a man.' Another example, male students asked if the female students would bring cookies to lab." The other two graduates did not make comment of similar remarks. These three alumni were students in the department at approximately the same time.

All three indicated that a female faculty member would be beneficial or very beneficial to help recruitment and retention of female students. These graduates were asked if there was anything that they felt could be done to help recruit female students interested in physics and engineering. One indicated more interaction with other female students in the recruitment phase (if not in physics, perhaps in other sciences.) In terms of retention Graduate #1 mentioned "it was important to treat students equally, and to be sensitive to gender issues in the classroom and in academic advising."

Appendix A - Summary of Alumni Survey

We received 15 responses to our survey. The number of each responses for each question are tallied below. In cases where an individual left a question blank there will be less the 15 total responses for that question. Minor spelling and grammatical errors were corrected on student free responses.

What was your status when entering college?	14 directly from high school, 1 transfer
When did you enter PLNU?	6 between 1995-99, 9 between 2000-07
Major	9 BS in engineering Physics, 1 BS in Physics, 5 BA in Physics
Gender	3 Female, 12 Male
What year did you graduate from PLNU?	All between 2000-07
Approximate GPA in major courses:	3 between 2.5-3.0, 4 between 3.0-3.5, 8 between 3.5-4.0
Approximate GPA for all courses:	1 between 2.5-3.0, 5 between 3.0-3.5, 9 between 3.5-4.0
What further education have you attained since PLNU?	2 None, 6 MA/MS, 1 Ph.D., 2 other, 4 currently in school
What is your current employment status?	12 currently employed; 1 was employed leaving college not currently looking for work; 1 not employed entering grad school; 1 employed part time in grad school
What category best describes your current job? (Where)	1 Medical Physics (Therapy Physics, Inc) , 6 Engineers (TrellisWare Technologies, SDGE, 2 individuals at SPAWAR, Boeing), Police Officer (SDPD), 2 Teaching (UCSD, not specified), 1 Academic Physicist (Queen's University Belfast), attending 1 Dental School, 1 in IT (PLNU), 1 Project Manager (The Cascade Joinery), 1 in law school summer associate (Wilson Sonsini Goodrich and Rosati)
Did you continue your education after graduation? If so in what field? How many years after leaving PLNU did you begin?	2 in Mechanical Engineering, 1 in Construction Engineering, 2 in Electrical Engineering, 1 in Aerospace Engineering, 1 Medical, 1 Dental, 2 Physics, 2 Theology. All but the two graduates who went to graduate school entered right after leaving PLNU. (One entered studies 1 year after graduation, the other 2 years after graduation.)
Which statement best describes how you regard your current job?	3 responded Job with career potential realized; 9 with Job with increasing career potential; 1 with Job with possible career potential; 2 said other.

	Very	Considerably	Somewhat	Barely	Not at all
After finishing your education, how closely related was your first job to the training you received in the department?	2	5	5	1	1
How closely related is your current job to the training you received in the Department?	2	6	4	1	1
How well did your education at PLNU prepare you for your current job or the advanced education needed for it?	5	7	3	0	0

Please answer the questions that pertain to your career and educational choices:

	outstanding	well	okay	poorly	N/A
How well did the undergraduate curriculum at PLNU prepare you for work in the field?	1	9	4	0	1
How well did the undergraduate curriculum at PLNU prepare you for graduate school?	3	5	2	0	4
How well did the undergraduate curriculum at PLNU prepare you for teaching?	1	1	3	0	9

The following are values that people may hold. Indicate how much you think that your college experience enhanced these values.

	very much enhanced	much enhanced	enhanced	not enhanced	N/A
A strong commitment to Christ	4	3	6	1	1
Engaging in a life of service to society	2	5	8	0	0
Demonstrating a sensitivity toward and concern for others	2	3	9	1	0
Affirming the equality of all people	3	3	8	1	0
Taking action on moral and ethical issues	4	2	8	1	0

Please tell us if your departmental course work enhanced your abilities in the listed areas:

	very much enhanced	much enhanced	enhanced	not enhanced	N/A
Think analytically and logically	11	3	1	0	0
Write effectively in the discipline	1	5	5	4	0
Working cooperatively in groups	2	3	8	2	0
Effective oral communication	1	4	4	6	0
Use of a computer	6	6	2	1	0
Problem solving	11	3	1	0	0
Integrate knowledge from many sources	9	3	3	0	0

The following relate to your satisfaction with your education in department of Physics and Engineering at PLNU. Please rate each of the following:

	very satisfied	satisfied	neutral	dissatisfied	N/A
General level of instruction	11	2	1	1	0
Level of laboratory experience	4	7	3	1	0
Personal interest of Professors	11	3	1	0	0
Professor accessibility	15	0	0	0	0
Academic advising	5	6	4	0	0
Lower division physics courses	9	4	2	0	0
Lower division engineering courses	6	5	3	0	1
Upper division courses	6	5	3	0	1
Electronics courses	1	5	5	2	2
Use of computers	4	6	5	0	0
Integration of faith and learning	5	4	4	1	1
Professors displayed Christian example	7	7	0	0	1
The Physics curriculum	6	6	3	0	0
University Physics	6	5	2	0	2
Modern Physics	6	9	0	0	0
Nuclear Physics	4	8	1	0	2
Analytical mechanics	4	5	1	0	5
E&M	4	6	4	0	1
Thermodynamics	5	1	6	1	2
Quantum Mechanics	2	5	7	0	1
Solid State Physics	0	4	7	0	4

Please rate the following based on the Engineering courses:

	very satisfied	satisfied	neutral	dissatisfied	N/A
Computational Methods I (Excel)	11	1	2	1	0
Computational Methods II (MATLAB)	3	4	2	0	6
Engineering Drawing (AUTOCAD)	4	4	3	1	3
Engineering Statics	5	2	0	0	8
Analog Electronics.	1	3	5	3	3
Digital Electronics and Interfacing Robotics	6	2	1	2	4
What was your overall feeling about the quality of the Engineering Physics Program?	3	7	2	0	3
How would you feel about adding more courses in mechanics, solids, or structures?	6	1	4	1	3
How would you feel about dropping the statics course?	0	0	4	6	5
How would you feel about dropping the drawing courses?	1	3	4	4	3
How would you feel about more circuit analysis courses?	4	2	6	0	3
How would you feel about the program cutting back on electronics/robotics courses?	0	0	6	5	4
How would you feel about obtaining ABET accreditation in Engineering Physics?	5	4	1	0	5

If you were an Engineering Physics major or are employed as an engineer or applied physicist, please answer the following questions:

Which would you prefer: More mechanics, solids and structures courses or an ABET accredited Engineering Physics (applied physics) major? Why?

- I have no idea what ABET accreditation involves, but for me, nuclear physics was the most useful course for my career. I never took a structures course, so I have no idea of its usefulness, but I don't deal with that in my career. I think this really depends on the future direction of the department - if the goal is to churn out engineers, then any bolstering of those type courses would be a positive.
- ABET accreditation
- ABET accreditation isn't important to me, but since solid state is a growing field right now, more concentration is this area would be good.
- An ABET accredited Engineering Program, because it could potentially open more doors for graduate school and career paths.
- More mechanics, solids, and structures but that is because that is the way I went. It seems like the program is more geared to electrical engineering type jobs now. Adding more solids and structures brings it closer to a general degree. In either case grad school is probably required to get a job. Would it make sense to offer 2 tracks within the physics degree?
- More mechanics, solids and structures courses because I find them more interesting and applicable to a wider variety of fields.
- Accredited ABET Engineering Physics because then it would be easier to transition into an engineering job or higher education for engineering.
- I would prefer more mechanics and solids. That would make it easier to get going in a graduate program right away. However, being ABET accredited would make it easier to get the P.E. or maybe get an engineering job right after college.
- Must it be one or the other? I would choose the accreditation as the higher goal of the two. I am now working for Boeing and I was only able to get an internship previous to working full-time because they recognized the ABET accredited Aerospace Engineering program at Embry-Riddle Aeronautical University. When I applied for work there, there was a drop-down list of schools and PLNU was not on there, I assume because it is not an accredited program, even though I felt my BSEP degree prepared me better for work than my MAE degree.

Please make any other suggestions you may have regarding the Engineering curriculum or accreditation. (You have the rare opportunity to direct the future of your department!)

- If you want to prepare students to make a ton of $$ following graduate school, include as much medical physics preparation as possible.
- I feel very poorly prepared in electronics, so we definitely need more courses in that. Also, requiring computer science/programming for freshmen would help prepare them better for the electronics courses.
- Astronomy / space / astrophysics stuff would be good too.
- I highly recommend an internship program within the Engineering and Physics degrees. Encouraging or requiring students to complete a summer internship some time during their last two years of school will be beneficial for the program and the students. PLNU will get recognized in the Engineering and Physics community at large because the exceptional PLNU students will give a good name to the program; opening up further name recognition, and opportunities for students. This would open up a network to future students and open up future job options. This also comes as a recommendation to have more involvement in the community by the professors. A large driving reason for myself to get a master's degree was that I felt it was difficult to find an engineering job coming out of the Point Loma Engineering Physics department. I did a lot of searching and applying for internships my last couple years at Point Loma and there were valuable lessons learned.
- Can you add other engineering degree programs? The accreditation is a big deal when trying to get an engineering job. Don't consider any engineering degrees without ABET. It leaves you with an unmarketable degree.
- I think that there could be more focus on electrical engineering or maybe even have that as a focus. In EE classes, a more EE focused book with EE terminology would be helpful. A DSP (digital signal processing) class would be good as well.
- I would suggest more course work in the different engineering fields and possible degrees for civil, structural and mechanical engineering. I would suggest the accreditation for taking the EIT.

Open Ended Questions

What skills learned and courses taken in the PHY/EGR department were particularly helpful once you entered the working world?

- Nuclear Physics, all labs, as well as lab assistant work.
- Excel is crucial to engineers, so the skills I learned in Computational Methods were very helpful for the rest of college and for the workplace.
- Analytical Mechanics
- Though my current job is not physics or engineering related, the ability to look at a problem and take all of the information, analyze a situation and come to a conclusion about how to best solve it is a skill that I feel was enhanced by the program.
- University Physics I & II. These courses were the foundation of my education and now career in Civil/Structural Engineering.
- The courses were not particularly useful. What was more important was knowing how to problem solve and find answers through research. Some of the more technical classes were useful though. Robotics, digital electronics, that freshman class where you learn to use Excel. On the CAD stuff. Autocad may be good for EE's but ME's do more solid modeling (Solid Works or ProE) definitely drop the hand drafting
- PHY241
- The Excel course was helpful. The MATLAB course would have been helpful if it was available when I was a student there. MATLAB is very common among engineers.
- I really appreciated the self-teaching and debugging skills that we learned in digital electronics. That has really helped when it comes to solving real problems.
- The discipline and problem solving skills.
- Problem solving skills were by far the most helpful. Struggling through physics problems for 4 years at PLNU made a masters degree in aerospace engineering seem easy comparatively. I learned that no matter how hard a test or assignment is, there will always be a twelve-year old (namely, Dr. Walker's nephew) who can do better than myself. This transfers as - find that person who knows more than you and ask them.

What skills or courses do you wish that the PHY/EGR department had offered?

- More electronics, especially more hands-on lab experience. Also computer programming
- None - I was well served by the courses I took.
- I wish that I had taken a linear algebra course, (maybe a little group theory), and that [] had done a better job in our differential equations class.
- I would have liked to have a class in 3d modeling, maybe using ProE.
- Scientific writing and communication, information about research opportunities and applying to graduate school
- From a Civil/Structural Engineering standpoint, I would recommend a stronger emphasis on statics, dynamics, strength of materials, and structural design. I realize this is somewhat one sided, for a B.S. in Physics/Engineering, so the most important thing would be meeting the requirements of the ABET accreditation.
- I wish I had taken statics. Solid modeling would have been nice. But then I went the ME path.
- analog or digital circuit design.
- More hands-on lab instruction, especially in the use of tools/machinery. Even an intro course in machining or something similar would be nice. Maybe turn the seminars into a projects course.
- Modern Astrophysics. I took it in my master's program and it combined most everything I learned in my physics courses into one class: modern physics, thermodynamics, E&M, quantum physics. It was an enjoyable class to see the physics I learned in application to the universe.
- Statistics would have been helpful to take prior to taking thermodynamics. Also, taking differential equations before quantum would have been useful.

What skills learned in the department have been most useful to you in the workplace?

- The lab courses, ability to problem solve, and working well in teams as well as independently are a few that come to mind.
- Critical thinking, problem solving
- Analytical & Critical Thinking. Problem Solving.
- Mathematics and Excel.
- Critical thinking and problem solving.
- Problem solving.
- Work diligently to solve the problem in front of me; it may not be easy.

Is there anything else that you would like to tell us?

- I'm still struggling to figure out what I can actually do with a physics P.hD. Walker encouraged me to go to grad school, but now that I'm here, I'm not sure why. I know that Puntenney put together some talks from alumni to give us some guidance in what the job market looks like, and that was a great idea, but I feel like that helped the engineers without doing much for the physicists. I also think that more guidance in the process of applying to grad school would have been helpful, especially on the personal statement.
- The year that my class hit upper division courses was an awkward year for the dept. We had to take some classes out of order (before taking the appropriate math classes). That made the last 2 years extra difficult. Hopefully this problem has been remedied.
- Point Loma Nazarene University was the start of my career in the Engineering field. I greatly appreciate the two years of education I received at PLNU. I consider it the foundation to where I am today. I always admired the enthusiasm of the Professors and their willingness to take the time needed to see their students succeed. Outside of Engineering, one of the most important items I learned at PLNU is that my hope is ultimately in God no matter what trial I may face in life.
- The problem solving and work ethic I developed in the physics department will be useful wherever I go.
- Be sure that the university gives Dr. Puntenney a nice going away present next year, like a first-class, round the world plane ticket. Have a great summer.
- Pt Loma and PLNU is the best place in the world.
- PLNU as a whole was an excellent builder for me. It prepared me for the "real world" in knowledge and wisdom, spiritually, relationally, and helped create a well-rounded person in me (much of which was Christ, of course). ERAU, with the #1 undergrad AE program, is great at sending out engineering students, but they lack so much in other areas that PLNU is great in - mostly social/relational areas. I believe that my PLNU experience in the EP major prepared me to excel in the working world just as well or better than my Aeronautical University experience. I don't think that is realized by employers or schools. Thank you.
