**Westmont College Biology Department Program Review 2015**

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***I. Introductory Summary***

Our program review was a fruitful opportunity for the Biology Department to take stock, examining the things we are doing well and identifying improvements that may be necessary. In addition to the student assessment we have done annually for the last 6 years, we connected with both current and former students to get a comprehensive view of their satisfaction with our program. This past academic year, we conducted 2 student focus groups and administered a student survey on curriculum. Furthermore, our alumni survey yielded a 45.4% response rate and therefore we heard from 103 of our graduates from the last 6 years. We examined the curricula at comparable institutions to see if there are any major deficits in our program. We surveyed Biology department colleagues at other colleges and universities about their facilities to see how we currently compare. Finally, we had a departmental retreat back in May to reflect together on the new data we collected and how we might respond as well as discussed what the obstacles might be that are preventing us from achieving our individual professional goals. While there are some concerns and areas for improvement, overall, this was an encouraging 6-year cycle for us.

Our annual student learning assessment projects revealed no major deficits in any of our program learning outcomes, except one, the lack of significant plant biology in our program, a deficit we have long identified. Otherwise, we found our students struggled in the areas known to be challenging (e.g. constructing arguments, framing a bioethical decision in a scriptural context, distinguishing what information goes in the Results and Discussion sections of a scientific article). Of course, identifying these weaknesses helped us modify our instruction accordingly. It also highlighted the classes and assignments that worked well and helped our students accomplish our student learning outcomes. For example, we were satisfied and encouraged with how our students grew in their ability to recognize a range of perspectives on the creation/evolution debate, to be self-critical of their own position, and to accept a degree of ambiguity when certainty is unattainable. It confirmed that it was important to retain a key debate assignment in our Introductory Biology course and to offer one of our capstone courses every year instead of every other year.

Most student and alumni feedback was overwhelmingly positive. In our alumni survey, 99% of respondents said that they were “satisfied” or “extremely satisfied” with their Westmont education as a whole. Over 90% said that the teaching in the Biology department specifically was strong or superior. Other departmental strengths described by alumni were the hands-on experience in the lab and field and the biology/faith discussions. Indeed, our current student focus group on biology/faith made it clear that these discussions permeate our entire curriculum, occurring in almost every class. The focus group with our current independent research students also indicated they were satisfied with their research experience with no student rating their experience less than a 8 on a 10 point scale. Finally, a large majority of alumni (81%) and current students (82%) were either “mostly satisfied” or “completely satisfied” with the breadth of course offerings in the Biology department. Nevertheless, alumni suggested that improvements could be made in expanding curricular options, in career direction and job preparation, and in offering more research opportunities. Half of current students also said that they wanted more Biology-specific off-campus programs.

Our comparisons to Biology programs at other institutions were less encouraging. Based on the data we gathered: 1.) We have a smaller faculty than 5 of 6 institutions we used for curricular comparison when you controlled for enrollment (This, of course, was immensely improved after our last program review in 2009 which resulted in the approval of an additional FTE), 2.) Compared to other CCCU schools, we rank last by a considerable margin in square footage/student (most CCCU schools have twice the space, the better ones have 3-4 times).

Based on the data we collected and our reflection as a group, it’s clear that many of our current challenges are not new but have perhaps been compounded with time. The paucity of Plant Biology in our curriculum has long been recognized and we have made staffing decisions knowing it would result in more of a specialization in animal biology in our Eco/Evo/NH track. While the Biology department is grateful for all the small and large renovation projects in our facilities, many comparable institutions have had newly built life sciences facilities or large additions to their current buildings in the last decade (e.g. Wheaton, APU, Gordon, Houghton, Point Loma, Taylor) and our facilities therefore may communicate to prospective students and parents that Biology is not a priority here at Westmont. This might be one contributing factor to the decreased enrollment in our Eco/Evo/NH track. Most faculty members said that research was the area in which the most struggles have existed. Insufficient dedicated research space, limited funds for the typical consumables needed for biological research, unreliable strategy to fund our summer research student program, and needed basic infrastructure such as the establishment of the IACUC have all put strain on many of our research ambitions.

While some of the challenges feel beyond our immediate control, we recognize that departmental effort is needed in certain areas to improve our program. Institutional momentum clearly exists for helping our students “launch” into careers after graduation and the department needs to take its share of the responsibility in improving the discipline-specific resources we offer, the guidance we give in advising, our internship opportunities, and our collaboration with the Career Development and Calling office. We need to seek creative strategies to incorporate more Plant Biology into the current classes we teach. We need to make sure the new faculty member hired to replace Frank Percival will expand our curriculum in one or more of the needed areas. Finally, we need to increase our efforts in acquiring external funds for our research programs. All these improvements seem reasonable and within our reach.

***II. Findings***

***A. Student Learning***

**PLO #1:** *Students will effectively identify, and explain, fundamental principles of life processes at different levels of structural organization.*

In 2014, we administered the Major Field Test in Biology to assess the SLO: *Students will score competitively on a national comprehensive standardized exam in Biology*. Thirty-two students in the department’s capstone courses, Bioethics Seminar (BIO 196), both Fall and Spring, and Biology and Faith (BIO 197) took the Biology Major Field Test, developed by the Educational Testing Service in the 2013-2014 academic year. The following three benchmarks were used to interpret the test results. Compared to the National Liberal Arts Colleges using the test only for program assessment (our “Main Reference group”), (a) BS General Track students’ mean score will be at the 50th percentile for the whole exam, (b) BA students’ mean score will be at the 40th percentile for the whole exam, and (c) the mean scores for our specialized tracks (Cellular and Molecular Biology and Environmental/Natural History) on the relevant subsections of the exam will be at the 60th percentile.

The full results can be seen in Appendix 2A. Our “average student’s” total exam score ranked at the 58th percentile of all students taking the exam (45,260 students from 507 institutions), and this placed us at the 69th percentile when comparing our mean total exam score to those of the other institutions in the database. Our student mean score for the total examination was virtually the same as the mean score for all students from our Main Reference Group (157 compared to 156.8, 48th percentile), and a Z test indicated essentially no difference between our students’ scores and those of the reference population as a whole (P = 0.929). For comparison, Westmont’s 75th percentile SAT score (1310) places us at the 54th percentile in relation to other institutions in this group. Looking just at the BS General Track students’ results, their mean score was 159 (54th percentile in the Main Reference Group) while our BA students, with a mean score of 154, were at the 40th percentile. Thus, these groups met the first two benchmarks defined above. The MFT’s “assessment indicators” indicated the relative strengths and weaknesses of our program. Overall, our students did relatively well with questions dealing with animal biology and biochemistry (79th and 66th percentiles in our Main Reference group) and relatively poorly on questions dealing with plant biology and ecology (16th and 29th percentile in our Main Reference group). Nevertheless, students in specialized tracks within the major have area scores that reflect the emphases of their studies.The Cellular/Molecular track students had mean subscores in Cell Biology, Molecular Biology and Genetics, and Organismal Biology that were well above the 50th percentile in the reference group, but their mean subscore for Population Biology, Evolution, and Ecology was at the 41st percentile. Conversely, the Environmental/Natural History students had their highest score (55th percentile) for Population Biology, Evolution, and Ecology, but scored well below the 50th percentile in the other three areas. Therefore, while the BS Cellular/Molecular students met the benchmark of the 60th percentile for the subsections most relevant to their studies the BS Environmental/Natural History students did not.

*Closing the loop***:** We are currently undertaking a review of our introductory core of courses for our majors in the current academic year with an eye toward possibly restructuring the way in which we introduce students to the study of Biology.

**PLO#2: Experimental Investigation:** *Students will grow in their ability to carry out scientific investigation of living systems.*

In 2011, we used a series of direct and indirect assessment strategies to examine 4 SLOs related this our research PLO. We analyzed end-of semester research posters from Bio-005 to analyze 2 SLOs: a.) *Students have an appropriate understanding of the experimental question and of the previous research published on the topic* and b.) *Students will apply appropriate principles of experimental design and data interpretation in their research projects*. In groups of two or three, the introductory Bio-005 students develop a research question, plan the experiments, carry out the research, analyze the data, and present their findings in a poster-style format. From the Spring 2011 class, we analyzed all 34 research posters, and in doing so organized our findings into two general areas of competence: Experimental design and background, and Graphs and statistics. Two faculty graded the posters (see Appendix 3B for the rubric used), compiled the data, and then presented it to the entire department for discussion. These data, reported as the number of student groups failing to meet the standard in each category (percentages could not be used here because each category does not apply to all 34 research posters), are depicted in Appendix 2B.

Although there were more instances of failing in each category than we desired, two in particular stood out. First, students don’t use the scientific literature appropriately in their research projects; specifically, they don’t do sufficient background research before starting their project (“Use of Literature”). One obvious reason for this is that, as introductory students, they simply aren’t comfortable with engaging the literature, even though one laboratory session is devoted to introducing them to the use of the scientific literature. A second, and very likely, explanation could be that even with some previous engagement with the literature and minimal level of comfort with reading papers, they do not know how to apply it specifically toward designing and carrying out a research project. Second, in interpreting their data, many students do not use the appropriate format to report their findings (“Proper graphs used”). For example, some students used a bar graph when an XY-style plot would have been appropriate and of those who did use an XY-style plot appropriately, some failed to connect the data points. Our students need to know that to be successful in interpreting the meaning of their data, they must be able to convey it in a form that is accessible to the reader.

*Closing the loop:* We discussed two broad changes to the curriculum that will be implemented in response to these observations:

1. The process of making a project proposal for Bio5 students was made more formal, in order to help students with experimental design. Specifically,
2. The Bio5 instructors designed a form that students will complete during or after consult with instructional staff that draws their attention to things like appropriate controls, units of measurement, and variables subject to manipulation.
3. The grading rubric was updated to be more explicit about how the scientific question should be developed
4. The Bio5 instructors added more emphasis to the proper methods for doing background literature searches so that students can better frame their research question.
5. We revised a section of the Bio-005 lab manual that addresses statistical tests.

We used a student survey to assess 2 other SLOs: c.) *Students will develop competence with current research methods, tools, and techniques*, and d.) *Students will conduct their research with enthusiasm and commitment.* Eight of nine Bio 198 and/or summer research students who worked during the summer of 2010 or the 2010-11 academic year to completed a survey evaluating their research experience. The survey (supplied as Appendix 3B) was designed to get the students’ perspective on their experience and their self-assessment on their abilities. For each question, students were asked to respond on a scale of 1 (strongly disagree) to 5 (strongly agree). The results are summarized in Appendix 2B. Our benchmark was to have the average value in each of the categories at 4.0 or above.

Overall, we were pleased with students’ self-evaluation of their independent research experiences. We met our benchmark in all but one category and identified two areas for improvement. The first area for improvement is identified by a noticeable trend in figure A above: students rate their ability to actually do the lab work higher than they rate their ability to engage the theoretical or background components of their work (compare the last two categories in Fig 2A, which evaluate lab bench competency [average value = 4.9], with the first four categories, which evaluate their understanding of and ability to articulate their research project [average value = 4.2]). Perhaps this is not surprising, as a majority of our students tend to view research in the lab as a series of techniques to master, rather than a set of scientific questions to answer. Second, responses were relatively high in each category except one: students did not agree that part of their motivation for independent research was that it would result in published papers or research posters (the latter would entail presentations at research conferences). We interpret these data to mean that students are not engaging their work at what we feel is a critical level: connecting what they do at the bench or in the field to the broader scientific community. This further suggests that the summative work in which nearly every one of our research students engage – constructing and presenting a research poster at the Westmont Research Symposia that take place in the fall and spring –is considered by the students to be just another component of the research experience, rather than as a capstone of their time in the lab or field.

*Closing the loop:* We would like to nurture our research students to think of themselves as contributing scholars in the field, rather than simply as “experiment doers” and to understand the big picture of how their experimental findings contribute to answering larger research questions. Towards this end, we discussed requiring each summer research student to (i.e., those that have ten weeks allotted to engage their research projects full-time)

1. submit a written report on how the primary literature, that serves as the background information for their own project, helps to frame the research question.
2. give a summative lab meeting-type presentation using their research poster as a visual aid, with their research peers and faculty mentor in the audience. In this presentation, the student’s faculty mentor will provide guidance on how to “tell a story” rather than link together a series of experiments.

**PLO #3: Scientific Communication:** *Students will be able to present the findings and implications of scientific research through written research reports, oral presentations and scientific posters.*

In 2012, we examined upper-division lab reports to assess the SLO: *students write research reports, produce posters and give oral presentations in appropriate format and style as instructed*. Three of our upper division biology classes (Bio-110, Microbiology; Bio-130, Cell Biology; and Bio-132, Molecular Biology) require an extensive paper that summarizes experimental work performed, stemming either from lab experiences planned by the instructor or independent projects that students have developed on their own. From these selected courses, we analyzed 9 research papers; three from each of the three courses, randomly selecting an “A, a “B,” and a “C” paper from each. All department faculty members read all 9 papers and scored elements of scientific format and style using a rubric (See Appendix 3C) Unknowingly, two of the “C” papers from two different courses were actually written by the same student. We therefore omitted data from one of these “C” papers, thus reducing our student sample size to eight. Reviewer’s scores were then compiled and averaged. Our benchmark was that the group mean for each element would be 4.0 or higher. Results are shown in the graph in Appendix 2C.

We found that upper division students do a good job writing in an appropriate scientific tone and style, as we met the target benchmark for each element in this category. With regards to adherence to a prescribed format, students showed some deficiencies in effective use of the three core sections used in scientific reports – the Introduction, Results and Discussion sections, as well as (for a few) the writing that occurs in a paper’s Abstract. Specifically, we observed that students 1) need more help in understanding the rationale for doing what they are doing and in connecting their research question to previously published literature (=Introduction), 2) need more help relating their own data to previously published literature (=Discussion), 3) (some) need assistance in understanding the requirement of statistical analysis in the student’s paper (=Results), by reviewing and then clearly indicating what statistical tests would be most appropriate for the work being done, and 4) (some) need further guidance in choosing the most relevant literature sources (although significant progress has been made in discerning the difference between peer-reviewed literature and other non-scholarly sources). Finally, a clearer understanding of the introduction, results and discussion sections should then improve the format of their abstract (the only other section with a mean score below 4.0) since it summarizes the contents of all other sections.

*Closing the loop*: We discussed two categories where work needs to be done:

1. How can we help more of our students improve in their ability to write scientifically, especially with regards to format?
   1. The Biology faculty met in May 2014 to review the lab report guidelines for Bio-114: Genetics, the writing-intensive course that all our majors are required to take. Our main observations and reflections were:
      * 1. Overall, descriptions of the section are very clear.
        2. We noted sub-discipline distinctions in format but all of the faculty were comfortable with this format in Genetics.
        3. We decided we needed to add a clear statement of using parentheses for reference to tables/figures and statistics.
        4. We noted that Chemistry requires an “Error Analysis” section which biology students feel compelled to include regardless of whether data suggest there might be any errors.

The Bio-114 instructor made changes based on this feedback.

* 1. We also agreed to spend departmental money to pay academically strong, upper division biology students to serve as departmental tutors during the second semester of this academic year. In the Spring 2013 and 2014, we required the Genetics lab TAs to hold 4 hours of open tutoring/help sessions each week to assist the lower-division students in our core-courses (Bio-005 and Bio-114). While they helped with general comprehension of lecture material, the student tutors also assisted Bio-005 students with correct poster formatting, utilizing appropriate literature resources, and using the correct graph format (see assessment results for PLO #3) and provided Bio-114 students with needed guidance on writing lab reports. Anecdotal evidence suggests the tutors have been useful.

1. How can we improve our strategy in assessing this particular PLO?
   1. We need to modify the way we select student papers to read. We need to consider assessing a larger, and completely random sample, of upper division, senior papers. We will rethink this strategy before our next round of assessing this PLO.

**PLO #4: Biology/Faith Integration:** *Students will be able to identify and describe a wide range of controversies, positions, and approaches to inter-disciplinary and theological implications of biological theory.*

In our last 6 year cycle, we assessed our Program Learning Outcome #4 twice, each focusing on different student learning outcomes. In 2010, we ambitiously attempted to assess several SLOs primarily related to creation/evolution, theological anthropology, and origin of life. In 2013, we focused on a multi-part SLO related to bioethics.

In 2010, 2 assessment methodologies were most successful and will be the emphases here. First, item analysis was done of embedded questions on a midterm exam to assess the SLO: *students can identify and describe historic and contemporary interdisciplinary implications of bioscience and approaches to relating these issues to religious faith*. The class average for all items on this exam is typically 82-84%. In Fall 2010, 66 test items requiring students (n=60) to “identify and describe” positions and approaches were analyzed. The class average was 90% correct on these items. Although we had not identified a specific benchmark, we deemed this an acceptable level of competence.

Second, a survey of personal views on faith and science was given to sophomores at the beginning and end of Bio-006 and also re-administered to seniors in Bio-197 to help assess 2 other SLOs: students can a.) *critically assess their own positions and respect those of others* and *b.) recognize and accept a measure of ambiguity in relating disciplines to one another.* The survey was a collection of 12 statements focused on 4 areas (Traditional Creationism, Theological & Evolutionary Anthropology, Origin of life, and General Approaches to science & religion) and students were asked to rank on a 5 point Likert scale whether they agreed with the statement. For 9 of these 12 statements, they were also asked to similarly rank how important they believed holding the "correct" view on the issue was to their Christian faith. Although the survey was given to over 300 Bio-006 and Bio-197 students from 2004-2010, we decided to analyze two samples with complete before / after data: (a) the Bio-006 classes for which we had both pre-and post-instruction surveys (n=93) and (b) the seniors in Bio-197 for whom we also had their Bio-006 survey results for a direct comparison (n=15). The full results can be found in Appendix 2D. Although we discuss finer details and nuances in our 2010 annual report, we generally used a significant change in their “do you agree” position as a proxy for their ability to critically assess their own position and respect that of others. We used significant change in their “how important for their Christian faith” position as a proxy for their ability to recognize and accept a measure of ambiguity. For Bio-006 students, the average “agree” score significantly changed for 8 of 12 statements, generally moving away from classic creationist tenants (young earth, worldwide flood, supernatural creation for all species) and toward more science-affirming and less conflict-oriented understanding. This pattern continued for seniors (significant change in average “agree” score in 8 of 12 statements) although the score change was much greater. Seniors did appear more able to recognize and accept ambiguity as they displayed a significant change in the average “how important to faith” score for 8 of 9 statements while Bio-006 students change for only 5 of 9 statements. The movement in the scores indicated a relaxation of commitment to seeing these issues as essential or important to their own faith. The only score that showed a significant increase in commitment between sophomore and senior year was the one with a degree of ambiguity reflected in the statement itself (*I believe God was supernaturally involved in creating humanity in some way, however He did it).* Notably however, student views of “the Fall” - a topic with most abiding theological import in the Christian tradition but with the least straight- forward connection either to creationism or evolutionary theory – showed the least change through Bio-006 and from sophomore to senior year.

*Closing the loop*: In response to these data, we decided

1. to retain a longstanding assignment, the debates, in our core-course, Bio-006. These are a significant amount of work for both the faculty member and the students and they take up two lab sessions. We wondered whether the either / or approach was a little outdated and contrived.  Student responses to the debates in particular and course outcomes suggested to us that we should retain them.
2. to offer Bio197 as an annually taught course, instead of alternating it every other year with another course. We also increased the cap to accommodate any interested student, which has included offering - at least on one occasion - an additional section.

In 2013, we assessed the SLO: Students *will be able to a.) describe a bioethical issue, b.) critically respond to one key argument, and c.) frame the issue within the context of Christian belief and scripture.* To assess part (a), we gave an end-of-semester questionnaire to the Fall semester Bio-196 (Senior Seminar in Bioethics) students (n=11). The questionnaire (Appendix 3D) was handed out with evaluations on the last day of class, however, and students’ answers overall were rushed & superficial. Their lack of effort made the assessment data meaningless and no useful information about student learning was attained. To assess part (b), faculty reviewed samples of student work from the Fall Bio-196 course. Students had to complete a worksheet evaluating arguments after watching a debate online. Two faculty then scored students answers on a 0-2 point score (See Appendix 3D for worksheet and scoring scale) and the scores were averaged. As 8 of 12 students (67%) had an average score of 1.5 or more, we failed to meet our capability benchmark of 80%. While we were pleased that students could talk about normative ethical theories & identify the theories from which debaters were drawing, they had trouble distinguishing between an argument and an assertion. A summary of the results can be found in Appendix 2D. To assess part (c), faculty reviewed samples (n=11) of student work from the Spring Bio-196 course. In the course, students read a chapter of a bioethics book covering topics such as euthanasia and organ donation and write a short, 6-part report of their reflections. Part #6 asks them to describe “one aspect of the Christian story that might inform your decision concerning the issue”. Three faculty read this section and assigned scores on a 0-2 point scale (See Appendix 3D for a full description of the assignment and scoring scale). Scores were averaged and the data are summarized in Appendix 2D. As 8 of 11 students (73%) had an average score of 1 or more, we failed to meet our capability benchmark of 80%. Overall, this is a challenging assignment since scripture does not speak directly to most (almost all) of the advanced medical and bioethical issues discussed. Students understandably struggle to make these more indirect connections themselves.

*Closing the loop:* In response to these results,

1. the Biology department invited the Philosophy department professors to a department meeting in the Fall 2014 to discuss argument vs. assertion and the use of scripture in ethical decisions. It was helpful hearing that their students similarly struggle in these areas and learning about some of the teaching strategies they use.
2. instructors for Bio-196 modified their instruction and course content accordingly. For example, the Spring instructor added an element on the weekly reflection and summary assignment asking students to evaluate arguments presented in the reading. Also, new instructors (Amanda Sparkman, Assistant Professor in the Biology department and Stephen Zylstra, Adjunct Philosophy Professor) started co-teaching Bio-196 in the Fall Semester.  They have designed the course such that students submit a written summary of the arguments from key papers prior to class each week, in preparation for argument analysis and critique during class discussion.  Students use the skills they develop throughout the semester to formulate their own arguments in a final paper, as well as articulate their position in lively case study-based discussion with their peers.

**B. Alumni Reflections**

We implemented the institutional alumni survey template in Survey Monkey and made the survey available to our students who graduated in the past six years. Out of 227 former students, we received 103 replies for a 45.4% return. The gender ratio in the responses (58.8% females, 41.2% males) closely approximated the ratio in the email list we obtained from Alumni Relations, indicating that, at least with respect to this factor, we received a representative sample of responses. The survey and results can be found in Appendix 7.

From the analysis of our survey, we learned of an overall general satisfaction among our graduates, with a few key areas that need improvement. Our survey results indicated that our majors are generally quite happy with the education they received at Westmont, with 99% of respondents expressing that they were “satisfied” or “extremely satisfied” with their Westmont education as a whole. With regards to the department’s teaching effectiveness, 92.9% of respondents rated it “strong” or “superior,” and the most frequent responses to “What was the best aspect of the program?” spoke of relationships with professors and the quality of teaching (53 of the 80 responses). Gaining hands-on experience in labs and in field work were also mentioned among the best aspects of the program (16 of 80 responses), and of those who participated in field programs, 89.6% believed their experience was a “positive” or “quite positive” contribution to their Biology education. Additionally, 67% saw faith/science discussions in courses impacting their worldview “a lot,” and 9 of the 80 free responses identified them among the best aspects of the program. On the other hand, weaknesses in career direction and job preparation, noted in 20 of the 60 responses to “What improvements would you suggest for the program?” (more on this below), challenged students’ satisfaction, as did limited curricular options (18 of 60 responses) and a desire for greater research opportunities (9 of 60 responses).

The sense of being prepared for life after graduating from our program varied from individual to individual. On one hand, 67.4% of respondents in post-graduate degree programs indicated that they were “better prepared” or “much better prepared” than their peers, and 8 of 37 responses to “Is there anything more you would like us to know” expressed being well-prepared for their current position, including medical school and dental school. On the other hand, the most frequent responses to “What improvements would you suggest for the program?” (20 of 60 responses) dealt with the need for more assistance in transitioning to the world of work, and some of these responses were among the most forcefully expressed. Respondents were certainly looking for more in the way of career counseling and networking opportunities, but some also wanted to see more emphasis on mastering technical skills that would be beneficial in their careers after graduating.

In our departmental discussions of the survey responses, we focused mainly on the need to give our students more assistance in preparing for careers. In the 2015 spring semester, along with the Office of Career Development and Calling, we hosted a career night which drew many of our majors (approx. 30) and received excellent feedback, and we plan to be more intentional about partnering with them in the future to incorporate this type of career exposure to a greater extent. We also need to identify ways in which we as faculty can grow in our student advising, helping our advisees to reflect more deeply on their interests and abilities in relation to their future careers, and, when possible, directing them toward alumni and other individuals who could help them in their career explorations.

We understand that the job market is far more competitive in today’s world, and technical skills are a qualification that most employers look for, but we are also mindful of the fact that we are asked to go beyond simply the teaching of technical skill; we are about a full and comprehensive learning experience, and want “love of learning” to be the central focus of our Biology majors, which should extend well beyond just technical prowess. Through our survey, we were pleased to find a continuance of lifelong learning and everyday discovery. Our survey asked respondents about hobbies and interests that integrate Biology into their everyday lives, and we were pleased to read through 72 responses, which ranged from attending professional conferences to tide pooling and hiking in the Sierra Nevadas.

Finally, the retirement of a Biology faculty member at the end of the 2015-2016 academic year provides a natural opportunity for curriculum review and revision. The feedback from the alumni survey provides input for that process, although the department’s mission as well as the mix of resources and challenges we currently experience will also be important determinants in that conversation.

**C. Curriculum Review**

Improvements to our curriculum remain a priority. Efforts toward that end have occupied a good amount of departmental reflection, and we have used recent alumni and current student input and a survey of course offerings from comparable institutions to evaluate where we stand and how our current curriculum might be augmented to expand disciplinary breadth. The alumni and student surveys and results can be found in Appendices 7 and 21 respectively. Four main points are summarized here:

1. **Student satisfaction.** A large majority of recent alumni (81%) and current students (82%) were either “mostly satisfied” or “completely satisfied” with the breadth of course offerings in the Biology department. These data reflect input from students in both the cell/molecular and ecology/evolution tracks of our major. Since the alumni respondents were in many cases reporting while engaged in a biology-related professional focus (and more than likely a recently started one, given the fact that we surveyed graduates within the past five years), the data suggest that for a variety of career or post-secondary programs our course offerings have provided suitable training.
2. **Course offerings.** Nonetheless, we are aware that a department with relatively few faculty members always has the opportunity to add additional courses of a particular disciplinary focus should the means be available to do so. We were encouraged to note that suggestions made by alumni and current students for additional courses that the Biology department might offer aligned with those identified as missing from our course repertoire based on a survey of the curriculum offered by comparable institutions. Appendix 8 shows course comparisons between Westmont and six similar institutions based on enrollment, selectivity, and inclusion in US News & World Reports’ ranking in the Top 100 of Best Liberal Arts Colleges. Two findings stood out to us as we evaluated the course offerings from these institutions:

* Westmont Biology lacks Neuroscience and a Developmental Biology courses in the Cell/Molecular side of the program (both courses are offered in 67% of the institutions surveyed), and a Conservation Biology course in the Ecology/Evolutionary Biology side of the program (offered in 67% of the institutions surveyed). Revealingly, all three of these courses were suggested multiple times when alumni and current students were queried as to which courses they would like to see added to our curriculum. We also noticed from these comparisons that Westmont Biology lacks a plant-related course (botany or plant physiology) on either side of the program, whereas one or both of these organisms were offered at all (6/6) of the institutions surveyed. We do currently offer a Plant Classification course, as well as Field Botany at an off-campus program. None of our current faculty has the expertise to teach Botany or Plant Physiology, but this lack will be something we will keep in mind as the composition of the department changes in future years.
* All (6/6) institutions’ biology programs offer significantly more specialized upper-division courses that Westmont does not offer, compared to the inverse relationship (specialized courses that Westmont offers that other institutions do not). The reason for this is more than likely due to increased faculty numbers in these institutions’ biology departments, even when adjusted for student enrollment: there is an average of 1.5 more faculty in these six institutions than in Westmont’s Biology department, with numbers ranging from 0.5 to 5 more faculty members. Thus, our ability to offer more courses, as expected, will be tied to some degree to the number of faculty available to offer these courses.

1. **New faculty hire.** The data from #2 above are timely, as we will be conducting a faculty search to replace a retiring member from our cell/molecular side of the program. We will refer to these data as we consider what particular disciplinary foci could become part of our program with this new hire (and the general field of cellular and molecular biology is a rather expansive one). Previous to collecting these sources of information used for this report, we had informally discussed the possibility of a neurobiologist joining our group. The findings presented here suggest we were sensible in this line of thinking, and also provide further context to fine-tune whom we might consider. For example, the data also indicate that we are lacking a developmental biology course; thus, a person in the area of developmental neuroscience might be particularly attractive. In addition, we know that both sides of the department lack a plant class. Therefore a plant developmental biologist or even a plant molecular biologist would be a good addition. So, as we have been able to identify the curricular shortcomings of our program, this exercise has been specifically beneficial in guiding our thinking toward our upcoming search for a new faculty member.

**D. Program sustainability**

*Enrollments*

* After a dramatic increase in enrollments during 80’s-90’s, biology grads have leveled out since 2000 (Appendix 23). We are consistently the highest enrolled lab science major and one of the three or so largest college majors. We need to analyze data on the quality of incoming students and on performance on national tests (GRE’s, MCATs) during this period.
* Graduates in tracks through the major have changed very significantly (Appendix 23). From 2000-2009, the Eco/Evo track had over twice the graduates of Cell/Molecular; from 2010 – present Eco/Evo has had less than half the graduates of Cell/Mol (for a net change of more than four-fold, p < .001). We attribute this to (a) national fluctuations in students in a number of field stations and campus programs, (b) elimination, deterioration, or curricular attrition of field programs to which we sent students (e.g., CCSP and to some extent AuSable), and, importantly, (c) off-loading our ecology course to evening adjuncts, not offering several popular field courses regularly, and cutting a lab promoting field studies in Bio6. All items in “c” have recently been remediated. Items in (a) and (b) remain out of our control.

**E. Additional Analysis**

1. **Research capability and resources**

The department has enjoyed several successes and encouragements in the area of faculty research and scholarship in this last 6-year cycle. In addition to 2 edited volumes, 29 articles or book chapters, 45 academic presentation, 49 popular talks, and 7 conference poster presentations, 2 faculty published peer-reviewed articles with students co-authors and research students gave more than 35 posters or oral presentations at campus symposia and regional and national professional conferences. We have more Bio-198/199 research students now than we did in our last 6-year cycle (average of 10/year from 2003-2009 vs. an average of 13/year from 2010-2015). With the re-approval of a previously approved FTE after our last cycle, we were able to hire a new faculty member with a robust research program who already has had success working with research students and securing external funds. We have had several large equipment acquisitions from external funding and internal start-up funds (e.g. flow cytometer, LiCor imager, pick-up truck for summer field work, field ultra-sound imager) and have several dedicated research spaces added (Hubbarb hall) or remodeled (Whittier Tissue Culture Room using CIP funding). Last year, the Whittier Biology Prep-room remodel, funded by CIP funds, indirectly supported faculty research by providing needed infrastructure for storage, dish washing, solution making, etc. Two large teaching labs were remodeled this year using funds from a foundation grant. While these labs primarily are used for teaching during the academic year, they still provide extra square-footage for summer research as well as space for computers and informal meetings between faculty and research students during the semesters. We are grateful for each of these projects and expansions.

Nevertheless, the faculty is feeling strained on multiple fronts related to research. They are outlined below:

* Dedicated Research Space, particularly for new hires:

A significant challenge for our program is adequate space to conduct research. This is especially significant because a distinctive we strive for is hands-on mentoring of students in research.

* The majority of our cell / molecular research occurs in what used to be an upper division teaching lab. The current space is not adequate for multiple faculty plus students doing research. And using it for research has also meant that our other labs experience heavier loads due to the classes displaced there.
* We have no large lab areas dedicated to research, or even available for research during normal work hours during the week. This means that human subjects research – something our students are very interested in – is almost impossible to do in the department. We also have no computer lab.
* The above represent present constraints, but we are particularly concerned about imminent challenges as present faculty (who have been less active in research and/or have done non-bench science) retire. Recruiting and sustaining new, research active faculty will require adequate facilities.

Specifically, the retirement of Frank Percival means that we will be hiring a new faculty in the next academic year. While Frank has had a modest research program, the expectation is that the new hire will have a more robust program with greater publishing requirements. While some faculty candidates may not require much research space, we currently only have part of a lab-bench to offer the incoming hire, enough space for 2 people to work. We also don’t have any additional space for significant equipment, although conceivably we could put some in one of the teaching labs, although it may prove challenging to work around the course lab sections. Furthermore, the lab bench is in one of the 2 spaces not renovated on the first floor of Whittier Science, and therefore the space is rather worn and tired. We view this is a significant challenge in recruiting a strong candidate.

* Lack of an IACUC (institutional Animal Care and Use Committee):

Currently, we have 3 faculty members in the Biology department using animals in research. The lack of a proper IACUC has been a significant challenge. Currently our IRB has served the role of an IACUC but it fails to meet the minimal requirements of an IACUC as set by the federal government. Furthermore, the members of the IRB as a whole do not have any training in animal research and therefore feel very uncomfortable in reviewing the animal proposals. In recent years, they have sent proposals over to the UCSB IACUC for advice but currently they are now refusing to review these proposals for liability reasons. IACUC approval is required for publication and grant funding and therefore the lack of an IACUC is significant. Since the Psychology department also uses animals and the new hire, Ron See, will need a functional IACUC as well, we seek the assistance of the institution to help us establish one and get members the proper training. A veterinarian with laboratory animal experience is a required member of an IACUC so there will be some consulting fees necessary.

* Funds to support research

Advances in technology have revolutionized how biological research is done. What is now “standard” in the field depends more and more on expensive equipment and reagents. Staying “relevant” in the field means using these technologies. Exposing our students to the new “norms” of research is imperative. It has been challenging for the Biology Department to keep up with this ever-changing landscape.

For the last 3 hires (McQuade, Julio, and Sparkman), significant start-up funds were given and proved essential in establishing viable and active research programs. While the start-up funds were initially said to only last 3 years, each received extensions to use the funds into their 4th or 5th year. While the funds allow the necessary equipment acquisition, there is significant “consumables” (chemicals, solutions, flasks, kits, plates, etc.) needed each year. While faculty members establish research programs that use these consumables standard in their disciplines, the funding is very challenging after the start-up funds are gone.

Research in the Biology department is currently funded by several avenues. The Provost provides professional development grants that faculty members have gotten to fund research. For example, Frank Percival received a grant to use next-generation sequencing technology to analyze microbial environments. Whether he has enough data from the 1 “run” he can afford with these funds remains to be seen (we covered a pilot run the previous year using a mixture of departmental funds and Frank’s own money). Yet, these grants have been a tremendous resource for the department and we are appreciative of the opportunity to apply for them.

The Biology’s annual unrestricted budget also significantly funds research. The department’s budget is currently $126,540, and $40,400 is expected to be covered by student lab fees. If our student lab fees exceed the budgeted lab fee revenue, then the excess remains in our unrestricted budget. In the last 6 years, this excess has averaged approximately $12,040. This excess funds the majority of our summer research program (student stipend, summer housing not covered by the Provost office, and $1000 for research for each faculty that is supervising a student which the faculty waive if they have start-up funds, $500 for each faculty not supervising a student). In some years, the excess also contributes to the $500 given to each faculty to fund research during the academic year (primarily the research done by Bio-198/199 students). A recent proposal by the Kinesiology department to use all the lab fees brought in by Anatomy (KNS/BIO-011) to fund the annual costs of a new Gross Anatomy course will draw approximately $6000 out of our budget, cutting down our summer research capability. While we certainly feel that this is a fair arrangement, and are even enthusiastic for Kinesiology to attain a grant to add a Gross Anatomy course, a course that will be a benefit to our majors as well as theirs, we hope the Provost Office will help the Biology department deal with the ramifications of such an ambitious addition.

Finally, as the amount of internal funds available for research is greatly limited (Provost professional Development, $1000-1500/year from the department unrestricted funds), its becoming increasingly clear that research productivity and indeed, the level of research we hope and expect from faculty, especially the faculty hired in the last 10 years, requires external grant funding. Only 2 faculty members in our department have successfully brought in external grants in the last 6 years. Jeff Schloss and co-investigators from other institutions got a $1.2M grant from the Templeton Foundation for research related to oxytocin and religious expression while Amanda Sparkman received a grant for $3500 from the Southern California Research and Learning Centre (SCRLC) to support her reptile evolution research in Channel Islands National Park. The department hopes to apply for more external grants and we appreciate the continued support from the administration in making this goal a reality.

1. **Student Focus groups**
2. **Independent Research**

In preparation for our 6-year report, we conducted a Student Focus Group to help assess the quality of our independent student research experience. Each year, students will either complete 1 or 2 semesters registered for Bio-198/199 or will work full-time for 8-10 weeks in the summer for a modest stipend. They will complete, individually or as a team, a small project that contributes to the larger research program in a professors’ lab. In this 6-year cycle, we had an average of 13 students in Bio-198/199 each year (range: 8-18). The number of student summer researchers has varied from 1 to 4, depending on faculty members’ sabbaticals or leaves and availability of funds (either from Provost office or from extra funds left-over in department budget). This last spring semester, we invited 13 current or former student researchers to participate in a student focus group to assess their experience. Five students (3 Bio-198/199 students and 2 summer students) ended up accepting our invitation (despite multiple pleas). Professor of Mathematics and Vice Provost Patti Hunter moderated the discussion, and the Mathematics, Computer Science, and Physics Administrative Assistant, Silvia Rodarte, took minutes (found in Appendix 20A) and recorded the conversation. All students described their experience in doing research in the Biology department as either positive or very positive (average rate of 8.5 on a 10 point scale; range: 8-9). They noted the fellowship among the department and that they felt “well-supported” and when they asked for help “there was always someone to guide you or give their opinion in a very supporting way”. When asked what have been the most important experiences or valuable lessons you have had/learned through independent research, several responses focused on aspects of learning to take risks, asking for help, and feeling permission to fail. Developing discrete skills such as problem solving, time management and critical thinking, were also mentioned as well as relational benefits (e.g. “having a great connection with mentor”). Other students talked about how research helped to “boost their confidence” and helped them learn to trust themselves and make their own decisions. The moderator felt that it was difficult to get the students to talk about anything negative about their experiences or to suggest improvements. One student suggested there should be more lectures or reading on a project before starting the research. Another student, who described herself as generally shy, said that she got very nervous presenting her project and that one way the faculty member could help is by helping her run through the presentation one-on-one and by giving her more feedback. Two students felt like their supervisor could have been more hands-on and one student felt their project could have been more ambitious. Overall, the department was very encouraged by the results and no systematic improvements seemed necessary. Instead the focus group results helped to remind us that students vary in their needs on an independent project and that faculty members need to vary their supervision strategy accordingly (more supervision, more reading, etc.).

1. **Faith-Learning throughout the curriculum**

The purpose of the "faith-learning focus group" was not to measure progress toward the departmental PLO of being " able to identify and describe a wide range of controversies, positions, and approaches to the inter-disciplinary and theological implications of biological theory," but to understand *students' own sense* of how they have experienced and progressed toward this goal. Nine students from our capstone Biology & Faith course met for 90 minutes to discuss questions (appendix 20) with a non-departmental faculty colleague, Carmel Saad from Psychology. Their responses were recorded and then anonymously transcribed. The following themes were clearly evident from the interviewer's comments and from the transcript of student discussion:

* There was complete unanimity that the range of topics treated across the major was both appropriate and interesting. Of particular interest to the majority of students were various aspects of evolution, genetic determinism, racial and sexual identity, stewardship & poverty, and biomedical ethics (particularly stem cells).
* Complete unanimity on appropriate balance between disciplinary instruction and examination of interdisciplinary issues, and shared sense that these issues were treated in increasing depth across the curriculum from lower to upper division. Most instructors and many classes were mentioned.
* Complete (and somewhat surprising) unanimity that - in spite of differences in background and temperament - students found the balance between commitment to a Christian worldview and openness to new or challenging perspectives to be appropriate and helpful ("gentle but thorough," "serious but not pushy," etc.). Most expressed having had to wrestle with the "uncomfortable," and believed they were the better for it.
* The pedagogical approach virtually all students believed they benefited most from, was lecture/reading followed by discussion. Discussion was particularly important for developing their own and encountering different views. Students appreciated increasing opportunities for discussion in upper division courses, though felt the formal debates and lecture in lower division were important preparations.
* All students believed they were leaving Westmont with a more sophisticated - though not necessarily more "settled" - understanding of faith and learning. In concluding written responses there was unanimous ranking of 5 (on a 5 point scale) to their sense of progress in "developing a clearer understanding of personal values" and "learning to analyze and critically evaluate ideas & points of view" in the faith - learning area.

1. **Facilities**

In spite of modest facilities relative to programmatic needs and comparable institutions, Westmont has attracted good students and cultivated collegiality between programs. Still, it is important to assess facilities relative to other colleges, other departments at Westmont, and needs within the Department.

* Compared to other schools in the CCCU, Westmont’s Biology program is in the very basement with respect to both space and modernity of facilities. We rank last by a considerable margin in space / student: most CCCU schools have twice the space, the better ones have 3-4 times. This was true of assessments done recently, one, and two decades ago [see attachments]. Relative to the two second most poorly resourced schools with whom we used to be somewhat comparable – Point Loma and Gordon College – we are now in a league of our own since they have both moved into large, new facilities. Even Biola and APU have surpassed us. By metrics and comments of visitors to campus: biology at Westmont College has the worst facilities of all Christian colleges with which we consider ourselves comparable in other ways.
* Compared to other laboratory sciences at Westmont, we rank last in terms of both space and faculty per major.
* Regardless of other colleges or programs, relative to fundamental programmatic needs, we have not attained the laboratory facilities envisioned in the building of Whittier Science 30 years ago with a much smaller major, or those outlined as crucial in response to Provost’s planning 20 years ago. Specifically, we lack (a) adequate research space for faculty and students, (b) important dedicated lab teaching space, and (c) permanent office space for faculty (and office space that is not adjacent to rodent facilities), (d) a greenhouse (we are the only college of the 15 comparables we’ve surveyed, and may be the only 4 year college in the U.S. with a Biology major that does not have a greenhouse or some sort of plant growth facility). Our utilization of lab space during the week for teaching labs – and in one lab for several lecture classes as well – is well beyond national maxima. For research, faculty & students doing bench science are highly space limited. Human subjects research – even though externally funded - has had to be abandoned.

Adequacy of facilities has serious implications for recruitment of students and new, research active faculty, and maintenance of teaching & research distinctives of the department.

1. **Internships**

An alumni survey (recent graduates in biology from the past six years) was conducted in late spring, 2015; out of a total pool of some 227 alumni, nearly 45% (103) alumni responded. Of the 103 alumni respondents, approximately 60 individuals (58%, roughly a quarter of all alumni contacted) responded to the question: “**What improvements would you suggest for the biology program?**”

In addition to two primary suggestion topics (discussed elsewhere), a small percentage of alumni respondents (approximately 5% of the 60 alumni who responded to the above question) specifically mentioned **Internship Experiences**. Respondents were clear in stating that they found their own internship/practica experiences rewarding, helpful, and positive. Generally, their suggestions to the Biology Department were to provide more internship opportunities, as well as the opportunity for students to go into those internships earlier in their undergraduate career. We can agree with and support the suggestions; however, implementation is not so easily achieved.

In this last 6–year cycle, we averaged 21.5 students completing units in our Bio-190/190SS: Practicum courses (range: 14-29). Since we graduated, on average, 31.8 students each year in that same period, we can roughly estimate that approximately two-thirds of our majors are completing a biology practicum. While we have not formally surveyed current Westmont students who have or are enrolled in Biology Practica, each semester, for at least the last three years, the Biology Practicum Instructor/Supervisor has met with most of the biology practicum students (roughly 50-60 different students over a 3-year period) and consistently asked them certain “key” questions. Responses to those informal classroom discussions are: 1) appreciation of the experience, whether positive, or not what they expected, 2) varying levels of frustration with sites in Santa Barbara, 3) feeling that they should be able to do “more” specific, technical things (true for clinical sites), but for those working at environmental sites, having wide and varying experiences, from tedious data-crunching to getting out and getting dirty, working with all manner of organisms from plants to marine mammals, really getting a “taste” of field work.

Circumstances limit our abilities to expand the “internship” component of the major because: 1) Santa Barbara is a small city; the number of potential sites, willing to take on students seeking credit for volunteer hours, and willing to sign the College’s ILAF (Internship Learning Agreement Form) is small, and diminishing, 2) there is tremendous competition for limited sites, not only from other Westmont students (due to the service learning requirement for all students) but also from several other educational institutions in town (UCSB, City College and high schools); sites themselves are only allowed a limited number of volunteers, 3) the semester schedule at Westmont is a bit “out-of-sync” with hiring/training schedules of several of the regular sites where students find work opportunities (by the time they are able to get their interview, run the gauntlet of the background checks, training sessions, etc., half the semester may already be over) and 4) we limit these credit-earning opportunities to our junior and senior majors, only. Starting too early in their undergraduate career means they have neither the “book knowledge” nor the technical skill that may be required at the practicum site. Even with this, clinical site opportunities are very limited with regards to what our majors will be allowed to do, due to issues of patient privacy.

Students want to do volunteer hours, but most want credit (thus, must find one of the limited number of sites in town willing to sign the ILAF during the regular academic year), and do not want to be overly inconvenienced in the doing of those volunteer hours (do not want to travel a half hour north or south of Santa Barbara). On the other hand, there are those students who go out on their own, get “hired” to do volunteer hours, and seek no academic credit for it. Many have found that if they “stick it out” long enough, they eventually are given more responsibility and get to “do” the things they were hoping that they would get to do, benefitting from a very valuable experience (but these students must enroll in some course offered at Westmont to fulfill requirements for units to graduate).

*Closing the* Loop: Biology Faculty: 1) need to be intentional in sharing information regarding volunteer experiences, encouraging students to do practica/volunteer internships, counseling that getting credit may not be possible or necessarily the first/best goal to have with regards to the experience. Faculty need to encourage students to see volunteer hours as a life experience that will always be with them, long after graduation; that those experiences may be the “edge” that a student needs when making application for a course of graduate/medical study or in seeking a biology-related job. Based on the comments from alumni who specifically addressed this aspect of the Westmont biology program, this is affirmed, and 2) biology faculty (each in our areas of expertise) need to inquire of, and find other potential sites in Santa Barbara that, as of yet, have not been tapped into (if indeed they exist), sharing that information with our students. Above all, faculty need to stress the long-term benefits of “experience,” whether done for credit or not; that these experiences are more about a “love of learning” than just something to put on the resume or earn a unit of credit for.

1. **Interaction with Other Departments**

The Biology department enjoys a collegial, even collaborative, relationship with departments that share a similar pedagogical focus as ours. For example, the Chemistry and Biology departments share significant course overlap for various tracks within each major, so students are accustomed to (and very much appreciate) the ease with which they are able to fulfill the requirements for each major; indeed, many of these students choose to double-major in both biology and chemistry. Additionally, the research focus of several biology and chemistry faculty is such that equipment between the two departments is shared quite often, and allows students to understand that the two disciplines have related scientific questions that are answered by taking advantage of resources that are accessible in related research environments. The fact that Biology and Chemistry share a building certainly contributes both practically and collegially to this collaborative spirit.

Despite these benefits of working in closely aligned areas, disciplinary overlap can also present challenges. One area where this is becoming increasingly apparent is in the recent changes of the Kinesiology department. As their number of majors has increased significantly, along with their decision to move toward a more biology-centered focus with the Bio course requirements of modified tracks through their major and with recent faculty hires (who are expected to develop a research program in biology related area), the question has arisen as to how both departments can accomplish their pedagogical and research goals while maintaining a unique identity. One issue is resources: lab space (increasingly needed by growing sections of Kinesiology), lab coordinator time, allocation of research resources. The other issue is an influx of students into our majors courses, many of whom do not share the professional goals or intellectual questions of the traditional science majors for whom these courses have been developed and need to serve. Of course, this tension has been felt by other science departments who have then responded by offering service classes to other science majors (e.g. Physics department and their Physics for the Life Sciences course). What will be required is ongoing conversation between the two groups, including administrative input, with the goal that the appropriate boundaries are established so that each department can serve its majors appropriately. These conversations have begun informally, and have helped to frame these issues, but more focused and direct conversations will be required as we work towards long-term solutions.

**III. Looking forward: Changes and Questions**

After reflecting on these data and our own experiences with our students and as professionals in our fields, there are direct changes we propose to improve our program. Nevertheless, there are obstacles that we need help in overcoming and seek the support of the administration. Finally, while some things were not the focus of this round of program review, enough data exist to suggest more examination and evaluation is needed. These we suggest may be some of our “Key Questions” for our next 6-year cycle.

*Proposed Changes:*

1.) **Improve career and professional guidance for students.** While we did not survey our current students on this topic, it was clear that many alumni identified this as a weakness of the program. As faculty, we recognize that we need to improve the discipline-specific resources we offer our students and that we, personally, need some professional development in networking and learning about the latest trends in biological sciences careers. We all chose the academic route for a biology career but need exposure to the wider breadth of what is possible. We also want to expand our collaboration with the Career Development and Calling office and offer at least 1 program each year on career development. Last year we hosted an evening event with the CD & C office to great success.

2.) **Increase our coverage of plant biology in our current classes.** We have administered the MFT in Biology twice over the last decade (once in this 6 year cycle and once in our last 6 year cycle) and our students were weakest in plant biology both times. The paucity of plant biology in our curriculum has long been recognized and we have made staffing decisions knowing it would result in more of a specialization in animal biology in our Eco/Evo/NH track. Nevertheless, we felt that we could all increase our coverage of plants in our classes. We decided we could eliminate some material in Bio-005 that overlaps with Bio-114 in order to expand the coverage of plants. We also decided that we could incorporate more plant biology coverage in several upper division classes. For example, we could incorporate more plant-specific cell biology in Bio-130, a class that currently focuses on cellular biology of multi-cellular animals.

3.) **Expand curriculum in key areas.** Curricular comparisons with similar institutions made it clear that many institutions offer more specialized classes than we do. While we have a smaller Biology department faculty than the comparable institutions we surveyed (Appendix 8), the majority of institutions (4 of the 6) offered 5 courses that we do not: Botany, Neurobiology, Developmental Biology, Invertebrate Biology, and Conservation Biology. However, we also recognize that we have to find solutions that are teaching load neutral since we are not requesting an additional FTE. In the next few years, we propose adding an Invertebrate Zoology course. This would be taught by Beth Horvath, an invertebrate biologist herself, and would alternate with the Marine Biology course in the spring semester. We also hope to hire a new faculty member this year to replace Frank Percival who is retiring. We have proposed 4 units of teaching load from the Biochemistry lecture to move to the Chemistry department. This would allow the new hire to teach a 4-unit lecture in their specialization. We have proposed looking for a candidate with strength in neurobiology and/or developmental biology.

4.) **Seek more external grant funding.**  It is clear that many of us simply cannot support the kind of rigorous research program we desire with the internal funds available to us. Therefore, we hope to apply for more external grants over the next 6 years. We look forward to working collaboratively with Dan Thomas from the Foundations and Corporate Relations Office in pursuing opportunities and writing grants. We also recognize that he lacks expertise in scientific grant writing and that we need to also proactively seek these avenues ourselves. More grant funding could also fund more student research opportunities instead of only relying on annual surplus in the departmental annual budget.

*Challenges for which we seek administrative guidance and support:*

1.) **More research-dedicated laboratory space**. We are concerned about the lack of research space and its effect on our ability to hire competitive candidates. While Frank Percival will be vacating a half of a lab bench he used for his research program in Whittier Science, the new hire will likely have a greater expectation in research productivity and therefore will require more space. Furthermore, both Jeff Schloss and Beth Horvath also lack significant research space and both of them will likely be retiring in the next decade. Either we need to find more space or we will simply have to limit our search to faculty whose research requires little to no space (e.g. in bioinformatics, or able to do all their research in the field with no laboratory component).

2.) **Establishing an Institutional Animal Care and Use Committee (IACUC).** An IACUC is needed to acquire funding from all governmental and most private agencies, to carry out research on any public land, and to publish any scientific paper that uses animals. We are hiring more and more science faculty with research expectations who use animals. We simply need a functional IACUC.

3.) **Negotiating curricular, missional, and resource allocation overlap with the Kinesiology Department.** The Kinesiology Department is currently experiencing a rapid growth in their major along with increasing pressure from national trends to become more scientifically rigorous. Our sense is that many kinesiology departments are morphing into Human Biology departments. Their new track in Movement and the Medical Sciences includes 5 required courses (20 units) from our Biology curriculum and for the last few years some Biology majors have not been able to get into some of our upper-division courses because of the enrollment of Kinesiology majors. Furthermore, the lab fees from cross-listed Bio/KNS courses are currently helping to fund Biology’s summer research program but it may need to start funding a Gross Anatomy course in the near future. Plus, many of their newest hires may be coming out of more Biology-focused programs and therefore we fear that the missional distinctives that delineate our programs may start to erode. We simply request that the Provost Office helps each of our departments navigate this changing landscape.

*Possible Key Questions for next cycle*

**1.) Internships: expansion of opportunities and improvement of experience?** While more and more Biology majors want to complete a Biology Practicum, placing all the students is becoming a greater challenge with each passing year. Beth Horvath, the Biology Practicum supervisor, has summarized these challenges nicely in the Internships section of this document but it is clear that it warrants a wider department conversation and that more data needs to be collected.

2.) **Sufficiency of the current off-campus program offerings for our majors?** Half of our majors said that they wanted more Biology-focused off-campus program opportunities. Also, quality of some of our current programs (such as CCSP) has been inconsistent and their rigor has dropped in order to recruit more non-Biology majors. We need to collect more data on quality as well as investigate more opportunities that might be appropriate for our majors. We particularly lack options for our Cell and Molecular track students and our students who also identify as pre-med.

Overall, we have been grateful for this season of “taking stock”. We feel encouraged by the high level of satisfaction of our alumni and current students but are also enthusiastic about our plans to move forward and improve in necessary and tangible ways. We look forward to discussing our results and reflections with the Provost’s office, the Program review Committee, and our external reviewer, and remain open to further suggestions and recommendations.

**Appendices**

1. **Program mission, vision, goals and program learning outcomes for the current six-year cycle or the link to the documents posted on the departmental website**

http://www.westmont.edu/\_academics/departments/biology/program-review.html

1. **Summary of assessment results for every PLO**
2. **PLO#1: Core Knowledge**

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| --- | --- | --- | --- | --- |
| **2014 MAJOR FIELD TEST RESULTS - COMPARISONS TO THE ENTIRE MFT DATA SET** | | | |  |
| (Percentile rankings from comparison to data for Sept 2010 - July 2014) | | | |  |
|  |  |  |  |  |
| **INDIVIDUAL STUDENT SCORES** | **Westmont Means** | **Reference School Means** | **%ILE INDIVIDUAL MEANS** | **Z TEST P** |
| **TOTAL TEST SCALED SCORE** | 157 | 153.2 | 58 | 0.106 |
| **CELL BIOLOGY** | 58 | 53.2 | 63 | 0.04 |
| **MOLEC BIO AND GENETICS** | 56 | 53 | 59 | 0.188 |
| **ORGANISMAL BIOLOGY** | 56 | 53.2 | 55 | 0.248 |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | 52.7 | 56 | 0.07 |
|  |  |  |  |  |
| **INSTITUTIONAL MEANS** | **Westmont Means** | **Reference School Means** | **%ILE INSTITUTIONAL MEANS** |  |
| **TOTAL TEST SCALED SCORE** | 157 | 152 | 69 |  |
| **CELL BIOLOGY** | 58 | 52.4 | 77 |  |
| **MOLEC BIO AND GENETICS** | 56 | 52.1 | 70 |  |
| **ORGANISMAL BIOLOGY** | 56 | 52.2 | 64 |  |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | 51.6 | 75 |  |
|  |  |  |  |  |
| **ASSESSMENT INDICATOR TITLE** | **Westmont Mean Percent Correct** | **Mean Percent Correct for Reference Schools** | **%ile Institutional Means Compared to Reference Schools** |  |
| Biochemistry and Cell Energetics | 54 | 46.6 | 80 |  |
| Cellular Structure, Organization, Function | 56 | 50.4 | 70 |  |
| Molecular Biology and Molecular Genetics | 52 | 47.1 | 70 |  |
| Diversity of Organisms | 45 | 42.3 | 58 |  |
| Organismal - Animals | 50 | 41.2 | 88 |  |
| Organismal - Plants | 30 | 32.7 | 32 |  |
| Population Genetics and Evolution | 58 | 50.6 | 78 |  |
| Ecology | 55 | 51.2 | 63 |  |
| Analytical Skills | 52 | 46.8 | 69 |  |
|  |  |  |  |  |
| WESTMONT 75th %ile SAT |  | 1310 |  |  |
| MEAN 75th %ile SAT FOR REFERENCE SCHOOLS | | 1157 |  |  |
| WESTMONT SAT %ILE IN REFERENCE GROUP | | 90 |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2014 MAJOR FIELD TEST RESULTS - COMPARISON TO USNWR** | | | | | |  | |  | |
| **"NATIONAL LIBERAL ARTS COLLEGES" TAKING THE MFT** | | | |  | |  | |  | |
| (Percentile rankings from comparison to data for Sept 2010 - Apr 2014) | | | | | |  | |  | |
|  |  | |  | | |  | |  | |
| **INDIVIDUAL STUDENT SCALED SCORES** | **Westmont Means** | | **Reference School Means** | | | **%ILE INDIVIDUAL MEANS** | | **Z TEST P** | |
| **Total Test Scaled Score** | 157 | | 158.3 | | | 43 | | 0.668 | |
| **CELL BIOLOGY** | 58 | | 57.3 | | | 51 | | 0.814 | |
| **MOLEC BIO AND GENETICS** | 56 | | 57.2 | | | 45 | | 0.472 | |
| **ORGANISMAL BIOLOGY** | 56 | | 57.6 | | | 42 | | 0.513 | |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | | 57.6 | | | 42 | | 0.742 | |
|  |  | |  | | |  | |  | |
| **INSTITUTIONAL SCALED SCORE MEANS** | **Westmont Means** | | **Reference School Means** | | | **%ILE INSTITUTIONAL MEANS** | |  | |
| **Total Test Scaled Score** | 157 | | 157.5 | | | 40 | |  | |
| **CELL BIOLOGY** | 58 | | 56.8 | | | 53 | |  | |
| **MOLEC BIO AND GENETICS** | 56 | | 56.4 | | | 43 | |  | |
| **ORGANISMAL BIOLOGY** | 56 | | 57 | | | 33 | |  | |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | | 56.7 | | | 44 | |  | |
|  |  | |  | | |  | |  | |
| **ASSESSMENT INDICATOR TITLE** | **Westmont Mean Percent Correct** | | **Mean Percent Correct for Reference Schools** | | | **%ile Institutional Means Compared to Reference Schools** | |  | |
| Biochemistry and Cell Energetics | 54 | | 51.8 | | | 60 | |  | |
| Cellular Structure, Organization, Function | 56 | | 55.9 | | | 44 | |  | |
| Molecular Biology and Molecular Genetics | 52 | | 52.8 | | | 41 | |  | |
| Diversity of Organisms | 45 | | 47.7 | | | 27 | |  | |
| Organismal - Animals | 50 | | 45.6 | | | 80 | |  | |
| Organismal - Plants | 30 | | 36.3 | | | 18 | |  | |
| Population Genetics and Evolution | 58 | | 56.2 | | | 55 | |  | |
| Ecology | 55 | | 57.1 | | | 29 | |  | |
| Analytical Skills | 52 | | 53.1 | | | 40 | |  | |
|  |  | |  | | |  | |  | |
| WESTMONT 75th %ile SAT |  | | 1310 | | |  | |  | |
| MEAN 75th %ile SAT FOR REFERENCE SCHOOLS | | | 1268 | | |  | |  | |
| WESTMONT SAT %ILE IN REFERENCE GROUP | | | 64 | | |  | |  | |
| **2014 MAJOR FIELD TEST RESULTS - COMPARISON TO USNWR** | | | | | | |  |  |
| **"NATIONAL LIBERAL ARTS COLLEGES" TAKING THE MFT BUT NOT GRADING INDIVIDUAL STUDENTS** | | | | | | | |  |
| (Percentile rankings from comparison to data for Sept 2010 - July 2014) | | | | |  | | |  |
|  |  |  | | |  | | |  |
| **INDIVIDUAL STUDENT SCALED SCORES** | **Westmont Means** | **Reference School Means (N=1986)** | | | **%ILE INDIVIDUAL MEANS** | | | **Z TEST P** |
| **Total Test Scaled Score** | 157 | 156.8 | | | 48 | | | 0.929 |
| **CELL BIOLOGY** | 58 | 56.6 | | | 53 | | | 0.53 |
| **MOLEC BIO AND GENETICS** | 56 | 57 | | | 49 | | | 0.964 |
| **ORGANISMAL BIOLOGY** | 56 | 56 | | | 47 | | | >0.999 |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | 56 | | | 48 | | | 0.646 |
|  |  |  | | |  | | |  |
| **INSTITUTIONAL SCALED SCORE MEANS** | **Westmont Means** | **Reference School Means** | | | **%ILE INSTITUTIONAL MEANS** | | |  |
| **Total Test Scaled Score** | 157 | 157.5 | | | 41 | | |  |
| **CELL BIOLOGY** | 58 | 56.3 | | | 62 | | |  |
| **MOLEC BIO AND GENETICS** | 56 | 56.1 | | | 50 | | |  |
| **ORGANISMAL BIOLOGY** | 56 | 56.5 | | | 41 | | |  |
| **POP BIOL, EVOLUTION, ECOLOGY** | 57 | 56.6 | | | 45 | | |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| **ASSESSMENT INDICATOR TITLE** | **Westmont Mean Percent Correct** | **Mean Percent Correct for Reference Schools** | **%ile Institutional Means Compared to Reference Schools** |  |
| Biochemistry and Cell Energetics | 54 | 51.2 | 66 |  |
| Cellular Structure, Organization, Function | 56 | 55.5 | 50 |  |
| Molecular Biology and Molecular Genetics | 52 | 52.4 | 45 |  |
| Diversity of Organisms | 45 | 46.4 | 41 |  |
| Organismal - Animals | 50 | 45.5 | 79 |  |
| Organismal - Plants | 30 | 35.9 | 16 |  |
| Population Genetics and Evolution | 58 | 55.9 | 54 |  |
| Ecology | 55 | 57.1 | 29 |  |
| Analytical Skills | 52 | 52.7 | 50 |  |
|  |  |  |  |  |
| WESTMONT 75th %ile SAT |  | 1310 |  |  |
| MEAN 75th %ile SAT FOR REFERENCE SCHOOLS | | 1286 |  |  |
| WESTMONT SAT %ILE IN REFERENCE GROUP | | 54 |  |  |

**2014 MAJOR FIELD TEST RESULTS – COMPARISONS BETWEEN BIOLOGY MAJOR TRACKS**

(Percentile rankings from comparison to data for Sept 2010 – July 2014)

**BS: Cell/Molecular (n=6) BS: Environ/Nat’l Hist (n=4) BS: General (n=10) BA (n=11)**

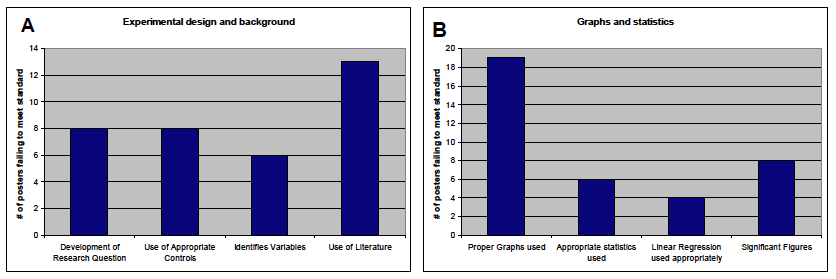
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Mean Score** | **%ile in Main Reference Group *a, b*** | **%ile in Entire Database** | **Mean Score** | **%ile in Main Reference Group** | **%ile in Entire Database** | **Mean Score** | **%ile in Main Reference Group** | **%ile in Entire Database** | **Mean Score** | **%ile in Main Reference Group** | **%ile in Entire Database** |
| **Total Test Scaled Score** | 164 | 68 | 77 | 152 | 35 | 44 | 159 | 54 | 64 | 154 | 40 | 50 |
| **Cell Biology** | 63 | 68 | 76 | 49 | 24 | 32 | 61 | 61 | 70 | 55 | 45 | 56 |
| **Molecular Biology and Genetics** | 68 | 83 | 87 | 51 | 35 | 44 | 56 | 49 | 59 | 51 | 35 | 44 |
| **Organismal Biology** | 64 | 70 | 76 | 49 | 29 | 36 | 58 | 53 | 61 | 52 | 34 | 42 |
| **Population Biology, Evolution, Ecology** | 54 | 41 | 49 | 58 | 55 | 62 | 58 | 55 | 62 | 57 | 48 | 56 |

a. “Main Reference Group” = US News and World Report “National Liberal Arts Colleges” that do not grade students individually using the Major Field Test

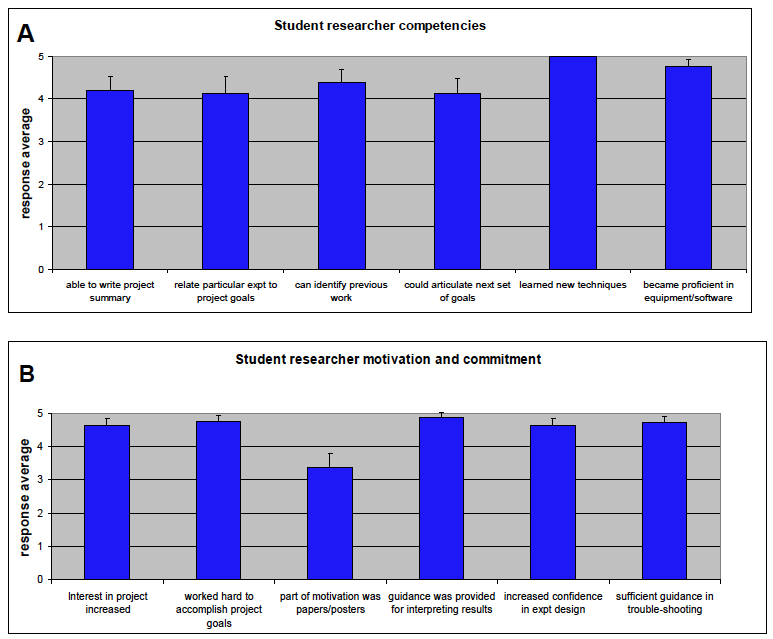
b. Percentile rankings are for individual student scores rather than institutional means

1. **PLO#2: Experimental Investigation**

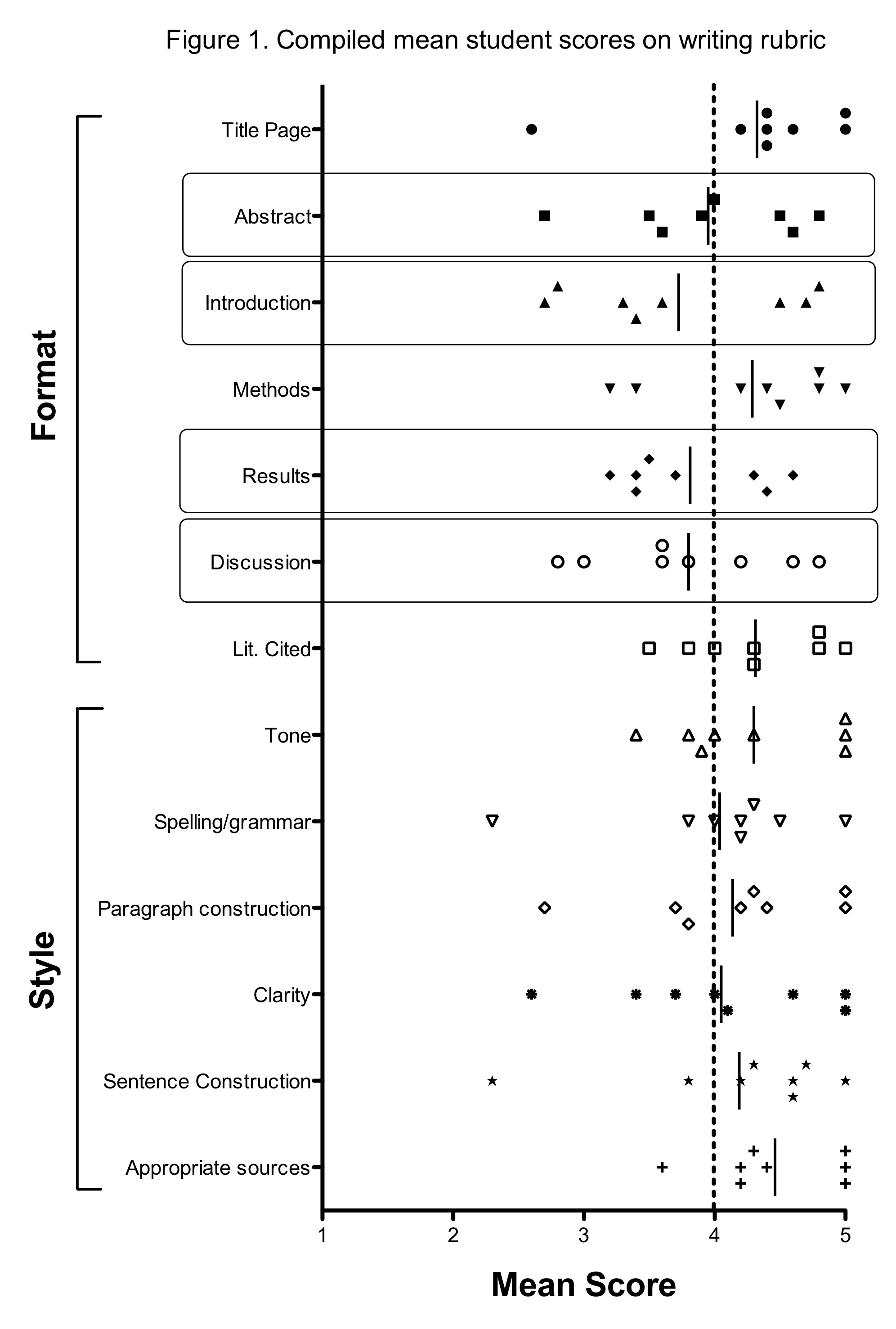
**Bio-005 Poster evaluation**



**Results of Research Student Survey**



1. **PLO#3: Scientific Communication**



1. **PLO#4: Biology/Faith Integration**

**Creation/Evolution Survey and Results**

**Data from Bioethics Assessment**

Data from Assessment method #1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Student** | **Reviewer #1 score** | **Reviewer #2 score** | **AVG** | **Reached benchmark?** |
| 1 | 4 | 3 | 3.5 | Y |
| 2 | 3 | 2 | 2.5 | N |
| 3 | 6 | 4 | 5 | Y |
| 4 | 4.5 | 6 | 5.25 | Y |
| 5 | 5.5 | 4 | 4.75 | Y |
| 6 | 5.5 | 4 | 4.75 | Y |
| 7 | 5 | 3 | 4 | Y |
| 8 | **5.5** | **3** | **4.25** | Y |
| 9 | 2.5 | 3 | 2.75 | N |
| 10 | 5.5 | 5 | 5.25 | Y |
| 11 | 4.5 | 4 | 4.25 | Y |
|  |  |  |  | 9/11 (82%) Y 2/11 (18%) N |

Data from Assessment Method #2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Student** | **Reviewer #1 score** | **Reviewer #2 score** | **AVG** | **Reached benchmark?** |
| 1 | 2 | 1 | 1.5 | Y |
| 2 | 2 | 2 | 2 | Y |
| 3 | 2 | 2 | 2 | Y |
| 4 | 2 | 2 | 2 | Y |
| 5 | 1 | 1 | 1 | N |
| 6 | 2 | 1 | 1.5 | Y |
| 7 | 1 | 1.5 | 1.25 | N |
| 8 | 2 | 2 | 2 | Y |
| 9 | 1.5 | 1 | 1.25 | N |
| 10 | 2 | 1.5 | 1.75 | Y |
| 11 | 2 | 1 | 1.5 | Y |
| 12 | 1 | 1.5 | 1.25 | N |
|  |  |  |  | 8/12 (67%)Y 4/12 (33%)N |

Data from Assessment Method #3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student** | **Reviewer #1 score** | **Reviewer #2 score** | **Reviewer #3 score** | **AVE** | **Reached Benchmark?** |
| **1** | **1.5** | **1.5** | **1.5** | **1.5** | **Y** |
| 2 | 1.5 | 1.5 | 1 | 1.3 | Y |
| 3 | 2 | 2 | 2 | 2.0 | Y |
| 4 | 2 | 1.5 | 1 | 1.5 | Y |
| 5 | 0.5 | 0.5 | 0 | 0.3 | N |
| 6 | 0 | 0 | 1 | 0.3 | N |
| 7 | 2 | 2 | 1.5 | 1.8 | Y |
| 8 | 0 | 0 | 1 | 0.3 | N |
| 9 | 1 | 2 | 1.5 | 1.5 | Y |
| 10 | 1 | 1 | 1 | 1.0 | Y |
| 11 | 1.5 | 1.5 | 1 | 1.3 | Y |
|  |  |  |  |  | 8/11 (73%) Y 3/11(27%) N |

1. **Rubrics and assessment instruments for every PLO**
2. **PLO#1: Core Knowledge**

The Major Field test in Biology

1. **PLO#2: Experimental Investigation**

**Bio5 grading rubric for student research posters**

**1. (20) General writing style**

Spelling and standard grammar

Logical flow in writing

Writing with appropriate “scientific tone” – passive rather than active voice.

**2. (15) Correct use of the sections in scientific writing**

Abstract summarizes the whole article.

Introduction develops the question.

Methods describe the experimental procedures.

Results present the experimental results.

Discussion draws conclusions from and analyzes the experimental results.

**3. (5) Literature reference citations in department-approved format**

References listed in alphabetical order of first authors’ last names in a numbered list. In the body of the text, sources are cited by their number in parentheses. For example, “Infection of pear tissue by *Erwinia amylovora* leads to increased expression of 394 genes in the pathogen (3).”

Book format:

1. **Sambrook, J., E. F. Fritsch, and T. Maniatis.** 1989. Molecular Cloning: a laboratory manual, 2nd ed. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y.

Book chapter format:

2. **Giovannoni, S. J., and M. S. Rappe.** 2000. Evolution, diversity, and molecular ecology of marine prokaryotes, p. 47-84. *In* D. L. Kirchman (ed.), Microbial ecology of the oceans. Wiley-Liss, Inc., New York, N.Y.

Journal article format:

3. **Zhao, Y., S. E. Blumer, and G. W. Sundin.** 2005. Identification of *Erwinia amylovora* genes induced during infection of immature pear tissue. J. Bacteriol. **187**: 8088-8103.

Web site format:

4. **Dionne, M. S., and D. S. Schneider**. 2002. Screening the fruitfly immune system. Genome Biol. **3**: REVIEWS1010. http://genomebiology.com/2002/3/4 /reviews/1010.

Be ***VERY*** selective in your choice of web resources. Not everything on the Web deserves to be taken seriously.

**4. (60) Content**

**a. (15) Introduction**

The question is biologically meaningful.

Introduction starts out with the general area and ends by stating the specific question under study.

Literature sources for the information presented are clearly cited in the body of the text.

Literature sources are academic in nature. Although many web sites meet this standard, web sites must be used with caution because there are no controls over what gets posted on the web.

**b. (15) Methods**

Methods used in the experiment are described clearly enough that someone would be able to repeat the experiment.

Methods are described as what you did (past tense) rather than as a series of directions to someone who will perform them in the future.

**c. (15) Results**

Results are reliable, based on careful experimental technique.

Results are presented both in words and in figures or tables.

Choose whether a figure or a table will best present your results, but avoid redundancy by not using both.

Select the type of graph that is appropriate for the type of data you are analyzing.

Results of calculations are presented rather than the raw data – *e.g*., mean and standard deviation rather than a list of all the measurements recorded.

Results of statistical analyses are included as appropriate.

**d. (15) Discussion**

Discussion provides an analysis of the experimental results rather than a repetition of the results.

Discussion draws a conclusion from the experiment and identifies sources of uncertainty in the results.

Discussion compares the results to other published work, citing the sources

**Independent Research Student Survey**

**BIOLOGY RESEARCH FEEDBACK FORM**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ M F (circle one) Ethnicity \_\_\_\_\_\_\_\_\_\_\_\_

Graduation Year \_\_\_\_\_\_\_ Student Collaborators \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Faculty Supervisor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Course(s) (BIO198, Major Honors, Summer Research) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Units \_\_\_\_\_\_\_\_\_\_\_

How did you hear about research opportunities in the department (circle all that apply)?

a. informed by a faculty member

b. heard from another student

c. departmental email/announced in class

d. other (please explain):

1. Why did you decide to pursue a research experience in the department?

2. How much time per week on average did you work on your project (fill in all that apply)?

During summer:

During the academic year:

3. My interest in the project increased through the course of the project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

4. I worked hard to accomplish the goals of the project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

5. I feel that I would be able to write a one-paragraph summary of my project, including the experimental question(s), methodology used, and main findings.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

6. I always knew how a particular experiment I performed related to the goals of our project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

7. I can identify previous work that was foundational for our project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

8. I can explain the relevance of our project to someone unfamiliar in the field.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

9. If I were to continue working on this project for another semester or summer, I would be able to articulate the next set of experimental goals?

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

10. I was an active participant in determining the direction of the project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

11. I was given appropriate guidance in how to interpret my results.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

12. I feel more confident in my abilities to design experiments and interpret data as a result of working on this project.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

13. I was given sufficient guidance in using and trouble-shooting scientific equipment and performing experimental protocols.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

14. I learned new research tools and techniques.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

15. I became proficient in using the relevant research equipment and computer software

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

16. I was given instruction in laboratory and field safety procedures.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

17. Part of my motivation for research was to have papers or posters in which my project results were reported.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Comments:

1. **PLO#3: Scientific Communication**

**SCIENTIFIC WRITING RUBRIC 2012 Paper #: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Reviewer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**OUTCOME: Students write research reports in appropriate format and style for a scientific article.**

**1. FORMAT**

There is a **title page** with descriptive title and 1 2 3 4 5

a list of all authors and their affiliation.

The **abstract** is an effective summary of the 1 2 3 4 5

entire paper.

The **introduction** cites relevant background 1 2 3 4 5

literature appropriate for the intended audience.

It should progress from general to specific and

include the experimental purpose.

The **methods** section reports what was actually 1 2 3 4 5

done. It should be thorough enough to allow

someone to repeat the experiment. It should be

written in past tense.

The **results** section gives a written description 1 2 3 4 5

of the results, illustrated by tables and/or

figures. It does not just report raw data but

describes all the data to its completion.

The **discussion** section draws conclusions, 1 2 3 4 5

provides possible explanation for anomalous

data, and suggests improvements and future

directions. When appropriate it compares the

results to other published work.

A **literature cited** section includes all the sources 1 2 3 4 5

cited in the text and is formatted in the manner

described by the instructor.

**2. STYLE**

Student writes with correct scientific tone (e.g. 1 2 3 4 5

straightforward, concise, objective), using

passive voice.

There are no spelling or grammar mistakes. 1 2 3 4 5

Each paragraph has a clear topic sentence 1 2 3 4 5

that encompasses the whole content of the

paragraph. There is clear organization and

logical flow within and between paragraphs.

Students communicate clearly and in a manner 1 2 3 4 5

appropriate for the intended audience.

Sentences are constructed well (e.g. no run- 1 2 3 4 5

ons, incomplete sentences, or dangling

participles).

Student used appropriate scientific sources 1 2 3 4 5

that indicates their understanding of the

differences between popular and scholarly

literature.

**General Comments:**

**PLO#4: Biology/Faith Integration**

**End-of-semester questionnaire in Fall Bio-196 class (Assessment method #1)**

**Bioethics assessment form 2012**

**Debate assignment in Fall Bio-196 class (Assessment method #2)**

Bio196_Stock Fukuyama debate questionnaire

**Excerpt from Spring Bio-196 syllabus describing weekly assignment (Assessment method #3; only answers from “6” were used for assessment)**

“Pence’s book is an introduction to medical ethics through a consideration of the historical cases that led to its development. Each week, you will read a chapter and write a short report of your reflections. This will take the following form.

1. Statement of the fundamental question posed in the chapter. ***Note****: Give this some thought. I do not always agree with the way that Pence characterizes the question in each chapter.*

2. Brief summary of one major case Pence describes that is relevant to the question.

3. Statement of your position on the issue.

4. One strong argument, drawn from the reading, that supports your position.

5. One strong argument, drawn from the reading, that argues against your position.

6. One aspect of the Christian story that might inform a decision concerning the issue.”

**Rubrics used to evaluate the data**

All student responses used for assessment were scored on a 0-2 point scale. Scales defined below.

**Rubric for Assessment Method #1:**

0 = failed to answer question (i.e, could not give or describe and example of what was asked for)

1 = gave an appropriate example but lacked clarity or depth

2 = clear, substantial & sophisticated description of bioethical issue

**Rubric for Assessment Method #2:**

0 = no analysis at all; simply restates the position without adding any critical perspective

1 = approaching competency; ambiguous or hard-to-follow reasoning

2 = competent; clearly or unambiguously articulates reasoning

**Rubric for Assessment Method #3:**

0 =  does not analyze the issue in the context of Scripture or Christian belief

1 = provides a superficial analysis of the issue in the context of Scripture or Christian belief (e.g., only cites marginally relevant Scripture)

2 = provides a robust analysis of the issue in the context of Scripture or Christian belief (e.g. discusses relevant Scripture and/or specific beliefs or aspects of the Christian story)

1. **Reports on closing the loop activities for every PLO**

|  |
| --- |
| **PLO#1: Core Knowledge**   * Reviewed of our introductory core of courses for our majors in the current academic year with an eye toward possibly restructuring – DONE (We decided no major revision was necessary; some material in Bio-005 that is redundant with Bio-114 will be eliminated and coverage of plant biology expanded) |
| **PLO#2: Experimental Investigation**  *Bio-005 poster assessment:*  We discussed two broad changes to the curriculum that will be implemented in response to these observations:   1. The process of making a project proposal for Bio5 students was made more formal, in order to help students with experimental design. Specifically, 2. The Bio5 instructors designed a form that students will complete during or after consult with instructional staff that draws their attention to things like appropriate controls, units of measurement, and variables subject to manipulation. (DONE) 3. The grading rubric was updated to be more explicit about how the scientific question should be developed (DONE) 4. The Bio5 instructors added more emphasis to the proper methods for doing background literature searches so that students can better frame their research question. (DONE) 5. We revised a section of the Bio-005 lab manual that addresses statistical tests. (DONE)   *Research Student Survey:*  We would like to nurture our research students to think of themselves as contributing scholars in the field, rather than simply as “experiment doers” and to understand the big picture of how their experimental findings contribute to answering larger research questions. Towards this end, we discussed requiring each summer research student to (i.e., those that have ten weeks allotted to engage their research projects full-time)   1. submit a written report on how the primary literature, that serves as the background information for their own project, helps to frame the research question. 2. give a summative lab meeting-type presentation using their research poster as a visual aid, with their research peers and faculty mentor in the audience. In this presentation, the student’s faculty mentor will provide guidance on how to “tell a story” rather than link together a series of experiments.   (We are still trying to figure out the logistics here because of varying summer schedules of faculty and students. So far, this has not been feasible) |
| **PLO#3: Scientific Communication**   1. How can we help more of our students improve in their ability to write scientifically, especially with regards to format?    1. The Biology faculty met in May 2014 to review the lab report guidelines for Bio-114: Genetics, the writing-intensive course that all our majors are required to take. Our main observations and reflections were:       * 1. Overall, descriptions of the section are very clear.         2. We noted sub-discipline distinctions in format but all of the faculty were comfortable with this format in Genetics.         3. We decided we needed to add a clear statement of using parentheses for reference to tables/figures and statistics.         4. We noted that Chemistry requires an “Error Analysis” section which biology students feel compelled to include regardless of whether data suggest there might be any errors.   The Bio-114 instructor made changes based on this feedback. (DONE)   * 1. We also agreed to spend departmental money to pay academically strong, upper division biology students to serve as departmental tutors during the second semester of this academic year. In the Spring 2013 and 2014, we required the Genetics lab TAs to hold 4 hours of open tutoring/help sessions each week to assist the lower-division students in our core-courses (Bio-005 and Bio-114). While they helped with general comprehension of lecture material, the student tutors also assisted Bio-005 students with correct poster formatting, utilizing appropriate literature resources, and using the correct graph format (see assessment results for PLO #3) and provided Bio-114 students with needed guidance on writing lab reports. Anecdotal evidence suggests the tutors have been useful. (DONE)  1. How can we improve our strategy in assessing this particular PLO?    1. We need to modify the way we select student papers to read. We need to consider assessing a larger, and completely random sample, of upper division, senior papers. We will rethink this strategy before our next round of assessing this PLO. (Need to consider in our next assessment cycle) |
| **PLO #4: Biology/Faith Integration**  *Bio-006 and Bio-197 Student Survey*  In response to these data, we decided   1. to retain a longstanding assignment, the debates, in our core-course, Bio-006. These are a significant amount of work for both the faculty member and the students and they take up two lab sessions. We wondered whether the either / or approach was a little outdated and contrived.  Student responses to the debates in particular and course outcomes suggested to us that we should retain them. (DONE) 2. to offer Bio197 as an annually taught course, instead of alternating it every other year with another course. We also increased the cap to accommodate any interested student, which has included offering - at least on one occasion - an additional section. (DONE)   *Bio-196 Bioethics Assessment*  In response to these results,   1. the Biology department invited the Philosophy department professors to a department meeting in the Fall 2014 to discuss argument vs. assertion and the use of scripture in ethical decisions. It was helpful hearing that their students similarly struggle in these areas and learning about some of the teaching strategies they use. (DONE) 2. instructors for Bio-196 modified their instruction and course content accordingly. For example, the Spring instructor added an element on the weekly reflection and summary assignment asking students to evaluate arguments presented in the reading. Also, new instructors (Amanda Sparkman, Assistant Professor in the Biology department and Stephen Zylstra, Adjunct Philosophy Professor) started co-teaching Bio-196 in the Fall Semester.  They have designed the course such that students submit a written summary of the arguments from key papers prior to class each week, in preparation for argument analysis and critique during class discussion.  Students use the skills they develop throughout the semester to formulate their own arguments in a final paper, as well as articulate their position in lively case study-based discussion with their peers. (DONE) |

1. **Relevant syllabi for major changes in the curriculum such as a new capstone course, senior seminar, internship requirement, experiential learning course, etc.**

None

1. [**Curriculum Map**](http://www.westmont.edu/_offices/institutional_portfolio/program_review/documents/SampleofCurriculumMapTemplate_.doc) **and the** [**PLOs Alignment Chart**](http://www.westmont.edu/_offices/institutional_portfolio/program_review/documents/PLOAlignmentChart.doc)

**Curriculum map**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Courses/**  **Activities** | **Required or Optional** | **PLO#1**  **Core Knowledge** | **PLO #2**  **Experimental Investigation** | **PLO #3**  **Scientific Communi-cation** | **PLO #4**  **Biology/**  **Faith integration** |
| 005 | Required | I | I | I | I |
| 006 | Required | I | I | I | I |
| 102 | Organismal Bio (General); 1 of 3 (Cell/Mol) | D | D | D | I |
| 104 | Population Bio (General); Upper-div Field course (Eco/Evo/NH) | D | D | D | I |
| 108 | Organismal Bio (General); Animal Systematics (Eco/Evo/NH) | D |  | D | I |
| 110 | Organismal Bio (General); 1 of 3 (Cell/Mol) | D | D | D |  |
| 113 | Required (Cell/Mol); Optional (other tracks) | D | D | D | I |
| 114 | Required | D | D | I | D |
| 120 | Population Bio (General); Upper-div Field course (Eco/Evo/NH) | D | D | D | I |
| 125 | Population Bio (General); 1 of 2 (Eco/Evo/NH) | D | D | D | I |
| 128 | Population Bio (General); Optional (other tracks) | D | D | D | I |
| 130 | Required (Cell/Mol) Optional (other tracks) | D | D | D | D |
| 131 | 1 of 2 (Eco/Evo/NH); Optional (other tracks) | D | D | D | I |
| 132 | Required (Cell/Mol) Optional (other tracks) | D | D | D | I |
| 141 | Animal Systematics (Eco/Evo/NH); Optional (other tracks) | D |  | D | I |
| 151 | Plant Systematics (Eco/Evo/NH); Optional (other tracks) | D |  |  |  |
| 155 | 1 of 3 (Cell/Mol); Optional (other tracks) | D |  | D |  |
| 190 | Optional | D |  |  |  |
| 191 | Optional | D | D |  |  |
| 195 | Required of all BS tracks | M |  | M |  |
| 196 | Required (1 of 2 options) |  |  |  | M |
| 197 | Required (1 of 2 options) |  |  |  | M |
| 198 | Optional |  | M |  |  |
| 199 | Optional |  | M |  |  |

**PLO Alignment chart**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Goals (if applicable) | **PLO#1**  **Core Knowledge** | **PLO #2**  **Experimental Investigation** | **PLO #3**  **Scientific Communication** | **PLO #4**  **Biology/Faith integration** |
| Program Learning Outcomes | *Students will effectively identify, and explain, fundamental principles of life processes at different levels of structural organization.* | *Students will grow in their ability to carry out scientific investigation of living systems.* | *Students will be able to present the findings and implications of scientific research through written research reports, oral presentations and scientific posters.* | *Students will be able to identify and describe a wide range of controversies, positions, and approaches to inter-disciplinary and theological implications of biological theory.* |
| Where are the Learning Outcomes met?    **I** Introduced  **D** Developed  **M** Mastered  **A** Assessed | I: Bio-005, -006  D: All upper division courses  M/A: Bio-195 | I: Bio-005, -006  D: All upper-division lab courses except those in systematics (e.g. Bio-108, -141, and -151)  M/A: Bio-198, -199 | I: Bio-005, -006, -114  D: almost all other upper-division courses  M: Bio-195  A: Bio-130, Bio-110, Bio-132 | I: All 4-unit lower and upper-division courses besides those mentioned below and Bio-110, -151, and -155  D: Bio-114 and -130  M/A: Bio-196, -197 |
| How are they assessed? | **Direct methods:**  MFT in Biology | **Indirect methods:** Student survey  **Direct & Embedded assessment:** Evaluation of Bio-005 posters | **Direct & Embedded assessment:**  Evaluation of papers from Bio-110, -130, and -132 | **Direct methods:**  Bioethics worksheet on evaluation day  **Indirect & embedded assessment:**  Student survey  **Direct and Embedded assessment:**  Bio-196 Debate assignment and weekly assignment |
| Benchmark | **Direct method:** Average score in 50th percentile or greater compared to National Liberal Arts Colleges using the test only for program assessment | **Indirect method:** none identified  **Direct & Embedded assessment:** Average score of 4 or more | **Direct & Embedded Assessment:**  Average score of 4 or more | **Direct methods:**  100% will have a minimal score of 3  **Indirect & embedded assessment:**  None identified  **Direct and Embedded assessment:**  Debate assignment: 80% of students will score a 1.5 or more  Weekly assignment: 80% of students will score a 1 or more |
| Link to the Westmont Learning Outcomes |  | Critical Thinking and Quantitative Literacy | Oral and Written Communication | Christian Understanding, Practices, and Affections |

1. [**Alumni Survey**](http://www.westmont.edu/_offices/institutional_portfolio/program_review/documents/ALUMNISURVEY_August2014.docx)

**A. Please tell us a little about yourself**

1. Gender (n= 102/103)

a. Female: 60, 58.8%

b. Male: 42, 41.2%

2. Ethnicity/race (n= 102/103)

a. American/Alaskan Native: 0, 0%

b. Asian 11, 10.8%

c. Black 0, 0%

d. Hawaiian/Pacific Islander 1, 1%

e. Hispanic 8, 7.8%

f. White 74, 72.5%

g. Multiethnic 5, 4.9%

h. do not want to disclose 3, 2.9%

3. Year graduated (n=101/103)

2006 1, 1.0%

2007 4, 4.0%

2008 8, 7.9%

2009 10, 9.9%

2010 14, 13.9%

2011 18, 17.8%

2012 20, 19.8%

2013 6, 5.9%

2014 20, 17.8%

4. How many years did it take to complete your Westmont degree? (n=102/103)

a. less than three 2, 2.0%

b. three 3, 2.9%

c. three and a half 15, 14.7%

d. four 79, 77.5%

e. four and a half 1, 1.0%

f. five 1, 1.0%

g. more than five 0, 0.0%

h. transferred 1, 1.0%

**B. Please tell us about your education**

1. Biology Major Track (n=103/103)

a. Bachelor of Arts 29, 28.2%

b. Bachelor of Sciences: General Track 29, 28.2%

c. Bachelor of Sciences: Environmental and   
Natural History Track 20, 19.4%

d. Bachelor of Sciences: Cell and Molecular Track 25, 24.3%

2. Did you complete additional majors/minors at Westmont? (n=103/103)

a. Yes. 71, 68.9%

second majors (n=31, 30.1%)

Anthropology 3, 2.9%

Art 1, 1.0%

Chemistry 21, 20.4%

English 2, 1.9%

French Studies 1, 1.0%

Sociology 1, 1.0%

Spanish 1, 1.0%

Minors (n=53, 51.5%, 5 with two minors)

Business 1, 1.0%

Chemistry 33, 32.0%

English 2, 1.9%

Math 2, 1.9%

Music 3, 2.9%

Philosophy 1, 1.0%

Psychology 2, 1.9%

Religious Studies 4, 3.9%

Spanish 3, 5.6%

Studio Art 2, 3.8%

b. No 32, 31.1%

3. Degree(s) you have completed since attending Westmont. For each, please tell us from which school/university: (n=49, 47.6%; note that this includes some respondents who are still in their programs rather than having completed their degrees, and some respondents did not indicate where they had studied.)

a. Teaching credential: 1, 1.0%

Institution not specified

b. Masters 21, 20.4%

CSU, Monterey Bay

CSU Sacramento

Loma Linda University

Midwestern University

Ohio State University

Penn State

Philadelphia College of Osteopathic Medicine

Portland State University

Quinnipiac University

Samuel Merritt University

Southern California College of Optometry

Trevecca University

Tufts University

UC Berkeley

University of Illinois, Chicago

University of South Florida

University of Washington

Vanderbilt University School of Nursing

Wheaton College

c. Doctorate 6, 0.6%

Midwestern University

Regis University

Southern California College of Optometry

UC Santa Barbara

d. MD 19, 18.4%

Ben Gurion University of the Negev – Medical School for International Health

Case Western Reserve University

Dartmouth University, Geisel School of Medicine

Loma Linda University

Rosalind Franklin University of Medicine and Science, Chicago Medical School

St. George’s University School of Medicine

Tufts University

UCLA

University of Colorado

University of Minnesota

USC Keck School of Medicine

e. Law 1, 1.0%

Institution not specified

f. Other 13, 12.6%

DDS, Marquette University

DO, Western University of Health Sciences

DVM, Western University of Health Scineces

Post- Masters Nursing, Vanderbilt University

RN, Lake Washington Institute of Technology

RN, University of Illinois, Chicago

BSN, Mt. St. Mary’s University

Associate Degree in Nursing, Santa Barbara City College

“Three Associate Degrees,” Moorpark College

Unspecified, Loma Linda University

**C. Please tell us about your employment**

1. Your first job out of college was:

See Appendix I

2. Related to your first job after college (mark all that apply): (n=96)

a. You were employed in the area of your major 45, 46.9%

b. Your Westmont education prepared you   
for this position 60, 62.5%

c. You were satisfied with the position 45, 46.9%

d. You are looking for a new job 22, 22.9%

e. None of the above 18, 18.8%

3. How long did it take you after graduation (or graduate school) to find your first professional job? (n=90)

a. 0-2 months 34, 37.8%

b. 3-5 months 22, 24.4%

c. 6-9 months 8, 8.9%

d. 10-12 months 3, 3.3%

e. 13-18 months / not yet 6, 6.7%

f. I am still seeking a   
professional job 17, 18.9%

4. What is your current employment status? (n=99)

a. Full-time 50, 50.5%

b. Part-time 7, 7.1%

For a list of full-time and part-time positions, see Appendix II

c. Unemployed, seeking employment 1, 1.0%

d. Unemployed, not seeking employment 0, 0.0%

e. Primarily work in home, supporting spouse   
and/or children 1, 1.0%

f. Student 38, 38.4%

g. Other 2, 2.0%

h. I would rather not disclose my employment status. 0, 0.0%

**D. Please tell us about the general impact of your Westmont education**

1. How important has the General Education been to your career? (n=98)

a. very important 40, 40.8%

b. somewhat important 38, 38.8%

c. neither important nor unimportant 11, 11.2%

d. not very important 6, 6.1%

e. not at all important 3, 3.1%

2. Overall, how satisfied were you with the education you received at Westmont? (n=98)

a. Extremely satisfied 73, 74.5%

b. Satisfied 24, 24.5%

c. Dissatisfied 1, 1.0%

d. Extremely dissatisfied 0, 0.0%

3. If a family member, friends, business acquaintance asked you to recommend an educational institution, how likely would you be to recommend Westmont? (n=98)

a. very likely 82, 83.7%

b. somewhat likely 15, 15.3%

c. not very likely 1, 1.0%

3a. A follow-up question for those who said “not very likely”: Why would you not recommend Westmont? [“Skip pattern”: only those who answered the last category in question 4 get this question]. (see next page)

“Focus is too much on General Education and general majors, not enough career planning help”

**E. Please give us some feedback about your experience in the Biology department**

1. How effective was the teaching in the Biology department for your learning? (n=98)

a. Superior 52, 53.1%

b. Strong 39, 39.8%

c. Average/ adequate 5, 5.1%

d. Weak 1, 1%

e. Very weak 1, 1%

1a. A follow-up question for those who said “weak” or “very weak.” How could instruction in the biology department have been more effective for you? [“Skip pattern”: only those who answered the last two categories in question 1 get this question]

“The instruction in the biology department was largely outdated. Instruction in the biology department was where the instructors were comfortable and only reached some student's learning styles. If students struggled it was almost universally pinned on students (no matter the number of students). Biology instructors at Westmont are missing a great opportunity to reflect on their own performance by teaching the same style almost every year.”

2. Were there any additional courses that you wish had been offered in Biology when you were a student? (n=40)

See Appendix 3

Were there any requirements for the major that you found unhelpful? (n=11)

None/Not Applicable (3)

Physics

Genetics/Cell Bio (2)

Genetics

Animal Diversity

Organic Chemistry (2)

3. Did you participate in a Biology practicum while an undergraduate? (n=95)

a. yes, for more than one semester 14, 14.7%

b. yes, for one semester 36, 37.9%

c. did not participate 45, 47.4%

3a. A follow-up question for those who did a practicum. If you did a Biology practicum, what area was it in and how was it beneficial? [“Skip pattern”: only those who answered the first three categories in question 2 get this question]: (n=47)

See Appendix 4

4. Did you participate in Biology research at Westmont? (n=93)

a. yes, for more than one summer/semester 21, 22.6%

b. yes, for one semester 8, 8.6%

c. yes, for one summer 3, 3.2%

d. did not participate 61, 65.6%

4a. A follow-up question for those who did research. If you conducted research while at Westmont, did you present your findings in any of the following venues? (select all): [“Skip pattern”: only those who answered the first three categories in question 3 get this question] (n=33)

a. Westmont poster session or talk 28, 84.8%

b. honors project 4, 12.1%

c. conference poster session or talk 12, 36.4%

d. published paper 5, 15.2%

e. electronic site, web page, blog, etc. 0, 0%

f. did not present the work 5, 15.2%

5. Did you participate in a Biology-focused off-campus program while a student at Westmont? (n=94)

a. Yes, I went to 29, 30.9%

CCSP New Zealand 13, 44.8%

Au Sable 10, 34.5%

Pacific Rim Program (4, 40%)

Washington (2, 20%)

Did not specify (3, 30%)

Studied on both Great Lakes and Pacific Rim programs (1, 10%)

Studied on both CCSP NEW ZEALAND and Au Sable 2, 6.9%

Organization of Tropical Studies, Costa Rica 2, 6.9%

SB Museum of Natural History 1, 3.4%

Channel Islands 1, 3.4%

b. No. 65, 69.1%

5a. A follow-up question for those who went on an off-campus field program. How would you characterize the field program’s contribution to your Biology education? [“Skip pattern”: only those who answered “yes” in question 5 get this question] (n=29)

a. Quite positive 17, 58.6%

b. Positive 9, 31%

c. Neutral or Mixed 3, 10.3%

d. Negative 0, 0%

e. Quite negative 0, 0%

5b. A follow-up question for those who marked negative or quite negative. Can you share some of the problems you encountered in the off-campus program? [“Skip pattern”: only those who answered d or e in question 5a get this question]

N/A (No one marked Negative or Quite Negative)

6. Did you pursue an advanced degree related to Biology? (n=94)

a. Yes 47, 50%

b. No 47, 50%

7. How would you say your education at Westmont prepared you relative to your peers who obtained Biology degrees in other institutions? (n=46)

a. Much better prepared 8, 17.4%

b. Better prepared 23, 50%

c. Neither better nor worse prepared 13, 28.3%

d. Worse prepared 2, 4.3%

e. Much worse prepared 0, 0%

8. How much did faith/science discussions in your courses impact your worldview? (n=94)

a. a lot 63, 67%

b. somewhat 30, 31.9%

c. not at all 1, 1.1%

9. What are some ways in which you have maintained your interest in biology outside of formal educational programs or professional work? (*e.g*., readings, volunteering, lecture attendance, hobbies, etc, etc.) (n=72)

See Appendix 5

10. The following set of questions ask a) how important each of the following program outcomes (skills and competencies) is for your professional career and b) how successfully you achieved each Program Learning outcome at Westmont.

**Outcome 1: Students will effectively identify, and explain, fundamental principles of life processes at different levels of structural organization.**

How important is this outcome for your professional career? (n=90)

(1-5, low to high) *Rating average: 2.78*

a. very (5) 38, 42.2%

b. somewhat important (4) 20, 22.2%

c. neither important nor unimportant (3) 14, 15.6%

d. not very important (2) 10, 11.1%

e. not at all important (1) 8, 8.9%

How successfully you have achieved this outcome? (n=89)

(1-5, low to high) *Rating average: 3.07*

a. superior (5) 32, 36%

b. strong (4) 34, 38.2%

c. average (3) 20, 22.4%

d. weak (2) 3, 3.4%

e. very weak (1) 0, 0%

**Outcome 2: Students will carry out scientific investigation in the lab and/or the field with competence and confidence.**

How important is this outcome for your professional career? (n=90)

(1-5, low to high) *Rating average: 2.82*

a. very (5) 36, 40%

b. somewhat important (4) 24, 26.7%

c. neither important nor unimportant (3) 15, 16.7%

d. not very important (2) 8, 8.9%

e. not at all important (1) 7, 7.8%

How successfully you have achieved this outcome? (n=90)

(1-5, low to high) *Rating average: 2.98*

a. superior (5) 30, 33.3%

b. strong (4) 37, 41.1%

c. average (3) 16, 17.8%

d. weak (2) 5, 5.6%

e. very weak (1) 2, 2.2%

**Outcome 3: Students will be able to present the findings and implications of scientific research through written research reports, oral presentations and scientific posters.**

How important is this outcome for your professional career? (n=90)

(1-5, low to high) *Rating average: 2.88*

a. very (5) 40, 44.4%

b. somewhat important (4) 21, 23.3%

c. neither important nor unimportant (3) 13, 14.4%

d. not very important (2) 10, 11.1%

e. not at all important (1) 6, 6.7%

How successfully you have achieved this outcome? (n=90)

(1-5, low to high) *Rating average: 3.03*

a. superior (5) 37, 41.1%

b. strong (4) 26, 28.9%

c. average (3) 20, 22.2%

d. weak (2) 7, 7.8%

e. very weak (1) 0, 0%

**Outcome 4: Students will be able to identify and describe a wide range of controversies, positions, and approaches to the interdisciplinary and theological implications of biological theory.**

How important is this outcome for your professional career? (n=90)

(1-5, low to high) *Rating average: 2.30*

a. very (5) 24, 26.7%

b. somewhat important (4) 18, 20%

c. neither important nor unimportant (3) 21, 23.3%

d. not very important (2) 15, 16.7%

e. not at all important (1) 12, 13.3%

How successfully you have achieved this outcome? (n=90)

(1-5, low to high) *Rating average: 3.09*

a. superior (5) 31, 34.4%

b. strong (4) 38, 42.2%

c. average (3) 19, 21.1%

d. weak (2) 2, 2.2%

e. very weak (1) 0, 0%

11. What was the best aspect of the program? (n=80) See Appendix 6 for unedited responses

Relationships with professors and quality of their teaching 53, 66.3%

Hands-on experience in the field and lab 16, 20%

Small class setting and teacher-student ratio 12, 15%

Faith/Science conversations and depth of class discussions 9, 11.3%

Rigor of the program 8, 10%

*Note: Percentages reflect the portion of students that reported the respective detail as the*

*“best aspect” of the program. Total percentage exceeds 100% since several students*

*listed more than one aspect of the program in their answer.*

12. What improvements would you suggest for the program? (n=60) See Appendix 7 for unedited responses.

1) More career-direction and opportunity, with more instruction of technical skills for finding a job: The tenor of these responses were that students want more of the “technical school” advantages (able to do a wide variety of specific tasks: GIS, R, project design), so that they can fit into a job easily, and want us to provide a far greater range of direct contact with job providers. 18-20 (~31%) responses were about this, some of them rather lengthy!

2) Wider range of curricular/course/track options across the discipline, with ability to count courses in other majors as part of the biology major, more extensive field courses, more specialization (clinical application, grant writing, horticulture, agriculture, cell culture, environmental law, nutrition), course offerings far more frequent (biochemistry every semester, or run it over two semesters; ditto with genetics) and courses that do not count now should count (anatomy). 16-18 (~27%) responses concerned this aspect.

3) More research opportunities, both earlier in the undergraduate career, and more openings for students—up to requiring research of every major (regardless of student ability, etc.) 9 (15%) responses dealt with this aspect.

4) More internship opportunities, and ability to go into those internships earlier in their undergraduate career. 3-5 (~5%) responses

5) More exposure to primary literature; require more reading of these articles, and more guidance in writing papers using primary literature. 3-5 (~5%) of the responses were along these lines.

13. Is there anything more you would like us to know? (n=37) See Appendix 8 for unedited responses.

Broad, positive statements about the quality and impact of the program, intellectually and spiritually (21 responses). One of these individuals commented on the support they experienced from faculty, even though they were not the strongest student while at Westmont.

Program did a good job preparing for medical school/dental school/current position (8 responses), although one individual commented that they wished that they could have been better prepared for “how real world science and big time labs work, including the process of what is involved with an academic career in research (grant writing, publication process, importance of posters and conferences, etc.)”

Program needs to do a better job of career counseling – those who made these comments were quite adamant in feeling the need for more help in this area (3 responses), although one person wrote about how helpful Steve Julio had been in advising in this area before and after graduation.

Echoing some of what was stated in the previous responses, the need for practical experience was emphasized (2 responses). One individual saw it as a real need, and the other talked about getting a job because of their research experience here.

First Job Out of Westmont College

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Regulatory Analyst for Pace Analytical | | |  |  | |  | |  | |
| Veterinary Assistant | |  |  |  | |  | |  | |
| Pet Groomer |  |  |  |  | |  | |  | |
| Research Assistant | |  |  |  | |  | |  | |
| Graduate Student | |  |  |  | |  | |  | |
| Optometric Technician | |  |  |  | |  | |  | |
| N/A, went straight to vet school | | |  |  | |  | |  | |
| Medical Assistant | |  |  |  | |  | |  | |
| Waitress |  |  |  |  | |  | |  | |
| Medical Assistant in pediatrician office | | |  |  | |  | |  | |
| Environmental Scientist | |  |  |  | |  | |  | |
| n/a |  |  |  |  | |  | |  | |
| Electronic Medical Records Consultant | | |  |  | |  | |  | |
| Nurse Practitioner (after graduate school) | | | |  | |  | |  | |
| Production Manager at TFD INC | | |  |  | |  | |  | |
| Scientific Aid, CA Dept Fish and Game/Medicatiion  Technician, Cottonwood Assisted Living | | | |
| Office Assistant |  |  |  |  | |  | |  | |
| Graduate Student | |  |  |  | |  | |  | |
| Assistant Clinical Coordinator | | |  |  | |  | |  | |
| Medical student |  |  |  |  | |  | |  | |
| Kennel Attendant | |  |  |  | |  | |  | |
| Lab technician |  |  |  |  | |  | |  | |
| Assistant to the Housing Director | | |  |  | |  | |  | |
| Diabetes research at Sansum research institute | | | |  | |  | |  | |
| Waitress |  |  |  |  | |  | |  | |
| Server |  |  |  |  | |  | |  | |
| Surgery center PCT | |  |  |  | |  | |  | |
| Registered Nurse | |  |  |  | |  | |  | |
| Medical Assistant | |  |  |  | |  | |  | |
| Emergency Department Scribe | | |  |  | |  | |  | |
| N/A |  |  |  |  | |  | |  | |
| Waitress |  |  |  |  | |  | |  | |
| Waitress |  |  |  |  | |  | |  | |
| Presenter/Animal Handler for education/outreach program | | | | |  | |  | |
| Lead Boat Driver, Catalina Island Camps | | | |  | |  | |  | |
| Patient Care Technician | |  |  |  | |  | |  | |
| Catering supervisor | |  |  |  | |  | |  | |
| Medical Assistant | |  |  |  | |  | |  | |
| Part time TA |  |  |  |  | |  | |  | |
| Emergency Room Scribe | |  |  |  | |  | |  | |
| Medical school |  |  |  |  | |  | |  | |
| none |  |  |  |  | |  | |  | |
| Sage Grouse Research Technician | | |  |  | |  | |  | |
| Emergency Department Scribe | | |  |  | |  | |  | |
| Technologist |  |  |  |  | |  | |  | |
| Starbucks barista |  |  |  |  | |  | |  | |
| Scribe |  |  |  |  | |  | |  | |
| Life Insurance Agent | |  |  |  | |  | |  | |
| Office Manager |  |  |  |  | |  | |  | |
| Trader Joe's Crew Member | |  |  |  | |  | |  | |
| Grad school |  |  |  |  | |  | |  | |
| Music Department Admin Assistant | | |  |  | |  | |  | |
| Mircrobiology Laboratory Assisitant | | |  |  | |  | |  | |
| Tutoring |  |  |  |  | |  | |  | |
| Ecologist |  |  |  |  | |  | |  | |
| Nutritional Counselor internship; EMT | | |  |  | |  | |  | |
| Landscaper |  |  |  |  | |  | |  | |
| Family Medicine Resident | |  |  |  | |  | |  | |
| Clinical Trials Research Assistant | | |  |  | |  | |  | |
| Medical residency | |  |  |  | |  | |  | |
| N/A |  |  |  |  | |  | |  | |
| NOAA Corps Officer | |  |  |  | |  | |  | |
| Researcher and assistant to the geriatric dentistry fellowship program at a large university and hospital | | | |
| Winemaking Intern | |  |  |  | |  | |  | |
| Applebee's |  |  |  |  | |  | |  | |
| Commercial fishing | |  |  |  | |  | |  | |
| Medical Student |  |  |  |  | |  | |  | |
| Substitute Teacher/ Starbucks | | |  |  | |  | |  | |
| Scribe |  |  |  |  | |  | |  | |
| Still in school |  |  |  |  | |  | |  | |
| Sales Representative | |  |  |  | |  | |  | |
| Direct to med school | |  |  |  | |  | |  | |
| Research assistant for a non-profit foundation | | | |  | |  | |  | |
| None- I went straight to medical school | | |  |  | |  | |  | |
| Pharmacy tech |  |  |  |  | |  | |  | |
| Associate at Amgen, Inc. | |  |  |  | |  | |  | |
| Associate at Amgen, Inc. | |  |  |  | |  | |  | |
| YMCA Member Services Representative | | | |  | |  | |  | |
| Medical assistant until med school | | |  |  | |  | |  | |
| Ty Warner Sea Center Education Assistant | | | |  | |  | |  | |
| Operating Room Registered Nurse | | |  |  | |  | |  | |
| Dental Office Manager | |  |  |  | |  | |  | |
| Student |  |  |  |  | |  | |  | |
| Supplemental Educational Services Regional Coordinator | | | | |  | |  | |
| Au Sable Environmental Institute | | |  |  | |  | |  | |
| Construction |  |  |  |  | |  | |  | |
| Quality Control Lab Tech | |  |  |  | |  | |  | |
| Graduate Research Associate (in graduate school at OSU) | | | | |  | |  | |
| Medical residency | |  |  |  | |  | |  | |
| Dental Front Desk | |  |  |  | |  | |  | |
| Accounts Receivable | |  |  |  | |  | |  | |
| Clinical Laboratory Assistant | |  |  |  | |  | |  | |
| Employee at Pottery Painting Studio | | |  |  | |  | |  | |
| Intern: California Condor Recovery Program | | | |  | |  | |  | |
| Professional Research Asst at U Colorado | | | |  | |  | |  | |
| Administrative Assistant - Property Management Company | | | | |  | |  | |
| Worked at a surf shop | |  |  |  | |  | |  | |

Current Jobs, Full-time and Part-time

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Regulatory Analyst | |  |  |  |  |  |  |  |
| Pet Groomer |  |  |  |  |  |  |  |  |
| Medical Assistant | |  |  |  |  |  |  |  |
| Medical Biller |  |  |  |  |  |  |  |  |
| Regulatory Compliance Chemist | | |  |  |  |  |  |  |
| Clinical Research Coordinator | | |  |  |  |  |  |  |
| Nurse Practitioner | |  |  |  |  |  |  |  |
| Production Manager | |  |  |  |  |  |  |  |
| Immigration Legal Assistant, Salazar and Cook Law Firm | | | | |  |  |  |  |
| Community Health Specialist | |  |  |  |  |  |  |  |
| Receptionist |  |  |  |  |  |  |  |  |
| resident physician | |  |  |  |  |  |  |  |
| Environmental Health Specialist | | |  |  |  |  |  |  |
| Server |  |  |  |  |  |  |  |  |
| Patient care technician | |  |  |  |  |  |  |  |
| Registered Nurse | |  |  |  |  |  |  |  |
| Physician Assistant | |  |  |  |  |  |  |  |
| Scribe |  |  |  |  |  |  |  |  |
| Assistant Site Manager, Catalina Island Camps | | | |  |  |  |  |  |
| Unit Care Technician | |  |  |  |  |  |  |  |
| Wildlife Technician | |  |  |  |  |  |  |  |
| Microbiologist |  |  |  |  |  |  |  |  |
| Health Assistant |  |  |  |  |  |  |  |  |
| Performance Improvement Coordinator for Providence Healthy & Services | | | | | |  |  |  |
| Music Department Secretary | | |  |  |  |  |  |  |
| EMT |  |  |  |  |  |  |  |  |
| Resident physician | |  |  |  |  |  |  |  |
| family medicine resident physician | | |  |  |  |  |  |  |
| Self-employed business owner in medical research | | | |  |  |  |  |  |
| Internal medicine resident at UCLA | | |  |  |  |  |  |  |
| Pilot for NOAA, conducting scientific surveys | | | |  |  |  |  |  |
| Dental Hygienist |  |  |  |  |  |  |  |  |
| Farm Hand |  |  |  |  |  |  |  |  |
| Registered Nurse | |  |  |  |  |  |  |  |
| Pre-K teacher |  |  |  |  |  |  |  |  |
| Sciences Lab Manager | |  |  |  |  |  |  |  |
| Health Assistant |  |  |  |  |  |  |  |  |
| Guest Services Representative | | |  |  |  |  |  |  |
| Finishing up as chief emergency medicine resident, starting position as attending physician in Salem, Oregon | | | | | | | | |
| Physical therapist | |  |  |  |  |  |  |  |
| Senior Associate at Amgen, Inc. | | |  |  |  |  |  |  |
| Senior Associate at Amgen | |  |  |  |  |  |  |  |
| Doctor |  |  |  |  |  |  |  |  |
| Aquarist, SB Museum of Natural History Sea Center | | | |  |  |  |  |  |
| Registered Nurse | |  |  |  |  |  |  |  |
| Dental office manager | |  |  |  |  |  |  |  |
| Head of Malting operations | |  |  |  |  |  |  |  |
| Quality Control Lab Tech | |  |  |  |  |  |  |  |
| High School Biology teacher at The Wellington School | | | | |  |  |  |  |
| Medical resident |  |  |  |  |  |  |  |  |
| Front Desk with Floyd | |  |  |  |  |  |  |  |
| Social Scientist at Northwest Fisheries Science Center | | | | |  |  |  |  |
| Research Associate | |  |  |  |  |  |  |  |
| Part time employee at pottery studio | | |  |  |  |  |  |  |
| Quality Assurance & Safety Manager | | |  |  |  |  |  |  |
| Lab Coordinator and Instructor | | |  |  |  |  |  |  |

Additional Courses Alumni Wished Had Been Offered

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| --- |
| 1. Ichthyology, herpetology, ornithology, restoration ecology, conservation biology, environmental statistic, technical writing, |
| 1. I would implement more internship requirements |
| 1. MORE ANIMAL SCIENCE. I wanted to take Anatomy and Nutrition but those were only available as kinesiology classes that I believe would not be relevant for what I needed and would be too easy |
| 1. Biology of cancer |
| 1. No |
| 1. Anatomy (for Bio majors) |
| 1. Epidemiology |
| 1. Plant Taxonomy (wish it was more frequently offered), Marine Mammals, |
| 1. Marketing |
| 1. Anatomy |
| 1. Microbiology |
| 1. N/A |
| 1. Pharmacology |
| 1. Pharmacology |
| 1. More career prep classes |
| 1. Researching journal articles |
| 1. Developmental Biology |
| 1. Course about career future/job finding, lab research opportunities for all students, not just a handful |
| 1. medical terminology |
| 1. Advanced Ecology, Botany, Conservation Biology, etc. |
| 1. Epidemiology, Health Policy (collab w/ Poli Sci?), Public Health oriented classes |
| 1. Infectious disease, virology, parasitology, biology methods |
| 1. specific areas of study (mammals, fish) rather than broad conceptual (ecology, cellular, micro) |
| 1. More (Biology based) Nutrition courses |
| 1. God and Nature |
| 1. Environmental Law+ Policy, Grant Writing, more intense field biology classes |
| 1. More smaller interest group type classes such as a medical education class or population/cultural based issues with regards to medicine or other disciplines |
| 1. Medical courses |
| 1. Medical Terminology and Clinical Biology/Physiology |
| 1. Human Anatomy with cadaver lab |
| 1. Introduction to Biotechnology |
| 1. Environmental Science, Conservation Biology, Specialized ecology courses, ecology fieldwork, Evolutionary Biology |
| 1. More Field Classes |
| 1. Embryology, |
| 1. Neuroscience |
| 1. Evolution (it was offered, but I missed out because of timing. I wish it was offered more often), A more intense statistics course (A biology specific stats class, preferably with an R programing component. I apologize in advance about all the future students who will complain about this, but I really feel like it's important especially if you are going to get an advanced degree. You can use me as a scapegoat if you like), GIS (not totally necessary, but it would have been a nice extra. You could maybe do just a 1-2 unit intro to GIS course) |
| 1. Environmental policy, Grant writing |
| 1. Cancer biology could be neat |
| 1. Horticulture, Plant Science, Soil Science, etc. |
| 1. something having to do with public health- epidemiology? |

Practicum Field and Benefits of Experience

|  |
| --- |
| 1. Volunteered at Ty Warner Sea Center. Good experience working with people, but hasn't directly been beneficial to me. |
| 1. Ty Warner Sea Center and at the SB Wildlife Care Network, environmental education and outreach as well as animal husbandry |
| 1. Environmental - gave me further experince |
| 1. Medical, I volunteered in the Labor and Delivery department at Cottage hospital. I found the experience very beneficial. |
| 1. Santa Barbara wildlife network. It provided a lot of hands on experience which was helpful for my recent field job. |
| 1. Biology: Necropsy lab at the marine mammal wing of the Natural History Museum. Tied in very well with marine bio class, was fun, made good connections, helped with very interesting research, and practiced a few surgical/necropsy skills |
| 1. Medicine, beneficial. |
| 1. Community Clinic- very helpful! |
| 1. Medicine, it allowed me to observe a hospital setting. |
| 1. Medicine, it gave me exposure and experience that I was able to use on my resume for jobs and my graduate program |
| 1. Medical Diagnostics Lab, it exposed me to a business side of science you will not experience in college |
| 1. Medical Assistant at Eastside Neighborhood Clinic; very beneficial for my spanish skills, interpersonal skills, thinking maybe I couldn't handle being in the medical field because of the blood! |
| 1. I volunteered at Cottage Hospital. It was not very helpful besides being given the opportunity to volunteer. In hindsight, I wish I had done Research. |
| 1. Marine Mammal Rescue, verified my passion for that field of work |
| 1. My practicum provided hands-on experience in the healthcare field. It also led to a part time job and was great to add on my resume. |
| 1. Healthcare, extremely beneficial and prepared me for an easy transition. |
| 1. Medical Assisting; it was very beneficial, it counted toward medical experience hours for applying to graduate school |
| 1. Unsure |
| 1. Observational studies at the SB Zoo, very beneficial |
| 1. Education: it was helpful to my current position as an outdoor educator but not professionally in the realm of biology. |
| 1. Eastisde medical clinic volunteer and it was extremely helpful and beneficial |
| 1. Bio Lit. Helped me learn to read scientific papers |
| 1. Environmental practicum at the Santa Barbara Wildlife Care Network. This gave me some bird handling experience and some insight into how wildlife rehabilitation is important for the field of conservation biology. |
| 1. Invertebrate Biology/Animal Husbandry |
| 1. Biology Education- yes, it was beneficial, but did nothing for me on my resume |
| 1. Santa Barbara Botanical Gardens, very helpful |
| 1. Biology literature |
| 1. ecology, it became a job. |
| 1. Clinical Research |
| 1. Medicine |
| 1. Santa Barbara Eastside Clinic, somewhat helpful |
| 1. Marine Biology, somewhat beneficial |
| 1. Dentistry-It was an honest experience in a field I wanted to enter. The experience coupled with skills learned through Biology classes helped me land my first job after Westmont. The dentists and MDs with whom I worked were very impressed with this background coming out of undergrad. My dental knowledge gained from my practicum was also very helpful in the first few months of dental hygiene school. I still keep in touch with those I met through my practicum, both dentists and other UCSB undergrads who were interns with me at the time. Over the years, I along with former interns have been collaborative in helping each other out along our respective dental paths. The dentist relationships formed during the practicum have also been great for networking as well. |
| 1. Santa Barbara wildlife center and museum of natural history |
| 1. Medicine, yes |
| 1. Health Science |
| 1. Microbiology (under Steve Julio); one of the most formative experiences of my academic training. |
| 1. East side clinic - professional skills |
| 1. Medical assistant- helped get a temporary job until medical school |
| 1. Aquarium. i was able to get a job there after volunteering, so it was immensely helpful for my career to date. |
| 1. Dentistry: It prepared be and helped my resume for dental school application |
| 1. one at the zoo, one in botany |
| 1. Restoration ecology. |
| 1. I volunteered at Cottage Hospital. Although most of what I did as a volunteer was not directly related to what I studied in the Biology department, the experience was helpful in that it gave me experience in the healthcare industry where I will be spending my career. |
| 1. Restoration work and working at the Natural History Museum. Restoration work was helpful, because I learned i did not want to do that as a career - that experience helped get me a field position as a botanist. Museum wasn't particularly helpful, it just looked good on a resume |
| 1. Environmental Biology, the experience was extremely beneficial as a practicum and allowed me to obtain more hands-on experience. |
| 1. Horticulture - Santa Barbara Botanic Gardens: This was very helpful for me as it solidified my interest in plants and horticulture and gave me a basis of experience for what I am working towards currently. |

Biology-Related Hobbies

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| --- |
| 1. Visiting zoos and aquariums, discussions with other friends with science majors |
| 1. i read biology journal articles, attend talks, volunteer with local restoration non profits, as well as backpack and explore the outdoors regularly. |
| 1. Reading, volunteering, birding and hiking |
| 1. I continue to volunteer in a local health clinic and read enough to keep relatively current on healthcare, globally and domestically |
| 1. Volunteering. Advocacy. |
| 1. Birding, national geographic, keeping up to date on conservation issues |
| 1. My whole life now revolves around biology. Other than that, I have enjoyed taking care of animals and I still go birding/herping! |
| 1. Occasional readings. |
| 1. Farming at a local farm, hiking, cooking and crafting things like kombucha (incubation) and rosewater (distillation!) :) |
| 1. I remain interested in conservation and preserving the environment. I also enjoy hiking and experiencing nature. |
| 1. I enjoy visiting museums and backpacking to explore the environmental side of Bio- haven't had a chance to enjoy marine biology since leaving santa barbara unfortunately |
| 1. Tide Pools for fun, Readings, And getting involved in conservation groups |
| 1. I worked as an environmental scientist at Fish and Game before grad school, and nowadays I hike the Sierra Nevadas, take my family to SB/Monterrey tidepools, volunteer at the SJR hatchery, and visit my fellow alumna Anela Ramos as she is a ranger at Pt. Reyes Nat'l Park (whale watching!). In my immigration work, I frequently have to write legal documents (similar to Bio research papers!) about people's medical conditions. I also visit zoos around the country and observe my favorite, the orangutans, as we did in Beth's class (Animal Diversity). I plan to hike to John Muir Trail in 2017 with my husband, and that wouldn't happen without my BIO experience at Westmont! |
| 1. I try and stay update on current medical research as well as other health related topics |
| 1. Readings |
| 1. Volunteering |
| 1. Additional reading in biology and evolution and the relationship between faith and science |
| 1. hobbies, occasional reading |
| 1. Fly-fishing, Birding, Snorkeling and Diving |
| 1. Reading, volunteering, teaching others |
| 1. For the most part, it's being out in nature on my days off and continuing my membership with the Los Angeles Zoo. I'll also read articles posted on a few science blogs I follow. |
| 1. Reading and science in the news |
| 1. Our family frequently goes tide-pooling. We engage in faith & science conversations frequently. |
| 1. I decided to take Biology of Human Disease course at my community college to supplement my learning from Westmont. |
| 1. Medical missions |
| 1. I give career talks at schools, and go hiking and camping often. |
| 1. Readings |
| 1. Reading articles |
| 1. Following new updates, etc. |
| 1. Readings |
| 1. Reading nonfiction books that center around issues and historical events in different biological fields. |
| 1. Outdoor activities, primarily SCUBA diving |
| 1. Pursued biology for the sake of my future career |
| 1. Professional work in the medical field |
| 1. reading old textbooks, subscribing to certain scientific journals, volunteering at shelters and reserves, |
| 1. Lectures, Journals, Periodical articles |
| 1. Conversations with others |
| 1. going tide-pooling |
| 1. Getting out in the world. Gardening. |
| 1. None |
| 1. I started a science-entertainment blog, and I'm starting a web series on it soon. |
| 1. Topics from the Biology and Faith class, particularly bio as it relates to human love, continues to interest me. I read on the topic when I can (academic sources when I find them, though most of what I come across is in popular media). |
| 1. readings, hobbies |
| 1. Reading journals |
| 1. Everytime I hike, go to the ocean, spend a day out of doors I can't help but view it scientifically |
| 1. Though my efforts are now mostly concentrated in healthcare, I do find myself going through old notes on biology/faith (in wanting to better articulate my thoughts on the subject), and from ecology and marine biology (When I'm at a beach or in a national park, I find myself wanting to identify things I used to be able to identify so easily for classes! I also own a Sibley Guide for birding). |
| 1. tutoring in Biology |
| 1. I understand a bit more about news articles and research that comes out |
| 1. I volunteer at local school to lead science days |
| 1. Habitat Restoration/ Nursery Internship, Habitat Restoration Volunteer, CNPS volunteer, backpacking, SERCAL Conference, Central Coast Invasive Weed Symposium |
| 1. reading journals |
| 1. Readings |
| 1. reading, outdoors |
| 1. I continue to have a deep appreciation for the ecology I learned while spending time enjoying the great outdoors. |
| 1. Growing succulents |
| 1. Minimal |
| 1. Free reading (i.e., Immortal Life of Henrietta Lacks, etc), podcasts/programs about science |
| 1. Plant collecting hobby, conservation volunteering, Volunteering with A Rocha |
| 1. Hiking, camping, scuba |
| 1. I SCUBA quite regularly and read articles as often as i can. |
| 1. Reading |
| 1. Gardening |
| 1. reading, i enjoy teaching my daughter simple science facts |
| 1. Writing a PhD dissertation in Environmental Politics |
| 1. Most of the books I have read recently have been mostly medically related. Because medicine is primarily founded on science, my background in Biology has been fundamental in my ability to understand and absorb the topics that I've read about. This past fall, I spent three months volunteering at a medical clinic in Haiti where again, I was able to apply concepts and ideas I learned while in the Biology department, to the tasks I accomplished daily. |
| 1. reading, education |
| 1. Birding, surfing, hiking, going outside |
| 1. I like to read/dialogue about the intersection of faith and science. I do alot of trekking |
| 1. I try to seek out volunteer opportunities, and additional readings. |
| 1. Well, I brew beer so it's helpful to know how yeast work. I also like reading about and discussing evolution. Sometimes I help out with science fairs etc |
| 1. Reading & hobbies: I am currently self-educating and working toward starting up my own organic small farm business. |
| 1. tide pooling, reading about infectious diseases |

Best Aspects of the Program

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| --- |
| 1. Having some flexibility with classes |
| 1. The mentorship of having excellent advisors and encouraging faculty as well as getting field experience. |
| 1. The professors |
| 1. The rigor of the Biology program taught me how to be a hard worker and has truly prepared to succeed in further schooling and has influenced my current work ethic. |
| 1. I like that there was a combination of focuses on ethics, research, knowledge, and laboratory experience. |
| 1. I loved doing work in the field, and having the knowledge to understand what I was looking at. |
| 1. The faculty is amazing. I enjoyed every bio class I took, and all of it is still relevant to my work today. I miss having such interesting, caring, knowledgeable, and fun professors. |
| 1. Physiology class. |
| 1. I loved the small group setting for all labs, especially Microbiology, my favorite class! I think the hands-on learning and availability and passion of the professors is what makes it truly great |
| 1. The professors are the best aspect of the program. I enjoyed every biology class I took, largely because the professors were interesting, engaging, and truly cared about the students. |
| 1. The professors. They were passionate, engaging, and inspiring. They were great mentors and teachers and absolutely invaluable in pushing me to pursue even more education. |
| 1. Teacher to student ratio |
| 1. The depth of the curriculum, the toughness of the courses, and availability to consult with professors. |
| 1. The professors' love for Bio and for their students, the integration of our studies/experiences and Christian discipleship. The rigor that made me a great writer, researcher, and lover of environmental stewardship/social justice (Marine Bio for the former and the HIV class for the latter). |
| 1. Small class sizes |
| 1. Level of academic rigor. |
| 1. Very skillful, knowledgeable and approachable faculty |
| 1. The relationships with the professors/hands on experiences |
| 1. Labs |
| 1. The professors and hands on experience in lab and in the field |
| 1. Class discussions and Lab |
| 1. I really enjoyed how we were encouraged to ponder how science and faith complement each other |
| 1. Professor involvement |
| 1. The professors are the best higher education has to offer. |
| 1. The availability of faculty and their interest in my learning |
| 1. the best part of the program was the enthusiasm and individual attention the professors provided us. The love for learning biology as well as developing the skills to apply it to research articles, societal situations, and our faith has been a profound experience. |
| 1. Interaction with the professors. |
| 1. Diversity among controversial viewpoints |
| 1. The close relationship with professors and small class size. |
| 1. the faculty's patience, kindness, and happiness to teach. |
| 1. I think the most important aspect of the program was the open doors of the professors and the strong sense of community built in the department. |
| 1. The professors |
| 1. Well-rounded education with excellent instructors |
| 1. The rigorous coursework with professors that equipped us well to meet requirements |
| 1. The professors who were very knowledgable and adept at explaining concepts and information to the students |
| 1. The discussion aspects of both seminar and lecture courses were the best way for me to really think deeply about biological issues and ideas. |
| 1. the faculty who care deeply both about the students and imparting knowledge of the subject |
| 1. Lab instruction |
| 1. The student to teacher ratio is nice because it leads to learning principles more effectively. |
| 1. The electives |
| 1. Interactions between faculty and students |
| 1. personal character development - I felt that the professors maintained a high academic standard while not sacrificing personal relationships with the students |
| 1. Integration of faith and learning |
| 1. Relating science and faith |
| 1. Instructors |
| 1. invested instructors |
| 1. The camraderie in the department was evident. The conversations we had (in specifically Physiology, Biology, and Bio &Faith) on science and faith were awesome. But most significantly, the most incredible part of the Bio department was having brilliant, qualified scientists who whole heartedly loved God. This combination in the Bio professors made it so that a lot of them were role models for me, and how I want to be in my personal as well as professional life. |
| 1. Discussion of matters involving science and faith affected my own faith and worldview. Discussions did not just focus on "which is true," but also explored impications on things like compassion, justice and righteousness, stewardship, love, and faith itself. |
| 1. Learning biology in a Christian atmosphere where we'll rounded discussions/debates could take place |
| 1. Small class sizes and passion of the teachers |
| 1. Great, knowledgeable, helpful faculty. Great teachers, and very accessible when I needed help/advice. |
| 1. The professors and the labs, small setting environments and getting out into the field |
| 1. Relationships with professors |
| 1. Lab and hands-on time |
| 1. I thought that the faculty were especially strong! They truly were invaluable to the program. The courses were rigorous and that all worked to ensure I obtained an education on par with, or superior to, an Ivy League institution. |
| 1. It was great to have professors who were both scientists and confident Christians |
| 1. The closeness of the students and professors, the wide range of ideas shared, and the care and preparation that was given for each lecture |
| 1. Having small class sizes, professors who are very approachable and communicate effectively |
| 1. Writing Laboratory articles |
| 1. The investment in my learning by faculty. I was pushed, but also encouraged to explore and ask questions. I was also taught the importance of articulating my knowledge, which has greatly benefitted me as both a medical student and a human being. |
| 1. Small class sizes, good lab exposure, great faculty |
| 1. I learned invaluable skills at Westmont that put me in a better position to obtain employment in the field after graduation. Specifically, I think doing summer research with Dr. McMahon (McQuade) and Dr. Julio equipped me to become self-sufficient in a new laboratory and have confidence in my technique and scientific reasoning. I also remember Dr. McMahon's tests and our final project in our Cell Biology course as being particularly difficult but invaluably useful in learning my footing in the working world of biology. |
| 1. Studying in the lab with classmates late |
| 1. I really enjoyed learning about the intersection of faith, philosophy, and science, as well as forming personal relationships with faculty and staff in the bio department. |
| 1. the personal connection and care with the professors |
| 1. One of the best aspects of the Biology program was the amazing faculty. Not only were the faculty excellent teachers, incredible scientists, and wise advisors, but also they became my mentors and friends. I am so thankful for how much each member of the Biology department poured into my life while at Westmont. I am also so grateful for my research experience while at Westmont. Relative to other undergraduate research programs I've heard of, our program was unique because our faculty to student ration was so low. Because of this, the undergraduate researchers were able to interface with the Primary Investigators directly instead of having to go through other students. Finally, I was so blessed by being taught by faculty that were not only excellent scientists but also strong Christ-followers. Since graduating, multiple people I've talked with have been surprised that I studied Biology in college but am still a Christian. It has been so enjoyable to explain that Biology and Christian faith are absolutely compatible. Being able to explain that would have been a lot less simple if I hadn't have had professors who were Christians. |
| 1. Good basic biology prepared me well for the basics in medical school |
| 1. The tutors and teachers |
| 1. The faculty is the best around. Never have I been in contact with so many intelligent and kind hearted individuals |
| 1. Freedom to explore "controversial" topics with the guidance of wonderful faculty. |
| 1. The professors - strong teachers and available to help their students |
| 1. Excellent Faculty |
| 1. good lab experiences, great relationships with faculty |
| 1. definitely the profs :) |
| 1. Small class sizes. Engaging, caring professors. Individual attention. |
| 1. The professors and their dedication to our learning. You are all amazing! |
| 1. The best aspect was the courses that took me outside of the classroom, and provided hands-on experience and application. |
| 1. The quality of the instruction was amazing. In particular, teaching on evolution, molecular biology, cell biology, genetics, and physiology all stuck out in my mind. The small class sizes and discussions were really wonderful. The labs - especially in cell bio and molecular bio - were key to my professional development and success as a research asst and now medical student, who is still heavily involved with research |
| 1. The best aspect of the program was definitely the teachers - their enthusiasm and passion for what they taught and studied was infectious. |
| 1. the challenge and rigor of upper division courses |

Suggested Improvements

|  |
| --- |
| 1. Could be helpful to have an additional biology major focus |
| 1. I know that the environmental natural history is a smaller group but their field is so different than some of the other areas of biology. The most important skills they should foster in for a career in the natural resource management field are technical writing, good observation skills, and the ability to follow a protocol. More exposure to the technical side of things, i.e. statistics, research, project design, the easier the transition will be. |
| 1. ask students more about what they want to do after westmont, and find ways to help them focus on what they need to do to get there. |
| 1. When I attended, the pre-medical program was just that, "pre-medical." I did not feel that there were resources for students considering careers in allied health (PA, Nursing, etc.) |
| 1. Scientific writing is very important, but writing papers often felt very daunting. |
| 1. Definitely require more internships. In the work force experience speaks. |
| 1. The Practicum program was kind of a mess my senior year in terms of placing people. I would encourage an Anatomy class offering or even a requirement. I came into vet school really wishing I had taken one. Human anatomy through the kines department did not count for anything even though it is one of the most important basic sciences, especially for PreHealth students. |
| 1. Structure, content organization, and style of the biochemistry class should be seriously adjusted. Class should be taught by Chemistry department. |
| 1. For me it would have been helpful if mentors knew more about other programs besides medical school: half-way through undergrad I knew I didn't want to be an M.D., but I often knew more about other healthcare careers (R.N., P.A., N.P, O.T. etc programs than most professors that I sought out for help. Perhaps this has improved since 2007-2011 though |
| 1. I would suggest an increased budget for the research department. I wanted to do research as a student but there were very few spots available. I would also suggest more informal events with faculty mentors for students. We had a few while I was a student and they really impacted me in both my personal and academic growth. |
| 1. Add more labs and projects involved with problem solving |
| 1. I wish the Pre-med, Pre-PA program could be more involved in discerning our vocations, because I could have learned before graduating that I didn't want to be a PA/in the medical field. Then I could have majored not in Gen. Bio but in Envir. Bio! Taking some Environmental Bio classes before my junior year (or more of that focus in the BIO 101 class) would have helped me realize what I am passionate about. |
| 1. Make research a requirement |
| 1. A formal orientation or invitation to student research may be helpful |
| 1. A greater presentation of job opportunities related to the major |
| 1. Maybe having professionals from different fields who had a biology degree come in and talk to help students decide their path after graduation? |
| 1. n/a |
| 1. Not sure. I really liked it. |
| 1. Education on the various health careers that exist |
| 1. I would like for future students to have more classes like bioethics and bio literature that will allow us to discuss different cases that relate to the medical field and biological research field. |
| 1. In my grad school, instead of textbooks, we purchase the professors notes. So the outline is already provided to us, and it allows us to add information that the professor is talking about that we find relevant. |
| 1. I really enjoyed any chances we got to be out in nature (natural history track). With the amazing surroundings of Santa Barbara there are so many options for learning in the midst of the subject matter. I would encourage continued use of field trips and possibly even more of them. |
| 1. I think one thing Westmont offers that other schools does not is a sense of student collaboration they helps prepare us for professional academics and the workplace. I think encouraging students more to work together and lowering the competitive nature of the course work would help students be more successful overall. |
| 1. None I can think of |
| 1. More career/graduate school guidance, stronger connections to research opportunities |
| 1. The last semester of my senior year is when I realized that I was missing two courses for applying to nursing/PA school. This was very disappointing to me, as at that point I had other requirements that inhibited me from being able to take those needed courses. So I left college with a degree in Biology, short two Biology courses for the field I was hoping to pursue. My advisor knew very little about nursing school, and even after meeting with Dr. Martin I felt ill prepared to apply due to the missing requirements. The Biology department, and Westmont as a whole, needs to work on career counseling for students so they don't end up in a position like that. Biology is a hard field to break into as a recent graduate, and I resorted to working at Starbucks because without research experience in my resume, I was unable to find an employer in a lab. I wish I had more guidance for optimizing my CV, resume, etc to secure employment with my degree. |
| 1. Offer more biology electives or from other departments that may count towards this major. There were simply not enough bioligy classes. |
| 1. The only thing more I would have wanted from the program was more opportunity to take field-oriented classes. Marine Biology and Animal Diversity were especially instructive for me, as well as Plant Classification and Ecology, but I wish there were more choices than those listed. Most of the biology program is focused on lab-intenisve classes with a molecular emphasis, and while this is a good thing, it did leave something to be desired for students on the environmental track. |
| 1. More opportunities for research and updated lab equipment |
| 1. i would have been nice to have more collaboration between the office of life planning and the biology department from an earlier point |
| 1. More conversation around diverse career paths relating to biology and/or health sciences; I found these conversations focused mainly on the medical profession and research |
| 1. need more research opportunities. When I was there, there were no research opportunities in ecology and the like, as a result I now feel deficient in grad school compared to my peers |
| 1. I would expand the (Biology based) Nutrition classes offered. This is a growing field, and I wish there were more classes offered at Westmont. |
| 1. There is an understandable tendency (not just at Westmont) to cram as much material into as little space as possible. There were some courses (genetics, biochem) that may have benefitted from either a slower or more in-depth approach over 2 semesters instead of one... not that I would have wanted that; my schedule was crowded enough ;) |
| 1. More opportunities for research |
| 1. Expand opportunities for students interested in research |
| 1. I wish that I would have done research as an undergrad while at Westmont. I know that it is not a required part of the curriculum, and while in college I did not quite fully understand how important research would be to my future career in medicine (whether pursuing a dedicated research position or working as a dedicated clinician). I tried to do research during my senior year, but there were no positions available (probably my fault, because I was a little late in trying to secure a position). I wish there would have been more opportunities, and that the importance of research would have been emphasized a little more. |
| 1. Have more overlap for different tracks to participate in the same classes. |
| 1. more class options |
| 1. Needs to help plug students into jobs right out of college to make the price of Westmont worth it |
| 1. I do not see a need for specific improvements, but I think the program should be kept rigorous and demanding - there is much to be said for a challenging program. |
| 1. Offer more intense field courses for those interested in environmental biology. Teach environmental law and policy, teach grant writing, teach aplied science/ how to use field biology tools and techniques. Stress the importance of doing an internship to get relevant job experience as an undergrad. Advisors should not only guide students in what courses to take, but in what jobs are relevant and avalaible and what training is necessary to get there. Encourage students to preform information interviews with people who have the jobs they are interested in. |
| 1. Having more speakers or opportunities to explore different career paths so that more could be decided while a student rather than after college |
| 1. More use of primary literature for teaching classes |
| 1. For the many students that are pursuing pre-medical studies, it would have been helpful to offer a greater emphasis on clinical aspects of physiology/biochemistry/genetics in the advanced coursework. |
| 1. One thing that I have noticed in discussions with my colleagues that would have been equipping in my field is learning a bit more about the basics of cell culture, including aseptic technique. I gained a lot of experience in lab under Dr. McMahon and Dr. Julio during my time in research, but this is one thing that it seems my colleagues in general learned more about in their time at larger universities that I wish I had experienced more at Westmont. |
| 1. A greater capacity for environmental/ecology related coursework. Global environmental problems affect the least of these and contribute immensely to poverty, illness, and resource related conflict. Westmont's recent push towards becoming a global institution could be supported well by a biology department that addresses the global context that its graduates will be operating within. I think the bio department does address this for its students, but not in a unified manner where all biology tracks together can recognize their role in global outreach. I didn't feel very connected with the rest of my bio cohort as an environmental track student, therefore some sort of capstone focused on global biological issues would have been a wonderful way to tie in medicine, biological research, and environmental work for Westmont students. I would have really appreciated that. Finally, although at Westmont I wasn't able to learn many of the technical skills (GIS, R) that I am currently needing in conservation biology graduate school, I would never give up my Westmont education because of the holistic and sincere content of the education. My ability to endure adversity, think critically, and communicate effectively are all directly from my time in the biology department and Westmont as a whole. |
| 1. Na |
| 1. It would have been nice to have a bigger Biology common area. For example, in Winter Hall, there was the Physics, Math, and Psychology lounges. Since the Biology major is on eof the larger ones on campus, it would be great to have a designated space where students could study together. |
| 1. More frequent class offerings (eg biochem in fall and spring) |
| 1. None in particular |
| 1. N/A |
| 1. None. |
| 1. can't think of anything |
| 1. While I didn't take an evolution or ecology classes, I would like a stronger emphasis on these subjects in general biology. As someone who went to a Christian K-12 school prior to Westmont, my knowledge of evolution and ecology was poor (to put it kindly). At my first teaching job, my lack of knowledge of ecology and evolution was a real difficulty to overcome. |
| 1. I really appreciate the learning/teaching based approach that Westmont has, but for anyone transitioning to a research oriented institution, the required reading of more journal articles would be extremely helpful! Also perhaps requiring a some sort of culminating research project. |
| 1. I didn't realize before graduating how incredibly important having field experience is if you want to get a job in wildlife biology. I think the bio department should really push students in the env/nat history track to pursue meaningful (20 - 40 hr/wk) internships/volunteer opportunities, even at the expense of lots of class time, or encourage them to get similar experience over the summer. I applied to probably close to 100 jobs between November 2012 and September 2013 but was always beat out by someone with just a little bit of field experience. I think having just one internship before graduating would have made an immense difference in my job search after college, and would have prepared me much better for the working world. Env/Nat Hist. students should live on this website: http://wfscjobs.tamu.edu/job-board/ and should probably be subscribed to the ECOLOG list serve: https://listserv.umd.edu/archives/ecolog-l.html. There’s also the Student Conservation Association, which has a ton of really great opportunities. There are so many great opportunities for students out there and I feel like I was kind of late to the party. I didn’t start looking at this stuff until I was a senior. It would be really helpful to push students towards these resources so that they can get more practical experience. Thanks for a great education! - Matt Blois |
| 1. I think more opportunities for students to become aware of their career options and pursue them. I think one problem for many students was knowing how to apply their degree practically and being prepared to be excellent candidates not only for graduate school, but also for jobs out of school. |
| 1. Adding a wider range of disciplines - especially including more agriculture and horticulture related majors or minors. |

Additional Comments

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| --- |
| 1. Biology program at Westmont overall was great, and helped prepare me for my current position |
| 1. I feel like my answers may be low as i have yet to find a job that requires them. But they aare based on the requirements i have seen while appying. |
| 1. Wonderful program. |
| 1. Thank you for all the good memories and knowledge! |
| 1. My degree in the biology department was solely due to convenience. I found several classes, namely those taught by Dr. Frank Percival, to be subpar. His classes carried passion/emotion but lacked evidence and value. |
| 1. Westmont Biology is the BEST! I loved everything about it, and even though I ended up getting a 2nd degree in nursing, Westmont Biology was the best undergrad experience I could ever ask for. |
| 1. I would really like the faculty in the Biology department to know that even though during my four years at Westmont I wasn't exactly the best Biology student, I Always felt supported and encouraged by the faculty to challenge myself and grow more. That belief in me as a student- that I wasn't completely hopeless- has stayed with me these past three years. I've now developed my own passion for education that I wish I had had in college, and I will be graduating with a Masters in Biomedical Science this summer and applying to doctorate schools. As a 19 and 20 yr old in college struggling in Biology I never dreamed that I would actually become very good at it and go on to be where I am today. And every time I think of how I got here I immediately think of the faculty at Westmont and the passion for education that they instilled in me and the time they took to build relationships with me. I am immeasurably grateful to my professors there for never giving up on me. |
| 1. To further explain above Genetics and BioChem had very challenging problem solving issues that relate to issues i deal with every day. |
| 1. I sometimes think I should have been a Sociology major (because of my social justice focus nowadays), BUT I have come to realize what a huge part of my life the BIO dept. still is in my heart. I know how to get out of my cubicle and into the mountains just 45 min away from me because of my appreciation for Biological processes and life. It is the root of me, and my dad (a former marine biologist) and I have a great common ground because of my BIO degree. Thank you for your service, your care, and your great stewardship of me during my time at Westmont. Blessings to you all! |
| 1. Westmont does an exceptional job at preparing students to think critically and have a strong work ethic. |
| 1. My experience in the biology department was very positive and I felt extremely well prepared for my medical education |
| 1. I absolutely loved Westmont and the program and professors have prepared me so well for dental school. |
| 1. No |
| 1. I loved my biology experience at Westmont. |
| 1. Majoring in biology, specifically at Westmont, has been very important to not only my intellectual growth but also my spiritual growth. I truly enjoyed learning from the professors who invest their time, energy, and passion to the students who were also fully supportive of our goals. |
| 1. Often times the textbook was not even slightly helpful as an aid to the professors material. |
| 1. It was a great experience, and I look back with so many fond memories |
| 1. I tell everyone who asks me about Undergrad how great westmont, and particularly the biology dep was for me personally and academically |
| 1. I entered medical school straight out of college. I felt more prepared than 95% of my classmates. Thank You! |
| 1. Please work on career counseling, while Biology is an excellent major which can be useful in many fields, it is difficult to market yourself as a Biology major without published work, research experience, or connections to someone in the field. It is a great degree for pursuing higher education in the medical field and I'm really glad I was able to do that, but wish I had had the opportunity to utilize my degree without furthering my education. Students need better counseling on future career paths and means to achieve goals. They should be encouraged/required to develop these goals under the guidance of a career counselor as early as possible in their time at Westmont. |
| 1. The Biology program at Westmont was critical in both igniting my passion for biology and helping my highlight a potential career path. I am very grateful to the faculty for this. Furthermore, the emphasis on faith in Biology, a somewhat rare emphasis in the field at large, was invaluable in shaping my worldview of faith and science. Thank You. |
| 1. I love Westmont |
| 1. I really enjoyed my time at Westmont and wouldn't trade it for anything. Moving from Westmont to a large academic center for medical school, I felt like I could have been more prepared for how real world science and big time labs work, including the process of what is involved with an academic career in research (grant writing, publication process, importance of posters and conferences, etc.) |
| 1. The Biology department was great while I was a student and I received a great education! |
| 1. My Westmont experience was life-changing and my faith grew by leaps and bounds, I made amazing friendships and was encouraged and enriched by living in Christian community. I wish I could say that Westmont prepared me for the job market, but it did not. I am confident in my faith as a biologist, but ill prepared to find a job related to environmental biology other than the most basic (I watered plants at a native plant nursery for 2 years, it was fun, but didn't pay the bills). I wish I had done internships while in college so that I would already have had job experience when I graduated. I learned more about field biology/ botany from my classes at the Pacific Rim Institue (that program was amazing!) than I did through Westmont. During temporary field jobs, I learned about environmental biology programs such as at Humboldt State and realized that if I wanted to pursue field biology, maybe I should have attended a different college. But at the time I didn't know where I wanted to end up. Westmont's Biology program would be much improved if advisors got more involved with helping students look ahead to their future as a biologist and encourage students to do internships, to get summer jobs working in the field, and to make relationships with people currently in the field of interest so they can learn what it's actually like to be a biologist. Also, it is pretty much essential to have a master's degree in order to get a job in botany/ ecology/ biology these days. Make sure students know this! Provide information about graduate programs (both thesis and non-thesis) so they can work towards completing the prereqs for a specific program rather than having to take additional classes after graduating. I am being very honest about all this becuase the past 3 years since graduating have been hard. There are not many ecology type jobs out there, funding is scarce, and students need to be better preapred/ informed. All that said, I really appreciate what you do! Keep up the good work of encouraging students in their faith as they learn to be scientists. We need more informed Christian scientists in the world. I am so greatful that you taught me that I can be a Christian and trust the science community's opinion on evolution, the age of the earth, and current environmental issues. It is because of your example that I am still strong in my faith today. Thank you! |
| 1. Really enjoyed my time at Westmont. |
| 1. I wish I knew I wanted to pursue a professional Biology Career when I was at WM. |
| 1. I am beyond proud of the way my Westmont education has prepared me to enter the medical field. I find myself constantly appreciative of the emphasis that was placed on collaboration, and developing good questions, and a subsequent desire to pursue my intellectual curiosities to their fullest potential. Thank you for all that you have given to us. These are the tools I have needed to succeed in serving others. |
| 1. Thank you all! You guys are all amazing professors and helped me feel very prepared for medical school. |
| 1. I was specifically told after I was hired that it was my research experience that put my resume at the top of a large stack for the entry-level position into which I was hired. This type of experience was much more interactive and easily attainable at Westmont then it would have been at a UC or larger school. I am incredibly grateful for the opportunities that the Westmont Biology Department provided me during my time there, and I am continually blessed by the love for science that my professors fostered during my time there. |
| 1. Thanks for the immensely wonderful impact upon both my personal and professional life! |
| 1. I am very satisfied with my westmont education and how it prepared me for the future |
| 1. No, I really enjoyed the program. It was challenging and I learned a lot. The only reason I didn't pursue another degree or career in biology is because I ended up having children and that became my priority. |
| 1. I greatly appreciated my conversations with Dr. Julio in determining my career path. During graduate school I had a "quarter life crisis" and I spoke with Dr. Julio over the phone. His advice was extremely important and I absolutely LOVE my current job and Dr. Julio played a HUGE role in this. I still keep in touch with Dr. Julio. |
| 1. I think maybe even requiring like a 1 unit course on job/further education transitions and the options available would be helpful. Westmont is particularly weak in this area in general - knowing that an advanced degree is necessary for most positions related to the field of biology, having some pointers on how to chose a grad school program, having job contacts or career expos specifically for biology students would be helpful for allowing students to actually utilize their degrees rather than just finding a job. |
| 1. I think I got a great education at Westmont. My only suggestion is to push students to get more practical experience before they graduate, and a more advanced stats class would have been nice. It makes life a lot easier. |
| 1. I didn't realize how amazing my education at Westmont was until I got to medical school, and realized I was better prepared than my peers and also realized that most professors in med school suck at teaching compared to westmont profs |

1. **Peer institution comparison**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Institutional demographics | | | | | | Cell/Molec program | | | Eco/Evo program | | |
| **college** | **USNWR  rank** | **criteria** | **enroll** | **selectivity  (% admitted)** | **total  bio fac** | **total fac adj for enroll** | **# fac** | **what we offer** | **what they offer** | **# fac** | **what we offer** | **what they offer** |
| **Westmont** | **96** | **Christian lib arts** | **1200** | **70%** | **6** |  | **3** |  |  | **3** |  |  |
| **Whitman College** | **37** | **Traditional lib arts** | **1500** | **57%** | **8** | **6.5** | **4** |  | **Biostastics Neurobiology Develompental Bio Plant Phys** | **4** | **Ornith/Herp** | **Biostatistics Conservation Bio Biodiversity** |
| **Centre  College (KY)** | **45** | **Traditional lib arts** | **1400** | **69%** | **13** | **11** | **6** | **Infectious Dis** | **Macromolecules Cellular Metabolism Vertebrate Nutrition Developmental Bio Plant Bio Histology Cellular Neurobio Biology of Viruses** | **7** | **Ornithology** | **Microev/speciation Invertebrate Bio Entomology Natural Hist of Vert Plant/Herbivore Int Conservation Bio Evol of Insects** |
| **Beloit College (WI)** | **51** | **Traditional lib arts** | **1300** | **68%** | **9** | **8.3** | **5** | **Infectious Dis** | **Biometrics Comparative Vert Anat Nutrition and Metab Neuroscience** | **4** | **Ornith/Herp** | **Botany Paleobiology Biometrics Population Bio** |
| **Kalamazoo College (MI)** | **64** | **Traditional lib arts** | **1450** | **67%** | **6** | **5** | **3** | **Infectious Dis** | **Developmental Bio Nervous Syst Disorders Neurobiology** | **3** | **Ornith/Herp Marine Bio Tropical Eco** | **Entomology Conservation Eco Population Bio Plant Bio** |
| **Hillsdale  College** | **69** | **Traditional lib arts** | **1500** | **50%** | **8** | **6.5** | **NA** | **Infectious Dis** | **Biostatistics Developmental Bio Plant Phys** | **NA** | **Ornith/Herp** | **Biostatistics Plant Morphology Methods in Field Bio Population Genetics** |
| **Earlham  College (IN)** | **76** | **Traditional lib arts** | **1200** | **64%** | **8** | **8** | **4** |  | **Bioinformatics Neuroscience Plant cell bio Neuropharmacology Parasitology** | **4** | **Herpetology** | **Evol genomics Biology of Insects Bio Diversity Field Botany Invertebrate zoology Conservation bio** |
| **COMMENTS** |  |  |  |  |  | **5/6 have more bio fac** |  |  | **common themes:  Neuroscience (67%) Developmentl Bio (67%) Plant course (67%)** |  |  | **common themes: Conservation Bio (67%) Plant course (67%)** |

1. **Full-time faculty CVs**

*JEFFREY P. SCHLOSS*

Distinguished Professor of Biology Westmont College

T. B. Walker Chair of Natural and Behavioral Sciences Santa Barbara, CA 93l08-1099

Director, Center for Faith, Ethics, and the Life Sciences (805) 565-6118; [schloss@westmont.edu](mailto:schloss@westmont.edu)

**EDUCATION**

**Washington University, Division of Biology and Biomedical Sciences. St. Louis, Missouri.**

Ph.D., Ecology & Evolutionary Biology. 1983.

**University of Michigan. Ann Arbor, MI**

Douglas Lake Biological Station graduate coursework & field study. 1977-1980.

**University of Virginia. Charlottesville, VA**

Mountain Lake Biological Station graduate coursework & field study. 1976.

**Wheaton College. Wheaton, IL**

B.S. with honors, Biology. 1975.

**PROFESSIONAL APPOINTMENTS & EXPERIENCE**

**FACULTY / ACADEMIC APPOINTMENTS**

**BioLogos Foundation**

Senior Scholar. 2013 –

**Westmont College. Santa Barbara, CA**

T.B. Walker Chair of Natural Sciences, 2009- ; Distinguished Professor, 2006- ; Professor, 1993- ; Associate Professor 1987-93; Assistant Professor 1981-87.

**Princeton Theological Seminary. Princeton NJ**

Visiting Instructor, Science for Ministry Institute, Program on Faith & Science. 2010.

**Calvin College. Grand Rapids, MI**

Co-Director (with Alvin Plantinga), Faculty Summer Course on Nature, Science, and Belief, 2004.

Co-Director (with Philip Clayton), Faculty Summer Course on Evolution, Theology, and Human Altruism. 2001.

**Global Stewardship Study Program. Belize C.A. and Christchurch N.Z.**

Faculty and Academic Council. 1994-2007.; Academic Dean 1994-96.

**Wheaton College. Wheaton, IL.**

Visiting Faculty, Science Station. Summers, 1989-2003.

**AuSable Institute of Environmental Studies. Mancelona, MI**

Adjunct Faculty and Academic Council. 1985-present.

**University of Michigan. Ann Arbor, MI**

Visiting Lecturer, Douglas Lake Biological Station. 1981.

**PROFESSIONAL HONORS AND AWARDS:**

**Witherspoon Fellow in Theology and Natural Sciences,** Center of Theological Inquiry, Princeton, 2012.

**Plumer Fellow**, St. Anne’s College, Oxford University, 2010.

**T. B. Walker Chair in Natural & Behavioral Sciences**, Westmont College, 2009-.

**Crosson Fellow**, Center for Philosophy of Religion, University of Notre Dame. 2009.

**Fellow**, American Scientific Affiliation, 2008-.

**Distinguished Professor of Biology**, Westmont College, 2006-.

**Senior Fellow**, Emory University Center for Law and Religion, 2006 - .

**Faculty Research Award**, Westmont College, 2006.

**Monroe Award for Outstanding Teaching**, Westmont College. 1987, 1993, 2005.

**Templeton Science-Religion Book of Distinction Awards**, 2003, 2005, 2007.

**Charter Member**, Evangelical Academy of Scientists & Ethicists, 2004.

**Fellow**, International Society for Science & Religion, 2002.

**Elected Member**, Society for Values in Higher Education. 1982.

**Danforth Fellow**, 1979-81.

**Mass Media Fellow in Science Communication**, American Assoc. for the Advancement of Science. 1978.

**Mountain Lake Fellow**, University of Virginia. 1976.

**SCHOLARSHIP**

**GRANTS AND RESEARCH SUPPORT:**

**Issachar Fund Initiative,** Beyond the "or wars": Evolution, Faith & Human Flourishing. 2013-14. ($41,700).

**BioLogos Foundation,** God’s Brushes: Evolution & Christian Belief. 2013-2014. ($44,386).

**Issachar Fund Initiative,** Evolution and Christian Belief. 2012-2013. ($22,500).

**John Templeton Foundation**, Evolution and the Capacity for Religious Experience: Oxytocin-Mediated Signals of Commitment. 2010 – 2012. Co-PI: Paul Zak, Center for Neuroeconomic Studies, Claremont Graduate University. ($784,662).

**Oxford University**, Philosophical Implications of Evolutionary Theories of Religion, 2008. Co-PI. ($90,000).

**University of Edinburgh**, Consulting Researcher, The Adaptive Logic of Religious Behavior. 2008 – 2011. ($113,000 to Westmont; $859,000 total grant, Dominic Johnson, University of Edinburgh P.I.).

**John Templeton Foundation**, Evolutionary Theory & Life’s Big Questions. 2007-9. ($99.600).

**Center for Theology & Natural Sciences STARS Competition**, Organic Embodiment of Moral Beliefs. 2008. (Schloss PI; Co-I Paul Zak, Claremont Graduate University; Edward Larson, Pepperdine University $20,000).

**Institute for Altruism Research Fellowship**, 2005. ($44,000).

**John Templeton Foundation**, Evolutionary Explanation, Biological Function, and Religious Purpose. 2004. (Co-I: grant to Calvin College, $203,845).

**Metanexus Institute,** Local Societies Initiative Grant, 2004-2007. ($15,000).

**Institute for Altruism Research**, Area Director Grant 2002. ($20,000).

**Center for Renewal of Science & Culture,** Fellowship 1999. ($15,000).

**Stewardship Foundation,** Development Grant, 1997. ($25,000).

**CCUC / Pew,** Global Stewardship Faculty Development Grant, 1996. ($5,000).

**Templeton Foundation,** Science/Religion Curriculum Development Awards, 1995 ($10,000).

**Christian Environmental Association**, Field-Program Curriculum Development Grant, 1994. ($15,000).

**Westmont College,** Faculty Development Grants, 1982, 1983, 1990, 1998, 2000, 2003, 2006, 2014.

**University of Michigan,** Environmental Research Grant, 1982.

**Scientific Research Society of North America,** (Sigma XI) Grants-in-Aid of Research, 1980, 1982.

**University of Michigan,** Biological Station Grants-in-Aid, 1977, 1978, 1979.

**ACADEMIC PUBLICATIONS, 1996 -**

**Edited Volumes:**

Putnam, Hilary, Susan Nieman, and J. Schloss. *Understanding Moral Sentiments from a Darwinian Perspective.* 2014. Transaction Publishers, Rutgers University.

Schloss, Jeffrey and Michael Murray, eds. *The Believing Primate: Scientific, Philosophical, and Theological Perspectives on the Origin of Religion.* 2010. Oxford University Press.

Clayton, Philip. And Jeffrey Schloss. eds. 2004. *Evolution and Ethics: Human Morality in Biological and Religious Perspective*. Eerdmans. [Templeton Science-Religion Book of Distinction Award]

Post, Stephen, Byron Johnson, Michael McCullough, and Jeffrey Schloss, 2003. *Research on Altruism & Love: An Annotated Bibliography of Major Studies in Psychology, Sociology, Evolutionary Biology, and Theology*. Templeton Foundation Press. [Templeton Science-Religion Book of Distinction Award]

Grace, Christopher and Jeffrey Schloss, editors. 2002. Theme issue on Evolutionary Psychology II, *Journal of Psychology and Theology*. Vol. 30: Issue 1.

Post, Stephen, Lynn Underwood, Jeffrey Schloss, and William Hurlbut. eds. 2002. *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*. Oxford University Press. [Templeton Science-Religion Book of Distinction Award]

Grace, Christopher and Jeffrey Schloss, editors. 2001. Theme issue on Evolutionary Psychology I, *Journal of Psychology and Theology*. Vol. 29: Issue 4.

**Articles / Chapters:**

*In Review / Prep*

Murray, M. and J. Schloss. "Evolution and the Problem of Natural Evil." Invited Submission for Reason and Wonder: Integrating Science and Religion. Eric Priest, ed. SPCK Publishers, London UK. In prep.

Schloss, J. "Behavioral Anthropology & Human Origins: Uncommon Nature Through Common Descent." Invited submission for *Two Views of Faith & Evolution*. Kenneth Keathley and James Stump, eds. For submission to Inter Varsity Press. Westmont, IL

---. “Darwinian Explanations of Morality: Accounting for the Normal but not the Normative.” In review: *Zygon.*

---. Curtis Hamann, Amanda Sparkman, M. Schloss, and C. Richard Tracy. “Vasotocin Modifies Driving Force Across Amphibian Integument*.”* In revision.

*In Print*

Lenfesty. H. & J. Schloss. 2014 “Big Gods and the Greater Good.”  *Religion, Brain, and Behavior.* 40-48.

Johnson, D., H. Lenfesty, and J. Schloss. 2014. “The Elephant in the Room: Do Evolutionary Accounts of Religion Entail the Falsity of Religious Belief?” *Philosophy, Theology, and the Sciences*. 1(2): 200-231

Schloss, J. 2014. “Hierarchical Selection and the Emergence of ‘Spirit’.” In *The Depth of the Human Person: A Multidisciplinary Approach.* Michael Welker, ed. Eerdmans. (p 125 – 144).

---. 2014. “Evolutionary Accounts of Morality: Explaining the Normal but not the Normative.” In Putnam et. al., above.

---. 2013. “Laws of Life?: The Nature of Law in Bioscience.” 2013. in *The Concept of Law in Science, Theology, and Legal Studies.* Michael Welker and John Polkinighorne, eds.

Murray, M and J. Schloss. 2013. “Evolutionary Accounts of Religion and the Justification of Religious Belief.” *Oxford Dialogues in Christian Theism*. Chad Meister and J. P. Moreland, eds. Oxford University Press. 242-258.

Schloss, J . “Unpredicted Outcomes in the Games of Life”. 2013. *Evolution, Games and God: the Principle of Cooperation*. Martin A. Nowak and Sarah Coakley, eds. Harvard University Press. 201-219.

---. “Whence Atheists: Outliers or Outlaws?” 2012. *Religion, Brain, and Behavior.* 2(1): 86-89.

--- . “Hovering Over Waters: Spirit and the Ordering of Creation.” 2012. In *The Spirit of Creation and New Creation*: *Science and Theology in Western and Orthodox Realms.*  Michael Welker, ed. Eerdmans. 26-49

--- and Murray, M. 2012. “Theism and Evolution.” In *Routledge Companion to Theism.* Charles Taliaferro, Victoria Harrison, and Stewart Goetz eds. Taylor & Francis. 224-239.

--- and Michael Murray. 2011. “How Might Evolution Lead to Hell?” *Religion, Brain, and Behavior.* 1(1): 93-93.

--- and Michael Murray. 2011. “Evolutionary Accounts of Belief in Supernatural Punishment: A Critical Review.” *Religion, Brain, and Behavior.* 1(1): 46-66.

---, Barrett, J., and Murray, M. 2010. “Looking Past vs. Overlooking Cognitive Evolutionary Accounts of Religion: A Response to N Barrett.”  *Journal of the American Academy of Religion*. 78(3): 622-628.

--- and Murray, M. 2010. “Evolution, design, and genomic suboptimality: Does science “save” theology?” PNAS. 107(30): E121

--- and Michael Murray. 2010. “Science, Religion, and the Sciences of Religion: Comments on Van Till’s Criticisms of Barrett. *Theology and Science*. 8(1): 17-23

--- and Michael Murray. 2010. “You Can’t Always Get What You Want: Evolution and True Beliefs?” *Brain and Behavioral Sciences*. 32(6): 533-534

---. 2009. “Evolutionary Theories of Religion: Science Set Free or Naturalism Run Wild?” In *The Believing Primate: Scientific, Philosophical, and Theological Perspectives on the Origin of Religion.* --- and Michael Murray, eds. Oxford University Press. Oxford University Press. 1-25.

Murphy, Nancey and J. Schloss. 2008. “Biology and Religion.” In *Oxford Handbook of the Philosophy of Biology*. Michael Ruse, ed. Oxford University Press. 545-569.

Schloss, . 2008. “Divine Providence and the Question of Evolutionary Directionality.” In *Back to Darwin: A Richer Account of Evolution.* John Cobb, ed. Eerdmans. 330-350.

---. 2008. “Neo-Darwinism: Scientific Account and Theological Attribution.” In *Back to Darwin: A Richer Account of Evolution.* John Cobb, ed. Eerdmans. 99-118.

---. 2007. “He Who Laughs Best: Religious Affect as a Solution to Recursive Cooperative Defection.” In *The Evolution of Religion: Studies, Theories, and Critiques.* Joseph Bubulia, Richard Sosis, Erica Harris, Russell Genet, Cheryl Genet, and Karen Wyman eds. Collins Foundation Press. 205-215.

---. 2007. “Is There Venus on Mars?: Bioenergetic Constraints, Allometric Trends, and the Evolution of Life History Invariants.” In *Fitness of the Cosmos for Life: Biochemistry and Fine Tuning.*  John Barrow, Simon Conway Morris, Stephen Freeland, and Charles Harper, eds. Cambridge University Press. 318-346.

---. 2006. “Evolutionary Theory and Religious Belief.” In *Oxford Handbook of Religion and Science.* Philip Clayton, ed. Oxford University Press. 187-206.

---. 2005. “Hath Darwin Suffered a Prophet’s Scorn? Evolutionary Theory and the Scandal of Unconditional Love.” In *Spiritual Information.* Charles Harper, editor. Templeton Press. 291-299.

---. 2004. “Symbiosis.” In *Religion in Geschichte und Gegenwart 4 Auflage.* Hans Dieter Betz, Don S. Browning, Bernd Janowski, and Eberhard Jungel editors. Volume 7. Mohr-Siereck. Tubingen

---. 2004. “Evolutionary Ethics and Christian Morality: Surveying the Issues.” In Clayton, Philip. and Jeffrey Schloss, eds. 2004. *Evolution and Ethics: Human Morality in Biological and Religious Perspective*. Eerdmans. 1-24.

Kniffen, Kevin, David Wilson, and J. Schloss. 2003. “Evolutionary Research on Altruism.” in Post, Stephen., Byron Johnson, Michael McCullough, and Jeffrey Schloss, 2003. *Research on Altruism & Love: An Annotated Bibliography of Major Studies in Psychology, Sociology, Evolutionary Biology, and Theology*. Templeton Foundation Press.

---. 2003. “Neodarwinismus.” In *Religion in Geschichte und Gegenwart 4 Auflage.* Hans Dieter Betz, Don Browning, Bernd Janowski, and Eberhard Jungel editors. Volume 6. Mohr-Siereck. Tubingen.

---. 2003. “Evolutionary Ethics.” In *Encyclopedia of Science and Religion*. Wetzel Van Huyssteen, editor. Macmillan Reference.

---. 2002. “Joseph Zycinski’s ‘Beyond Necessity and Design’ .” *Bulletin Center for Theology and the Natural Sciences Bulletin.* 22:1. 16-18.

---. 2002. “From Evolution to Eschatology.” In *Resurrection: Theological and Scientific Assessments*. Ted Peters, Robert J. Russell, and Michael Welker, editors. Wm Eerdmans. 56-85.

---. 2002. “ ‘Love Creation’s Final Law?’: Emerging Evolutionary Accounts of Altruism.” In, Post, S., Underwood, L., Schloss, J., and Hurlbut, W. eds. *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*. Oxford University Press. 212-242.

---. P. 2001. “Philip Clayton’s ‘Emergence of Spirit’.” *Bulletin Center for Theology and the Natural Sciences Bulletin*. 20:4. 21-23.

---. 2000. "Wisdom Traditions as Mechanisms of Homeostatic Integration: Evolutionary Perspectives on Organismic 'Laws of Life'." In *The Science of Wisdom and the Laws of Life*. Warren Brown, editor. Templeton Foundation Press. 153-191.

---. 1998. "Evolutionary Accounts of Altruistic Morality and the Quandary of Goodness by Design." In *Mere Creation* William Dembski , editor. Intervarsity Press. 236-261.

---. 1996. “Sociobiological Explanations of Altruistic Ethics: Necessary, Sufficient, or Irrelevant Perspective on the Human Moral Quest”. In *Investigating the Biological Foundations of Human Morality.* James Hurd, editor. New York: The Edwin Mellen Press. 1996. 107-145

**INVITED ACADEMIC PRESENTATIONS, 1996 -** (Conference plenary lectures or invited seminars):

"Life's History and Life Histories: the Question of Directionality and 'Progress' in Evolution." Invited plenary for Equipping the Next Generation of Christian Paleontologists, Calvin College. June, 2015.

" 'In Some Wild Poet'?: Simmering Issues in Biology & Belief." Invited presentation to Westmont College Faculty Workshop on Faith & Learning."

“The Question of Design in Nature." Moscow Nuclear University, Moscow, Russia. April 2015.

"Evolutionary Ethics and the Question of Moral Realism." Postgraduate School of the Russian Orthodox Church. April 2015.

"Lions & Tigers & Bears: Evolution's Big Three Purported Challenges to Theism." Undergraduate Faith-Science Seminar Series. Calvin College, Grand Rapids MI. February 2015.

"Big Gods: Are They Handier if They're Meaner?" Invited Panel Presentation, American Academy of Religion national meetings. San Diego, CA. November 2014.

"Evolution of Moral Cognition and the Question of Human Exceptionalism.” Invite closing plenary, joint meetings of the American Scientific Affiliation, Canadian Scientific Affiliation, Christians in Science. McMaster University, Hamilton Ontario. July, 2014

"Evolution and Human Flourishing." Invited workshop presentation at Fuller Seminary, June 2014.

“Evolution and Moral Realism.” Half day seminar with responses by three philosophers. Free University, Amsterdam. June, 2014.

"The Evolution of Morality." Academic Symposium / Exchange with primatologist Frans de Waal. Free University, Amsterdam. June, 2014.

“Charismatic Worship as Oxytocin-Mediated Signals of Commitment.” Invited seminar for Program in Evolution & Culture, UCLA. Los Angeles, CA. May, 2014.

“Religious Worship, Charismatic Experience, and Oxytocin-Mediated Signals of Commitment.” Invited Keynote Address for International Association for Cognitive Science of Religion (IACSR). Berlin, Germany. July 2013.

“Evolutionary Theories of Religion Belief: Explaining or Explaining Away?” [With Michael Murray]. M. Holmes Hartshorne Memorial Lecture. Colgate University. April, 2013.

Evolutionary Science & Christian Faith. Invitational Workshop for Old Testament Scholars on Genesis & Human Origins. Fort Lauderdale, FL. February, 2013.

“Morals Without God?” Veritas Forum Debate with Frans de Waal, Emory University. February, 2013.

“Evolutionary Accounts of Morality & Religion: Implications for Skepticism.” Center of Theological Inquiry. Colloquium. Princeton. October 2012.

“Neither Angel Nor Brute: Biology & the Human Spirit” International Conference on The Science and Religion Dialogue: Past and Future. University of Heidelberg. October 2012.

“Moral Beliefs: What Biology Does, Doesn’t Yet, and Can’t Ever Answer.” Conference on Challenges to Religious and Moral Belief: Disagreement and Evolution. Purdue University. September 2012.

“Evolutionary Explanations of Morality: What We Can & Can’t Explain.” International Conference on the Evolution of Morality: The Biology & Philosophy of Human Conscience. The International School of Ethology and the Ettore Majorana Center for Science and Culture. Erice, Sicily. June 2012.

“Theology as Conclusion vs. Background Belief in Engaging Evolutionary Theory: The Issue of Providence & Progress.” Wheaton College Science Symposium, Evolutionary Theory: Implications for Science and Christian Belief. Wheaton College, Wheaton IL. March 2012.

Bellingham Lectures in Philosophy of Religion. [With Michael Murray] “Evolutionary Accounts of Belief in God” and “Evolution and the Problem of Evil.” Western Washington University. Bellingham, WA. February 2012.

“Evolutionary Accounts of Religion: What Can Philosophers Contribute?” Society of Christian Philosophers Regional Meeting. Westmont College. Jan 2012.

“Evolution, Theism, and the Problem of Animal Suffering.” [with Michael Murray] Faraday Institute for Science & Religion. St. Edmunds College, Cambridge University. July 2011.

“Evolution of Morality: Normalizing vs. Normative Implications.” International Conference on the Morality of Evolution and the Evolution of Morality. Ian Ramsey Centre for Science & Religion, Oxford University. July 2011.

“Evolution in Biology and Theology” Lecture Series presented at Princeton Theological Seminary Science for Ministry Program. September 2010.

“Evolutionary Perspectives on Morality and Altruism.” Faraday Institute for Science & Religion, St. Edmund’s College, Cambridge. July 2010.

“What Would an Evolutionary Theory of Religion Look Like?” (with Michael Murray) Institute for Cognitive & Evolutionary Anthropology, Oxford University. June 2010.

“Evolutionary Biology and the Problem of Natural Evil.” (with Michael Murray). Ian Ramsey Lecture, Oxford University. May 2010.

“Laws of Life?” University of Heidelberg Conference on the Concept of Law in Science, Theology, and Legal Studies. Berlin. March 2010.

“Can Theology Inform the Practice of Science?” Azusa Pacific University. Azusa, CA. March 2010.

“Evolutionary accounts of conscience: implications for moral realism.” Program in Evolutionary Dynamics, Harvard University. November 2009.

“Biological Explanations of Religion: Science Set Free or Ideology Run Wild?” Calvin College Philosophy Colloquium. November 2009.

“Hovering Over Chaos: Directionality in the Evolutionary History of Life.” University of Heidelberg. Oct., 2009.

“Religious Joy as a Signal of Commitment; or, Why should evolved minds believe in loving gods, why should such beliefs be associated with positive affect, and why should such affect be associated with well-being?” Emory University Center for Law & Religion. October 2009.

“Evolutionary Biology and the Question of Altruism” Conference on Science, Philosophy, and Belief at Peking University, Beijing China. June, 2009.

“Hierarchical Selection and the Evolutionary Emergence of ‘Spirited’ Agents. Conference on the Complex Unity of the Human Person. University of Heidelberg. February 2009.

“The Biology of Love.” Peking University, Beijing China. October 2008.

“The Evolution of Religion and the Religion of Evolution.” University of Michigan, Ann Arbor. September 2008.

“The Laws of Nature and the Law of Love.” International Workshop on Law and Love, sponsored by University of Heidelberg. Berlin. July 2008.

Lecture series on Science & Religion. Houghton College. April 2008.

Ladd Lecturer. Series on Science & Religion. Southern Nazarene University. April 2008.

“Evolutionary Accounts of Religion: Explaining or Explaining Away?” Oklahoma City University. April 2008.

“Simone Weil on Love & Happiness Amid the Holocaust,” Invited panelist, Conference on Love and Well Being. Emory University. October, 2007.

“Naturalistic Explanations of Religion: Metaphysical Assumptions & Implications.” Workshop on Social, Political, and Religious Transformations of Biology, Cambridge University, September, 2007.

“Evolutionary Accounts of Religion: Explaining & Explaining Away.” Plenary Address at joint meetings of American Scientific Affiliation (US) and Christians in Science (UK). University of Edinburgh, Aug. 2007.

“Evolution and the Problem of Evil.” Faraday Conference on Religion & Biology, Cambridge University. July 2007.

“Evolutionary History, Open Theology, and the Question of Purpose.” Conference on Open Theology, Providence and Science. Eastern Nazarene University. June, 2007.

“Biological Nature, Human Purpose, and the Transhuman Future?” Invited Response, Metanuexus Conference on Transdisciplinarity and the Unity of Knowledge. University of Pennsylvania. June, 2007.

“Evolution, Cooperation, and Human *Telos.*” International Workshop on the Evolution & Theology of Cooperation. Program in Evolutionary Dynamics, Harvard University. May 2007.

“Faith, Science and the Design Debate.” Religion & Science Lecture Series. Loyola Marymount University, April 2007.

“Life History Invariants and the Nature of Law in Evolutionary Theory.” University of Heidelberg, March 2007.

“Beyond the ‘OR’ in Design-Evolution Debate.” National Panel on Intelligent Design, Grove City College; Feb. 2007.

“The ‘Matter’ of Love.” Conference on Love, Philosophy Dept, Franklin & Marshall College, Feb. 2007.

“Is Christian Love Biologically Impossible? Evolution, Altruism & Religious Belief. Wheaton College. Feb. 2007.

“The Last Laugh: Religious Faith, Humor, and Evolution.” Closing Plenary Address, International Conference on the Evolution of Religion. Makaha, HI. January, 2007.

“Feeling Good, Doing Good, and Living Well: Evolutionary Perspectives on Eudemonia.” Conference on the Pursuit of Happiness, Center for Law and Religion, Emory University. October, 2006.

“Charismatic Signs as Unfakeable Signals: Perspectives from Evolutionary Biology.” Symposium on Spirit in the World, Center for Religion and Civic Culture, University of Southern California. October, 2006.

Lecture Series (2) on Evolutionary Theory and Christian Belief. Azusa Pacific University. September, 2006.

Lecture Series (2) on Evolution and Human Nature. Inaugural Summer Course, Faraday Institute on Science & Religion. Cambridge University. July 2006.

“Eudemonia: Evolution and the Internalization of Love” Metanexus Conference on Science & Religion, University of Pennsylvania. June, 2006.

“Beyond Intelligent Design” Metanexus Conference on Science & Religion, University of Pennsylvania. June, 2006.

Lecture Series (3) on Evolution, Purpose, and Human Identity. Greenville College. March 2006.

“The Intelligent Design Controversy: Scientific Debate or Ideological Blood feud?” Invited public lecture for Oklahoma City University Science-Religion Series. February, 2006.

“Hierarchical Selection, Biological Purpose, and the Evolutionary Emergence of Spirit” Invitational Workshop on the Body, Soul, and Spirit, hosted by University of Heidelberg, January 2006.

“Descriptive, Prescriptive, and Normative Notions of Law in Evolutionary Theory: Analogues with Wisdom Traditions?” Invitational Workshop on the Concept of Law in Science and Religion, hosted by University of Heidelberg. December, 2005.

“Evolutionary Theories of Religion: Is Faith ‘Natural’?” Opening Keynote at Conference on Nature and Belief. Calvin College, Grand Rapids MI. November, 2005.

“Doing Well by Doing Good?: Evolution, Ethics, and the Internalization of Altruism.” New Visions of Nature Lecture Series, University of California Santa Barbara. October, 2005.

“The ‘Matter’ of Love: Evolution, Religion, and the Embodiment of Altruism.” Opening Plenary Lecture for Harvard University Lecture Series on Evolution, Religion, and Cooperation. October, 2005.

“Can Evolution Explain Moral Purpose?: Science and Religion on the ‘Nature’ of the Good.” Invited plenary lecture in Science-Religion Lecture Series, Seattle Pacific University. February, 2005.

“God and Darwin.” Stanford University, November 2004.

“Altruism, Game Theory, and Religious Experience.” Invited presentation, annual meetings of the American Academy of Religion. San Antonio. November, 2004.

“Evolutionary Directionality, Theological Purpose, and Process Thought.” Invited presentation, Dialogues Concerning Science & Natural Religion, Claremont School of Theology. October, 2004.

“Is Genuine Love an Evolutionary Impossibility?: Scientific and Theological Perspectives on the Mystery of Altruism.” Invited seminar at Oklahoma City University. October, 2004.

“The Nature of and Nature in Ethics: Evolutionary Perspectives.” Templeton Foundation Symposium on the Nature of Ethics. Nassau. October, 2004.

“Evolutionary Directionality and Complexification in Nature.” Invited response to J.K. Russell Conference on Science and Religion, Center for Theology and Natural Sciences. Berkeley. October 2004.

O**’**Connor, Lynn E., Jack W. Berry, Nicole Kryla, Therese Mascardo, Eunice Yi, David Sloan Wilson, Jeffrey Schloss. “Survivor Guilt: Surpassing Siblings, Friends, or Strangers.” Annual Meetings of the American Psychological Association. Honolulu, HA July 2004. (Peer reviewed, not invited)

“Evolutionary Theories of Human Altruism and Religious Belief”. Invited lecture series (2) at Wycliffe Hall Workshop on Science and Christianity. Oxford University. July 2004.

“The Evolution of Religion and the Religion of Evolution?” Invited Seminar at University of Georgia, Athens GA. March 2004.

“Evolution and the Problem of Theodicy: An Overview.” Presentation at Conference on Evolution & Natural Evil. Westmont College, January 2004.

“Bioenergetic Teleology: Directionality In The Evolution Of Life History Strategies.” Invited presentation at Workshop on Biochemical Fine Tuning, Harvard University. October, 2003.

“Evolutionary Theory, Human Nature, and the Question of Free Agency.” Invited plenary lecture, meetings of Christians in Science. London, October 2003.

“Autonomic Signaling, Religious Affections, and the Evolution of Altruism.” Invitational Panel, annual meetings of Association for Politics & Life Sciences. Philadelphia, August 2003.

“The ‘End’ of Love: Altruism as Biological Adaptation or Evolutionary Effluvium.” Invited plenary lecture, Works of Love Conference. Villanova University, May 2003.

“Scientific and Religious Understandings of Love: Opportunities for Constructive Dialogue.” Invited lecture, Utah State University. April, 2003.

“Science, Sex, and Scripture: Biological & Theological Perspectives on Human Pairbonding”. Invited Seminar, Northwestern College. Pellah, IA. April 2003.

“Evolutionary Theory, Natural Evil, and the Problem of Group Conflict.” Invited lecture, Graduate Theological Union, Berkeley. February, 2003.

“Evolutionary Psychology and Religious Belief: Surveying the Possibilities.” American Association of Religion. Toronto. November, 2002.

“Evolutionary and Game Theoretic Approaches to Altruistic Morality.” Plenary Talk at Conference on Evolution, Altruism, and Purpose. Calvin College, Grand Rapids MI. November 2002.

“Attachment and Beyond: Evolutionary Controversies Over Bonding, Selves, and Sacrifice.” Invited plenary address at Conference on Attachment, Implicit Memory, and the Development of Self. UCSF Physicians Extension Program, San Francisco, October 2002.

“A Plague on Both Your Houses: Moving Beyond Impasse on the Design Debate” Invited plenary lecture at annual meetings of the American Scientific Association, Pepperdine University, August 2002.

“What Every Seminarian Should Know About Evolution.” Plenary presentation at Science-Religion Course Program Workshop for Seminarians. St. Paul Seminary, Kansas City. June, 2002.

“Beyond Econometric Self-Interest. Introductory comments”, Workshop on Game Theory and Altruism. Institute for Advanced Studies, Princeton, New Jersey, March 2002.

Invited respondent. J. K. Russell Research Conference on The Emergence of Spirit. Center for Theology & Natural Sciences. University of California, Berkeley. November, 2002.

“Evolutionary Eschatology: Organismic & Ecological Constraints.” Invitational Conference on Science, Theology, and Resurrection. University of Heidelberg. July, 2001.

“Sociobiological Accounts of Morality: The Problem of Evil or the Problem of Goodness?” Invited presentation, Science & Religion Workshop. Bible College of New Zealand, Auckland, NZ. May 2001.

“Is Christian Love Evolutionarily Impossible?: Darwinian & Theological Reflections on the Mystery of Altruism.” Invited presentation, Seminar Series on Science & Religion, University of Portland. April, 2001.

“The Problem of Love: Evolution, Design, and the Quandary of Altruism.” Invited talk, Conference on Naturalism and Design in Science. Yale University. October, 2000.

“Evolution, Theodicy, and the Problem of Natural Evil*.”*  International Conference on Can Nature Be Wrong, Bad, or Ugly? Free University. Amsterdam. October 2000. (peer reviewed, not invited)

“The Limits of Reductive Materialism: Dualistic Theory in Recent Scientific Accounts of Human Altruism.” The Nature of Nature: Interdisciplinary Conference on the Role of Naturalism in Science. Baylor University. April, 2000. (peer reviewed, not invited)

“Biological Perspectives on the Problem of Natural Evil: Creation and the Wisdom of God" Convocation Series, Greenville College. Greenville, IL. March, 2000.

"Biological & Theological Views of Sex and Gender." Invited presentation, Beyond Materialism Conference. Biola University. La Mirada, CA. December 1999.

"Is it Really More Blessed to Give than Receive? - Emerging Questions in the Evolution of Altruism" Invited Plenary at Conference on Empathy, Altruism, and Agape: Scientific and Religious Perspectives. Boston, MA. October, 1999.

"Survival of the Fittest and the Christian Love Command: Inherently at Conflict?" Invited for Science and Religion Forum Series, Center for Theology and the Natural Sciences. Berkeley, CA. May, 1999.

"Is Christian Love Biologically Impossible? Evolutionary Theories of Human Altruism." Plenary Address, Furman University Speaker Series on Science/Religion. Greenville, SC. April 1999.

"Sociological & Evolutionary Accounts of Religious Investment: Berger's Routinization of Charisma and Frank's Theory of Deceitful Displays." Invited Paper at International Conference on Natural Selection and Subjective Commitment. Evolution & Human Adaptation Program, University of Michigan, Ann Arbor, MI. April 1999.

"Evolutionary Theories of Meta-Cognition and Human Wisdom." Invited presentation, Workshop on Religious & Scientific Understandings of Wisdom. Fuller Seminar, Pasadena, CA. October 1998.

"Emerging Biological Understandings of Human Love & Morality: Reflections of Divine Design, Purposeless Self-interest, or Both?" Plenary Address at Regional Meetings of the American Scientific Affiliation. Colorado College, Colorado Springs, CO. March 1998.

"Second Generation Sociobiology and Emerging Evolutionary Accounts of Human Morality." Plenary talk at the Center for Theology & Natural Sciences Workshop on Science and Religion. University of California, Berkeley. June 1998.

"Evolutionary Naturalism and Intelligent Design: Surveying the Landscape." Invited course lecture; Department of Philosophy; California State University, Sonoma. February 1997.

"Evolutionary Theories of Human Nature: Maginot Line or Armistice Site for Theism/Naturalism Conflict?" Interdisciplinary Conference on Naturalism, Theism, and the Scientific Enterprise. University of Texas, Austin. February, 1997. (peer reviewed, not invited)

"Of Natural Theology and Natural Theodicy: Evolutionary Accounts of Altruistic Morality and the Quandary of Goodness by Design." Invited address, Christian Leadership Ministries Conference on Design and Origins. Mere Creation: Reclaiming the Book of Nature. Biola University, La Mirada, CA. 1996.

"Nature Red in Tooth & Claw: the Theodicy Question in Evolutionary Biology." Invited lecture, Houghton College; Houghton, NY. 1996.

"Ambivalence & Conflict in Scientific and Biblical Views of Nature" Invited lecture, Department of Ecology; University of Montana; Missoula, MT. 1996.

**POPULAR ARTICLES, PRESENTATIONS, INTERVIEWS, 2002-:**

**Invited Public/Popular Level Presentations & Teaching Series**

"Evolution, Creation, and the Grandeur of Life?" Plenary presentation, Conference for Evolution & Christian Faith. Grand Rapids, MI. June, 2015.

"Behavioral Anthropology & Human Origins: Uncommon Nature Through Common Descent." Invitational meeting of Young Earth, Old Earth, and Theistic Creationists. Southeastern Baptist Theological Seminary. Wake Forest, NC. April 2015.

Public Panel on Human Origins with scientists & biblical scholars from BioLogos and Reasons to Believe. Southeastern Baptist Theological Seminary. Wake Forest, NC. April 2015.

"Evolution and the Problem of Natural Evil." Invited public presentation for inter-religious dialogue series, Moscow Russia. April, 2015.

"Biosciences & Christian Faith." Day long seminar for Newbigen Fellows Program. San Francisco, CA. April 2015.

" Evolution, Faith, and Human Origins." Invited Seminar for Task Force, Wheaton College, Wheaton IL. February 2015.

"Faith, Learning, and the Call of Pastor-Teacher." Invited keynote for faculty retreat. Oaks Christian School, Thousand Oaks, CA. January 2015.

"Rejoicing in His Earth: Creation Care as Appreciative Love." Annual Conference on Christian Mission, First Presbyterian Church, Santa Barbara CA. January 2015.

“Evolution, Faith, and Human Origins.” Presentation at God & Evolution workshop (with old testament scholars John Walton and Jack Collins) at Claremont Colleges, Los Angeles CA October 2014.

“ ‘Big Questions’ in Faith & Evolution.” BioLogos National Conference for Seminary Presidents & Journalists. New York City, September 2014.

“Does it Take God to be Moral?” Debate / Conversation with primatologist Frans De Waal. University of Wisconsin, March 2014. Free University, Amsterdam, June 2014.

The Believing Neandertal: Evolution, Faith, and Human Uniqueness. Veritas Forum at University of Tennessee, Knoxville. February, 2014.

Talk of God, Talk of Science: a biologist & theologian ask each other the hard questions. Exchange with Mark Lauberton, President Fuller Theological Seminary. Trinity Episcopal Church, Santa Barbara, January, 2014.

Biological & Theological Perspectives on a Historical Adam. Public debate / conversation with representatives of BioLogos Foundation and Reasons to Believe. Hosted by Areopagus Christian Study Center, Atlanta GA. October, 2013.

Biosciences & Christian Faith. Full day seminar for Newbigen Fellows Program, City Church, San Francisco, CA. April 2013.

From Science and Faith to the Science *of* Faith: Does Evolution ‘Explain’ Religion? Santa Barbara Study Group on Faith & Science, Trinity Episcopal Church. April, 2013.

Human Origins, Evolution, and the Artistry of God. Debate / Panel Discussion with Darrel Falk (BioLogos Foundation) and Fuz Rana (Reasons to Believe). Seneca Creek Community Church, Gaithersburg, MD. March, 2013.

This is Your Brain in Love. Westmont College Chapel (Sexuality Week). February, 2013.

Evolutionary Science & Christian Faith. Invitational Workshop for Old Testament Scholars on Genesis & Human Origins. Fort Lauderdale, FL. February, 2013.

On the “Matter” of Love: Evolution, Faith, and the Nature of Altruism. Veritas Lecture, University of Arizona. February, 2013.

Biblical Faith & the Science of Origins. Westmont Downtown Public Lecture Series. Santa Barbara. November, 2012.

Evolutionary History and the Question of Providence. Concluding Event for Princeton Theological Seminary Science for Ministry Project. First Presbyterian Church, Santa Barbara, CA June 2012

Science, Evolution, and Christian Belief. Lecture Series for Newbigen Fellows Program. San Francisco, CA April 2012.

God’s Brushes of Creation: Evolution & Biblical Faith. BioLogos Foundation Conference. New York, NY. March 2012.

Evolutionary and Biblical Accounts of Origins. Veritas Event (with OT scholar Tremper Longman). University of California, Santa Barbara. February 2012.

Evolution, Scripture, and Human Origins. BioLogos Foundation Workshop for Evangelical Pastors. San Fernando, CA June 2011.

A Christian View of DNA, Origins, and Behavior. American Scientific Affiliation Regional Conference. Los Angeles, CA. April 2011.

Science, Scripture, and Human Nature. Full day seminar for Newbigen Fellows Program, City Church, San Francisco, CA. April 2011.

Human Genome, Human Origins, Human Nature. Plenary Address for Q3 Science & Religion Conference, Asbury Theological Seminar Science For Ministry Program. March 2011.

On the ‘Matter’ of Love: Evolution, Faith, and Human Altruism. Veritas Public Lecture. California Polytechnic University. San Luis Obispo, CA. January 2011.

Theism, Deism, and Evolution. Invited Presentation for BioLogos Foundation International Conference for Christian Leaders. New York, November 2010.

Believers by Nature?: Emerging Biological Accounts of Religious Faith. Christians in Science. Oxford UK. June 2010.

Biological Accounts of Morality and Their Implications for Christian Belief. Oxford University Graduate Christian Union. May 2010.

Teaching Series on Evolution & Christian Theology. Newbigen Fellowship. San Francisco, CA. April 2010 (and 2011, forthcoming).

Biblical Faith and the Science of Origins. Providence Hall Preparatory School. Santa Barbara, CA. April 2010.

On the “Matter” of Love: Evolution, Faith, and the Nature of Altruism. Veritas Lecture. Washington University. March 2010.

Life Sciences and the Living God: Biology, Faith and the Purposes of Life. Inaugural Lecture for T. B. Walker Chair in Natural & Behavioral Sciences. Westmont College. February 2010.

The Mandate to Care for Creation. Environmental Sustainability Plenary Presentation. Westmont College Chapel. February 2010.

God is Creation’s Master Artist – What do We Know About His Brushes? Plenary presentation at BioLogos National Workshop on Science and Faith. November, 2009.

Teaching Evolution in the 21st Century. Darwin Day Panel. Santa Barbara Museum of Natural History. February 2009.

Evolutionary Theory and the Question of Human Uniqueness. Veritas Forum. California Polytechnic University. San Louis Obispo. January 2009.

Emerging Issues in Biosciences & Christian Faith. Invitational Conference on Generating Capital for the Christian Mind. Seattle, WA. August 2008.

Evolution & Creation: Beyond the “or wars”. Birnham Wood Club, Montecito, CA. November 2007.

Intelligent Design: Scientific Debate or Culture War? Westmont Downtown Series, SB, CA. April 2007.

Does Science “Prove” God? Cal Poly University Christian Fellowship. San Luis Obispo, CA. April 2007.

Science, Scripture, and Human Origins. Goleta Presbyterian Church, Goleta CA. January 2007.

Panel on Intelligent Design. Center for Religious Inquiry, Wilshire Boulevard Temple, Los Angeles. Oct, 2006.

The Heavens Declare… Message, Interdenominational Citywide Good Friday Service. Courthouse Gardens, Santa Barbara. March, 2005.

Panel on Environmental Sustainability, Fritzof Capra. Sustainability Project, Santa Barbara, CA. October 2004.

‘What if they gave a war and nobody showed up?’ – Constructive Exchange Between Science & Religion. Invited plenary lecture. Annual workshop of Texas Freedom Network. Dallas, November 2003.

The Four Loves Revisited: Science & Theology on the Natural Loves. Plenary series at national conference, Younger Leaders Network, Buffalo, New York. August, 2003.

The Science of Love: What Biology is Discovering About Caring Relationships. University Club Lecture, Santa Barbara CA. May, 2003.

Made for Monogamy: Science & Scripture on Lifelong Marriage. Calvary Chapel Pastors’ Conference, Sydney Australia, September, 2002

Knowing God through Scripture & Nature. San Diego Covenant Church, February 2002.

**Electronic Media: Radio, Television, and Online Interviews**

"The Ultimate Reservoir of Wonder: Questions of science & philosophy." 2015. Interview, *Science & Belief*. http://scienceandbelief.org/2015/08/06/the-ultimate-reservoir-of-wonder-questions-of-science-and-philosophy/

Interview on evolution and religious faith. PBS Television Series *Closer to the Truth.* February 2012.

Interview with Michael Murray on evolutionary explanations of religion and the viability of faith. Philosophy News. (philosophynews.com)

Dialogue with on evolution and human nature with primatologist Frans deWaal on Bloggerheads TV. May 2009.

Philosophical & Scientific Perspectives on Altruism. *Philosophy Talks*, nationally syndicated public radio show. June 2008.

Science, Religion, and Intelligent Design. Oct. 2006. KRXA, northern California

Is Religion a Natural Phenomenon? March 2006. Public Radio International. (one hour show with Daniel Dennett)

Evangelicals and global warming, March-April 2006. KCBX, SLO; KRXA, NoCal; KXCI, Tucson, AZ

Environmental stewardship and the biblical case for creation care. October 2005 revision of Endangered Species Act.

Radio America (nationally syndicated); KRXA (No California); KSFR (New Mexico).

The Biology of Love. Invited guest for *Springboard* PBS television show. June 2001.

Sociobiology. Invited panelist with Paul Ehrlich & Lionel Tiger*, Uncommon Knowledge* PBS television series, June 2001. *La Paz,*  December. 1994.

"Are Legitimate Science and Religious Belief Contradictory?". Radio discussion with Dr. Nancy Murphy (Philosophy, Fuller Seminary) and Dr. Michael Shermer , (editor, Skeptic Magazine; Adjunct Faculty in History, Occidental College). Larry Mandell 'Live Talk' Show; KPPC Public Radio: Los Angeles. January, 1997.

"The Scientific Controversy Over the Origin of Human Love and Morality." Television interview with Dr. Hugh Ross, *Reasons to Believe*. December 1996; TBN Television network.

"Biblical Stewardship and the Endangered Species Act" Radio interview @ KRPC; Washington, DC. 2/96.

"The United Nations' Conference on 'The Environment and Island Nations: A Christian's Perspective." Interview on Christian Radio, Barbados. 1994.

**Popular writing & print media:**

Schloss, J. 2015. Review of *Faith Versus Fact* by Jerry Coyne. Washington Post. August 3, 2015. https://www.washingtonpost.com/opinions/science-and-theology/2015/08/03/77136504-19ca-11e5-bd7f-4611a60dd8e5\_story.html

Murray, M. and J. Schloss. 2013. "Does Evolutionary Psychology Explain Why We Believe in God? (Parts I & II). BioLogos Forum. http://biologos.org/blog/does-evolutionary-psychology-explain-why-we-believe-in-god-part-1

"Evolution, Creation, and the Sting of Death." Essay exchange with Southern Baptist Theologian John Laing. http://biologos.org/blog/evolution-creation-and-the-sting-of-death-part-1

“Evolution and Belief in a Creator.” Westmont College Horizon. January 2011.

Interview for Fox News Story, “How Pope Reconciled God and the Big Bang.” January 2011.

“Totally – if you’re a Martian!” Essay contributed to *Does Evolution Explain Human Nature?* Templeton Press. April 2009.

“Evolution and God’s Paint Brushes.” Westmont College Horizon. November 2008.

Interview on evolutionary theories of religion, Callas Morning News, “Scientists Rush in Where Angels May Tread” April 2007.

“Looking for Love in All the Right Places: An Interview with Jeff Schloss.” Science & Theology News, Oct 2003.

"To See Things Whole: Evolutionary Biology and the Human Quest for Wisdom." 1999. *Science & Spirit.*  10:2. 16-20.

“Going Off and Drawing Near: Faculty Reflections on Students and Family. 2000. Westmont Magazine.

"Beyond Environmentalism: The Groan of Creation and the Soul's Thirst for God." 1995. Westmont Magazine.

"Sizzler Salad Bars and the Cry of the Poor." *La Paz,* October. 1988

"Social Ecology and the Kingdom of God." *La Paz*, April. 1987

Intelligent Design Debate: *Sacramento Bee*, October 2004

Articles on evolution & altruism, love & religious traditions: *Science & Theology News* (2002-5)

Articles on biology of race, science of gender, evolution & altruism: *Science & Spirit* (2001-3)

**OTHER SCHOLARLY ACTIVITIES / PROFESSIONAL SERVICE**

**EDITORIAL, REVIEW, & GOVERNING BOARDS**

**Governing / Advisory Boards** (stipendary appointments)

Advisory Board, Evolution & Christian Faith Project, Trinity International University. 2015 - present.

Board of Trustees, John Templeton Foundation. 2009 – 2015.

Board of Trustees, Templeton World Charity Foundation. 2009 - 2015.

Board of Trustees, Templeton Religion Trust. 2009 - 2015.

Advisory Board, BioLogos Foundation. 2009 – present.

Advisory Board, Society of Christian Philosophers, Science-Religion in China Project

International Board of Advisors, John Templeton Foundation. 2000 – present.

International Advisory Council, Metanexus Institute for Science & Religion. 2002 – 2004; 2007 – 2009.

**Judging & Planning Panels of Major Grant Programs**

Review Committee, Templeton Prize. 2009 – present.

Advisory & Review Board, Foundational Questions in Evolutionary Biology Grant Program, Harvard University. 2009-2011 .

Judge, Local Societies Grant Initiative. Metanexus Institute. 2005 – 2009.

Judge, Advanced Research Grant Program in Science & Religion. Metanexus Institute. 2006.

Judge, Templeton Research Lecture Grants in Science & Religion. 2004, 2005.

Judge, Science – Religion Course Award Program. Center for Theology & Natural Sciences. 2001, 2002.

Steering Committee, Coalition of Christian Colleges & Univ. Interdisciplinary Grant Program. 1999 – 2005.

**Editorial Boards**

Editorial Board, *Science, Religion, and Culture*

Editorial Board, *Religion, Brain, and Behavior*

Biology Book Review Editor, *Zygon: Journal of Science & Religion*

Editorial Advisor, *Research News in Science & Religion*

Editorial Advisor, *Science & Spirit*

Editorial Board Member, *Science & Christian Belief*

Editorial Board Member, *Theology and Science*

Editorial Advisory Board, Renewed Minds Book Series, Baker Books / CCCU

**Professional Service:**

Faith-Learning-Living Council, Coalition of Christian Colleges & Universities, 2003-2006.

Academic Council, Creation Care Study Program, 1999 – 2005.

Chair Education Committee, Evangelical Environmental Council

Academic Council, AuSable Institute for Environmental Studies, 1984 – present.

Reviewer, Science-Religion Course Award Proposals: Center Theology & Natural Sciences. 1999-2000.

External Evaluator. Science/Religion Course Program, Center for Theology & Natural Sciences. 1999-2000.

External Advisor. Interdisciplinary Science General Education Program. Cornerstone College. 1998-1999.

**Reviewer:**

*Oxford University Press*

*Religion, Brain, and Behavior*

*Theology & Science*

*Perspectives in Religious Studies*

*Perspectives on Science and the Christian Faith*

*Christian Scholar’s Review*

*Bioscience* (American Institute of Biological Sciences)

*Ecology* (Journal of the Ecological Society of America)

*Christian Scholar's Review*

*Perspectives on Sciences and the Christian Faith* (Journal of the American Scientific Affiliation)

Grant Proposals, John Templeton Foundation, Metanexus Institute, Institute Research Unlimited Love

# INTERNATIONAL CONFERENCES & COLLABORATIONS

# Conferences/Workshops Co-Directed

Evolution of Religious Cognition & Behavior Westmont / Biltmore 2011

International Workshop on Evolution & Conscience Santa Fe Institute April 2010

International Workshop on Biology & Religion Westmont College January 2010

National Conference on Nature & Belief Calvin College November 2005

Invitational Workshop on Nature & Ethics Nassau, Bahamas September 2004

Evolution & the Problem of Natural Evil Westmont College January 2004

National Conference Evolution, Ethics, & Altruism Calvin College November 2002

International Conference Empathy, Altruism, Agape’ Boston October 1999

# Participation In Invitational Collaborative Projects, 2001 -

# (interdisciplinary multi-year workshop & book projects)

Darwinian Accounts of Morality Harvard University 2009-10

The Adaptive Logic of Religious Belief & Behavior University of Edinburgh 2008-11

Cognition, Religion, and Theology Project Oxford University 2008-10

Political, Religious, and Ideological Uses of Biology Cambridge University 2007-8

Love & Eudemonia: Science, Theology, & Polity Emory University 2006-10

Science & Spirit: Pentecostal Views of Science-Religion Regent University 2006-8

Body, Soul, and Spirit in Science & Theology University of Heidelberg 2006-10

The Evolution and Theology of Cooperation Harvard University 2005-7

Concepts of “Law” in Science, Theology, & Legal Studies University of Heidelberg 2005-10

Non-Supervenience Approaches to Mind & Body Ursinus College 2004-6

Becoming Human: Perspectives on Human Nature Stanford University 2003-5

Resurrection: Scientific & Theological Perspectives University of Heidelberg 2001-2

**Invited Workshops & Consultations, 2001 -**

Evolution, Neuroscience, and Human Personhood. Stanford University, March 2015.

Evolution and Human Personhood. Jacksonville, FL. Feb. 2012.

Science, Faith, and Truth Pilot Curriculum Forum. Trinity Forum, Stanford University. Oct., 2010.

Does Religion Breed Intolerance? Oxford University, June 2010.

Science, Faith, and Truth Summer Symposium. Trinity Forum, Washington DC. July, 2009.

Moral Markets: Ethics, Economics, and Liberty. Liberty Fund Conference. San Diego, CA. March, 2009.

Generating Capital for the Christian Mind. Woodinville, OR. August, 2008.

Biology & Religion: Explaining & Explaining Away. Panel Chair. Metanuexus Conference on Transdisciplinarity and the Unity of Knowledge. University of Pennsylvania. June, 2007.

Biology and the Origin of Virtue. Liberty Fund Conference. Key West, FL. December, 2006.

Freedom & Responsibility in Darwin. Liberty Fund Conference. Glenn Arbor, MI. July, 2005.

Non-Darwinian Evolution. Sorbonne. May, 2004.

Freedom & the Evolution of the Human Brain. Liberty Fund Conference. Tucson, AZ. April, 2004.

Fitness of the Cosmos for Life: Biochemistry and Fine-Tuning. Harvard University. October, 2003.

Science and Human Freedom. Liberty Fund Conference. Key West. July, 2003.

Neuroscience and the Emergence of Personhood. Stanford University. February, 2003.

Evolutionary Game Theory & the Emergence of Order. Institute for Advanced Study, Princeton. March, 2002.

Teleonomy, Purpose, and Evolutionary Biology. Duke University. March, 2001.

**FIELD EXPERIENCE**

Jaguar Creek Rainforest Rsch. Center (Belize) Christian Envir. Assoc. 1995-2002

Quetzal Education & Research Center (Costa Rica) Southern Nazarene University 1992, 96, ‘04, ‘11

Orama Field Station (Great Barrier Island, New Zealand) Creation Care Study Program 2001, 2003

La Selva Biological Station (Costa Rica) Org’n for Tropical Studies 1992; 96, ’04, ‘11

Wheaton College Science Station (SD) Wheaton College 1989-2003

Douglas Lake Biological Station (MI) University of Michigan 1977-86; 1995-03

Chesapeake Bay Center for Environmental Studies (MD) Smithsonian Institution 1977

Mountain Lake Biological Station (VA) University of Virginia 1976

Fort Burgwin Biological Station (NM) So. Methodist University 1976

**ADMINISTRATIVE EXPERIENCE & COMMUNITY SERVICE**

**Westmont College Governance and Administrative Service:**

Biology Department Chair 1989 – 1996; 2006 – 10.

Budget & Salary Committee (Chair, 2012- 2010 – 2013.

Provost Search Committee 2008 – 2011.

Admissions Committee 2006 – 2010.

Faculty Senate 1989 – 1996; 2006-2010.

Hiring for Mission Task Force 2004 – 2006.

Faculty Council 2002 – 2003.

Presidential Search Committee 2000 – 2001.

Chaplain Search Committee 1998 – 1999.

Off Campus Programs Committee 1990 – 2006.

College Campaign & Master Plan Task Force 1995 – 1997.

Personnel Committee 1998.

Provost Search Committee 1995 – 1996.

Institutional Vision Statement Task Force 1994 – 1996.

Presidential Task Force on Long Range Planning 1993 – 1996.

Academic Planning Committee (Chair, 1992-94; 1995-96) 1991 – 1996.

Student Life Committee (Chair, 1984-88) 1982 – 1988.

Dean's Council on Academics & Student Development 1984 – 1986

Interdisciplinary Studies Task Force 1985 – 1986.

Ethics Across the Curriculum Committee 1986 – 88.; 90 – 91.

Computer Committee 1983 – 1989.

Head, biology curriculum & departmental evaluation 1990 – 1992.

Chair, faculty search committees (multiple occasions) 1989 – .

## Community Service:

Trustee American European Bethel Mission, 2007 – present.

Leadership Committee Santa Barbara Science Education Partnership (SB public schools), 2006 – 7.

Planning Committee Santa Barbara Sustainability Project, 2004 – 6.

Advisory Committee UCSB New Visions in Science & Religion Program, 2004 – 6.

Executive Council Montecito Covenant Church, 1996 – 1997.

**TEACHING**

**ACADEMIC TEACHING EXPERIENCE**

**Field Programs Developed:**

Global Stewardship Study Program. Semester field study program in Belize, available to CCCU schools. Co-founded with Gordon Aeschliman and Chris Elisara, Christian Environmental Association.

Creation Care Study Program. Semester field study program in Samoa / New Zealand, available to CCCU schools. Co-founded with Chris Elisara, Restoring Eden.

Westmont College Tropical Mayterm. Developed and run six-week tropical ecology & global sustainability Mayterm in Costa Rica.

**Field Courses (taught at residential biological field stations):**

Physiological Plant Ecology (University of Michigan Biological Station)

Forest Ecology {Jaguar Creek Environmental Center, Belize}

Ecology (Wheaton College Science Station)

Environmental Science (Wheaton College Science Station)

Tropical Ecology (Costa Rica; various field stations)

## Majors’ Disciplinary Courses

Introductory Biology w/ lab (team taught, Ecology & Evolution section)

Biology of Organisms w/ lab

General Physiology w/ lab

General Ecology w/ lab-field

Physiological Ecology w/ lab-field

Human Ecology

Evolution (“Origins,” upper division course open to majors and non-majors)

Senior Seminar in Biological Literature

**Non-Majors’ Disciplinary (General Education) Courses**

Human Physiology (lab)

Humans and the Biological World (non-majors biology)

The Universe, Order, and Change (team taught; integrated science general education core course)

Matter, Energy, and Life (team taught; integrated science general education core course)

**Interdisciplinary Courses:**

Biology & Faith (issues in Christian theology & biological sciences, senior capstone)

Philosophy, Faith, and Evolution (upper division, team taught with philosopher)

God and Nature (overview of issues, history, and philosophy of science-religion)

Global Biology & the World Christian (biological, social, and theological perspectives on diversity & ecology)

Sociobiology & Human Nature

Human Love & Sexuality

Seminar in Bio/Environmental Ethics

Perspectives on Gender (team-taught, senior capstone course)

**Faculty Workshops, Short-Courses & Institutes:**

Plenary Lecturer, Faraday Institute for Science & Religion Summer Course, Cambridge University. 2006, 2007.

Faculty Participant, NSF/Chautauqua Faculty Short Course on Ecology of Coral Reefs. 2005.

Plenary Lecturer, Oxford-CCCU Faculty Summer Course on Science-Religion, 2004

Co-Instructor, Calvin College Faculty Workshop on Nature and Belief. 2004.

Co-Instructor, Calvin College Faculty Workshop on Evolution, Theology, and Human Nature, 2001

Plenary Lecturer, Center for Theology & Natural Sciences Workshops of Faith/Science, 1998 - 2002

Faculty Participant, Houghton Institute of Integrative Studies: Summer Workshop on Moral Philosophy. 1997.

Faculty Participant, NSF/Chautauqua Short Course in Creation/Evolution. Honolulu, 1988.

Faculty Participant, CCCU Short Course on the History of Science. George Fox College; Newberg, OR. 1986.

**MENTORING OF UNDERGRADUATE RESEARCH:**

Cooperation and polymorphic variation in oxytocin receptor gene. Meridian Rhode. 2013- 2015.

Religious worship, cooperation, and plasma oxytocin. Myvy Ngo, Brent Tatomir, Tyler Macrae. 2013-14. (presented at Westmont College Research Symposium).

Parasitoid Defense by Hitch-hikers in Leafcutter Ants. Derek Troya, Kameron Bechler, Brittany Miller 2011. (presented at Westmont College Research Symposium).

“Richard Dawkins’ ‘weasel analogy’ of selection’s probability amplification: population genetic assumptions.” Karli Johnson. 2006. Senior Project: Literature review and computer program. Co-supervised by Prof. Wayne Iba, Computer Science.

“The Photophilous Myth: distributional patterns and biophysical adaptations of terricolous lichens in forest gaps.” Alison Girod and Amanda Sparkman. 2004. Poster, Annual West Coast Biological Sciences Undergraduate Research Conference. Point Loma Nazarene University. San Diego, CA.

“Vasotocin modifies organismic water potential and direction of water flow across anuran ventral integument.” Alison Girod, Dathan Hamann, and Amanda Sparkman. 2004. Poster, Annual West Coast Biological Sciences Undergraduate Research Conference. Point Loma Nazarene University. San Diego, CA.

“Tissue water potential and photosynthesis rates in north and south facing leaves of  *Nerium oleander*.” Amanda Sparkman. 2003. Poster, Westmont College Undergraduate Research Symposium. Also, opening plenary oral presentation at Westmont College Celebration of Student Research.

“Tissue water potential of a salt-storer *(Salicornia virginica*) and salt-pumper (*Limonium californicum*) species along a salt marsh gradient. Emily Hoffman. 2001. Poster, Westmont College Undergraduate Research Symposium.

“Growth rates of terricolous lichen ground cover along a canopy closure gradient.” Benjamin Lassond 2000. Two-year project, developed and implemented computer program for digital canopy analysis and ANOVA of growth plot data.

“Differential vulnerability to a plant parasite (*Cuscuta salina*) and its impact on growth and distribution of *Salicornia virginica* and *Arthrocnemum subterminal*e in a California salt marsh.” Graham Lyons & Jonathan Ball. 1995. Senior field project.

“Optimizing data acquisition hardware & software for the biological sciences: multi-use applications in laboratory & field settings.” Chris Kronberg. 1993. Presentation (by Schloss) at Annual Conference of the Association for Biological Computing. California State Polytechnic University. San Louis Obispo, CA.

*Field & Study Guide for Tropical Ecology: a Costa Rica Field Course.* Brian Cronk. 1993. Senior Project based on directed summer fieldwork in Costa Rica and John Kricher’s *Neotropical Companion*.

“The relationship of distribution and growth rates of *Cladonia* and *Cladina* ground cover to forest floor microclimate.” Denise Deckert. 1989. Senior Project.

"Biophysical models of water loss in *Rana pipiens*." Phillip J. Arnold, Kevin L. Flack, and Jeffrey Wigmore. 1987. Oral Presentation, Annual West Coast Biological Sciences Undergrad Research Conf. Univ of Santa Clara.

"Ecophysiological adaptations to contrasting moisture regimes of sun and shade species of terricolous lichen." Winifred Grasser and Anna Park. 1986. Oral Presentation, Annual West Coast Biological Sciences Undergraduate Research Conference. Occidental College. Los Angeles, CA.

"Interactions between circadian rhythmicity, thermal shock, and whole locomotor performance in adult *Rana pipiens*." R. L. Bagwell, Charlene Heise, Jennifer Jones, Janice C. Leaman, and Susan Shuemaker. 1984. Oral Presentation, Annual West Coast Biological Sciences Undergrad Research Conf. University of Santa Clara.

"Effects of fasting on thermal preferenda and thermal conductance of *Rana pipiens*." 1984. Barry R. Hamann and Diane S. Ratzlaff. 1984. Oral Presentation, Annual West Coast Biological Sciences Undergraduate Research Conference. University of Santa Clara. Santa Clara, CA.

"Effects of temperature acclimation on behavioral and physiological thermal regulation in *Rana pipiens*." Stephen W. Ernest and Donald Wessel. 1983. Oral Presentation, Annual West Coast Biological Sciences Undergraduate Research Conference. University of Santa Clara. Santa Clara, CA.

"Effects of temperature acclimation on whole organism locomotor performance in *Rana pipiens*." Kevin S. Callaway and Pamela Herrick. 1982. Oral Presentation, Annual West Coast Biological Sciences Undergraduate Research Conference. University of Santa Clara. Santa Clara, CA.

"Mechanism of action of vasotocin in two species of anuran amphibian." Curtis Hamann and William J. Kimball. 1982. Oral Presentation, Annual West Coast Biological Sciences Undergraduate Research Conference. Univ. of Santa Clara.

CUrriculum vitae

**STEVEN M. JULIO, Ph.d.**

Department of Biology

Westmont College

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Santa Barbara, CA 93108

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email: sjulio@westmont.edu

**Education**

Ph.D., Biochemistry and Molecular Biology 2001

University of California, Santa Barbara

B.S., Biology, Westmont College, Santa Barbara, CA 1992

**EMPLOYMENT**

Associate Professor

Department of Biology, Westmont College 2012-present

Assistant Professor 2006 - 2012

Department of Biology, Westmont College

Philip MorrisPostdoctoral fellow 2003-2006

University of California, Santa Barbara

Lecturer, Summer Sessions 2003

University of California, Santa Barbara

Research Scientist I, Remedyne Corporation 2001-2003

Santa Barbara, CA

Research/Teaching Assistant 1992-2001

University of California, Santa Barbara

**PROFESSIONAL RESPONSIBILITIES**

External referee, *Molecular Microbiology* 2011-2012

External referee, *Infection and Immunity* 2011-2013

## PROFESSIONAL SOCIETIES

American Society for Microbiology 2001-present

American Scientific Affiliation 2002-present

**Awards and Honors**

Westmont College Bruce and Adaline Bare 2010

Teacher of the Year Award in Natural and Behavioral Sciences

Westmont College Professional Development Grant 2006, 2010, 2015

Philip Morris External Research Program Postdoctoral Fellowship 2004

Graduate Student Seminar Series

Senior Grad Student Award for best research seminar 2000

Graduate Student Fee Fellowship 1994

### Publications (Westmont student co-authors underlined)

1. Kaut, C. S., Duncan, M. D., Kim, J. Y., Maclaren, J., Cochran, K., and **S. M. Julio**. 2011. A novel sensor kinase is required for *Bordetella* to colonize the lower respiratory tract. Infect Immun, **79**(8): 3216-3228.

2. **Julio, S. M**., Inatsuka, C., Mazar, J., Dietrich, C., Relman, D., and P. Cotter. 2009. Natural-host animal models indicate functional interchangeability between the filamentous hemagglutinins of *Bordetella pertussis* and *Bordetella bronchiseptica* and reveal a role for the mature C-terminal domain, but not the RGD, during infection Mol. Microbiol. **71**(6):1574-1590

3. Heithoff, D. M., G. Badie, **S. M. Julio**, E. Y. Enioutina, R. A. Daynes, R. L. Sinsheimer, and M. J. Mahan. 2007. In vivo selected mutations in methyl-directed mismatch repair suppress the virulence attenuation of *Salmonella* dam mutant strains following intraperitioneal, but not oral infection of naïve mice. J. Bacteriol. 189: 4708-4717.

4. Inatsuka, C. S., **S. M. Julio**. and P. A. Cotter. 2005. *Bordetella* filamentous hemagglutinin plays a critical role in immunomodulation, suggesting a mechanism for host specificity. Proc. Natl. Acad. Sci. USA. **102**:18578-18583.

5. **Julio, S. M**. and P. A. Cotter. 2005. Characterization of the filamentous hemagglutinin-like protein FhaS in *Bordetella bronchiseptica*. Infect Immun. **73**(8):4960-4971.

6. **Julio, S. M**., D. M. Heithoff, and M. J. Mahan. 2002. DNA adenine methylase overproduction in *Yersinia pseudotuberculosis* alters YopE expression and secretion and host immune responses to infection. Infect Immun. **70**(2):1006-1009.

7. **Julio, S. M**., D. M. Heithoff, D. Provenzano, K. E. Klose, R. L. Sinsheimer, D. A. Low, and M. J. Mahan. 2001. DNA adenine methylase is essential for viability and plays a role in the pathogenesis of *Yersinia pseudotuberculosis* and *Vibrio cholerae*. Infect Immun. **69**:7610-7615.

8. **Julio, S. M**., D. M. Heithoff, and M. J. Mahan. 2000. *ssrA* (tmRNA) plays a role in *Salmonella enterica* serovar Typhimurium pathogenesis. J. Bacteriol. **182**:1558-1563.

9. Conner, C. P., D. M. Heithoff, **S. M. Julio**, R. L. Sinsheimer, and M. J. Mahan. 1998. Differential patterns of acquired virulence genes distinguish Salmonella strains. Proc. Natl. Acad. Sci. USA. **95**:4641-4645.

10. **Julio, S. M**., C. P. Conner, D. M. Heithoff, and M. J. Mahan. 1998. Directed chromosomal deletions of *Salmonella typhimurium*- specific genes induced during infection. Mol. Gen. Genet. **258**:178-181.

11. Heithoff, D. M., C. P. Conner, P. C. Hanna, **S. M. Julio**, U. Hentschel, and M. J. Mahan. 1997. Bacterial infection as assessed by *in vivo* gene expression. Proc. Natl. Acad. Sci. USA. **94**:934-939.

**INVITED ORAL PRESENTATIONS**

**Julio, S. M**. “Toward a better vaccine for whooping cough: understanding the need, celebrating the effort” Westmont College Downtown lecture series, 2015

**Julio, S. M**. “New kid on the block: a role for the sensor kinase PlrS in *Bordetella* pathogenesis” Westmont College Biology Department research talk, 2015

**Julio, S. M**. “New kid on the block: a role for the sensor kinase PlrS in *Bordetella* pathogenesis” University of North Carolina, Chapel Hill Research Colloquium, 2014

**Julio, S. M.** “*Bordetella* pathogens and the immune system: the great balancing act” UCSB Undergraduate Research Colloquium, 2006

**Julio, S. M.** “How *Bordetella* Cause Respiratory Infections” UCSB Undergraduate Research Colloquium, 2005

**Julio, S. M**. “Vaccine development using *Salmonella typhimurium* DNA adenine methylase mutants” In: Westmont College NBS Seminar Series, 2000

**PRESENTATIONS: ACCEPTED ABSTRACTS AT REGIONAL/NATIONAL CONFERENCES** (Westmont research student co-authors underlined)

Wilk, A., McHargue, B., Bonenfant, G., Nicholson, T., Ramirez, J., and **S.M. Julio. “**A Role for the Sensor Kinase PlrS in Controlling the Response of *Bordetella bronchiseptica* to Elevated CO2 Levels” In: American Society for Microbiology, General Meeting, Spring 2014.

Kaut, C. S., Duncan, M. D., Kim, J. Y., Maclaren, J., Cochran, K., and **S. M. Julio**. 2011. “A novel sensor kinase is required for *Bordetella* to colonize the lower respiratory tract” In: The American Society for Microbiology General Meeting, Spring 2011.

**Julio, S. M.**, C.S. Inatsuka, and P. A. Cotter. “The C-terminal Domain of Filamentous Hemagglutinin (FHA) is Required for Lower Respiratory Tract Colonization and Immunomodulation” In: Eighth International Symposium: Saga of the Genus Bordetella, Institut Pasteur, 2006.

**Julio, S. M.**, and P. A. Cotter. “Characterization of the FHA-like Protein FhaS in *Bordetella bronchiseptica*” In: American Society for Microbiology, General Meeting 2005.

Inatsuka, C. S., **S. M. Julio**, and P. A. Cotter. “*Bordetella bronchiseptica* Expressing Filamentous Hemagglutinin (FHA) from *Bordetella pertussis* Reveals a Critical Role for FHA in the Induction of an Inflammatory Response

” In: American Society for Microbiology, General Meeting 2004.

Xiang, R., K. S. Cooke, **S. M. Julio**, A. J. Dahlsten, R. Ballester, R. A. Reisfeld, and K. M. Zsebo. “Single Dose of Remestim-CEA Oral Vaccine Protects Against Pulmonary Metastases” In: Gene-Based Vaccines: Mechanisms, Delivery Systems and Efficacy (Keystone Symposia) 2002.

Heithoff, D. M., **S. M. Julio**, and M. J. Mahan. “The Role of DNA Methylation in Controlling Bacterial Virulence” In: American Society for Microbiology, General Meeting 2001.

**PRESENTATIONS GIVEN BY RESEARCH STUDENTS: ACCEPTED ABSTRACTS (presenters with an asterisk; contributors underlined)**

\*Fetters, K., and **S. M. Julio**. “Functional interaction between two-component regulators required for virulence in *Bordetella*” In: West Coast Biological Sciences Undergraduate Research Conference, Spring 2015 (oral presentation).

\*McHargue, B., and **S. M. Julio**. “Analysis of the role of plrS in CO2 sensing in multiple Bordetella bronchiseptica strains” In: West Coast Biological Sciences Undergraduate Research Conference, Spring 2014 (oral presentation).

\*Wilk, A., McHargue, B., Bonenfant, G., Nicholson, T., Ramirez, J., and **S.M. Julio**. “A role for the PlrS sensor kinase in controlling the response to CO2 in *B. bronchiseptica*” In: West Coast Biological Sciences Undergraduate Research Conference, Spring 2014.

**\***Midgley, J., \*LaBarba D., \*Wheeler, M., and **S. M. Julio.** “Examining the role of *plrS* in *Bordetella bronchiseptica* virulence gene expression” In: The West Coast Biological Sciences Undergraduate Research Conference, Spring 2013.

\*Duncan, M., Williams, S., Cochran, K., and **S.M. Julio**. “Disruption of the BB0264/BB0265 genes in *Bordetella* affects virulence” In: West Coast Biological Sciences Undergraduate Research Conference, Spring 2010.

**\***Pritchett, J.C., and **S. M. Julio**. “FhaL from *B. bronchiseptica* plays a role in colonization of the mouse respiratory tract” In: Southern California Conference for Undergraduate Research, Fall 2009

**\***Kaut, C. S. and **S. M. Julio**. “Analysis of *Bordetella bronchiseptica* Two-Component Regulators in Respiratory Tract Infection” In: Southern California Conference for Undergraduate Research, Fall 2007

**PRESENTATION GIVEN BY RESEARCH STUDENTS: UNDERGRADUATE SYMPOSIA**

Wilk, A., Fetters, K., Webber, M., Smith, N., Nicholson, T., Bone, M., Cotter, P., and **S.M. Julio**. “CO2-responsive sensor kinase PlrS is required for BvgAS activity in *Bordetella bronchiseptica*.” In: Westmont College Undergraduate Research Symposium, Spring 2015.

McHargue, B. and S.M. Julio. “*plrS*-dependent CO2 sensing in *Bordetella bronchiseptica*” In: Westmont College Undergraduate Research Symposium, Fall, 2013.

Midgley, J., Gardner, S., McHargue, B., West, J., Iba, W., and **S. M. Julio**. “Analysis of microarray-identified genes that are regulated by PlrS in *Bordetella bronchiseptica*” In Westmont College Undergraduate Research Symposium, Spring 2013.

Midgley, J., LaBarba D., Wheeler, M., and **S. M. Julio.** “Examining the role of *plrS* in *Bordetella bronchiseptica* virulence gene expression” In: Westmont College Undergraduate Research Symposium, Fall 2012.

Beard, M., Bond, A., Burks, A., Ramirez, J., and **S. M. Julio**. “Microarray-based analysis of the PlrAS two-component regulator of *Bordetella bronchiseptica*” In: Westmont College Undergraduate Research Symposium, Spring 2012.

Burks, A., Kleen, S., Ramirez, J., and **S. M. Julio**. “Evaluating the role of PlrS as a regulator of gene and protein expression in *Bordetella bronchiseptica*” In: Westmont College Undergraduate Research Symposium, Fall 2011

Burks, A., Kleen, S., Ramirez, J., and **S. M. Julio**. “Evaluating the role of the sensor kinase PlrS from *B. bronchiseptica* in response to innate and adaptive immunity” In: Westmont College Undergraduate Research Symposium, Fall 2011.

Cochran, K., Conley, Z., Ramirez, J., Roberts, S., and **S. M. Julio**. “Phenotypes associated with PlrS-mediated virulence in *Bordetella bronchiseptica*” In: Westmont College Undergraduate Research Symposium, Spring 2011

Kim, J., and **S. M. Julio**. “Characterization of the virulence phenotype of BB0264 in Bordetella bronchiseptica” In: Westmont College Undergraduate Research Symposium, Fall 2010

Duncan, M., Williams, S., Cochran, K., and **S.M. Julio**. “Disruption of the BB0264/BB0265 genes in *Bordetella* affects virulence” In: Westmont College Undergraduate Research Symposium, Spring 2010

Pritchett, J.C., and **S. M. Julio**. “FhaL from *B. bronchiseptica* plays a role in colonization of the mouse respiratory tract” In: Westmont College Undergraduate Research Symposium, Fall 2009

Maclaren, J., and **S. M. Julio**. “A filamentous hemagglutinin-like C-terminal domain is required for FhaS to function as an adhesin in *Bordetella bronchiseptica*” In: Westmont College Undergraduate Research Symposium, Fall 2008

Duncan, M., Maclaren, J., Kaut. S., and **S. M. Julio**. “Analysis of the virulence properties of the *Bordetella bronchiseptica* two-component regulator 0264/0265” In: Westmont College Undergraduate Research Symposium, Fall 2008

Downend, N., Nannepaga, S., Grieco, E., and **S. M. Julio**. “Characterization of the Surface-Expressed FhaS Protein in *Bordetella* Infection” In: Westmont College Undergraduate Research Symposium, Spring 2008

Kaut, C. Hoesterey, K., Downend, N., and **S. M. Julio**. “Analysis of a *Bordetella bronchiseptica* Two-Component Regulator Required for Virulence” In: Westmont College Undergraduate Research Symposium, Spring 2008

Hammer, B., Zirschky, K., Valladares, C., Johnson, J., Newton, T., Ashley, J., Nannepaga, S., **Julio, S. M**., and M. N. Masuno. “Investigating Pacific Coast Sponges for Novel Marine Natural Products with Anti-bacterial Activity” In: Westmont College Undergraduate Research Symposium, Spring 2008

# FORMAL TEACHING EXPERIENCE

University of California, Santa Barbara

Department of Molecular, Cellular, and Developmental Biology

MCDB 1A – *Introduction to biochemistry, cell biology,* 2003

*development, and genetics*

MCDB 1B – *Introduction to animal and plant physiology* 2003

Westmont College, Department of Biology

BIO-006  *General Biology II (Animal physiology)* 2006-present

BIO-102  *Physiology, with laboratory*  2006-present

BIO-132 *Molecular Biology, with laboratory* 2007-present

BIO-195 *Seminar in Biological Literature* 2007-present

BIO-196 *Seminar in Bioethics* 2007-present

BIO-155 *Infectious Disease and Immune Response* 2008-present

BIO-114L *Laboratory in Genetics* 2009-present

**SUPERVISED RESEARCH WITH UNDERGRADUATES – Westmont College**

Alina Logerquist Fall 2006 – Spring 2007

Callan Kaut (*Major honors, 2008*) Summer 2007 – Summer 2008

Shreya Nannepaga Fall 2007 – Spring 2008

Roberto Valladares Fall 2007

Nathan Downend Spring 2008

Elisa Grieco Spring 2008

Kyle Hoesterey Spring 2008

Mark Duncan Summer 2008 – Fall 2009

Josh Maclaren Summer 2008 – Fall 2009

Preston Angell Fall 2008 – Spring 2009

Jenna Stephens Spring 2009

Josh Pritchett Summer 2009 – Fall 2010

Stefanie Williams Fall 2009

Zack Conley Fall 2009 – Spring 2011

Keith Cochran Fall 2009 – Spring 2011

Je Yei Kim Summer 2010

Sarah Roberts Fall 2010 – Spring 2011

Samantha Kleen Summer 2011

Amanda Burks Fall 2010 – Spring 2012

Jose Ramirez Fall 2010 – Spring 2012

Megan Beard Fall 2011 – Spring 2012

Aleah Bond Fall 2011 – Spring 2012

Michelle Wheeler Spring 2012 – Summer 2012

Dean LaBarba Summer 2012

Jeff Midgley Summer 2012 – Spring 2013

Jacob West Fall 2012

Brittany McHargue (*Major honors, 2013*) Fall 2012 – Fall 2013

Samantha Gardner Spring 2013

Gaston Bonenfant Fall 2013

Aaron Wilk Fall 2013 – present

Madeleine Webber Fall 2014 – present

Natalie Smith Fall 2014 – present

Kirk Fetters Spring 2015 – present

Rachel Maragliano Fall 2015

**SERVICE – Westmont College and Community**

A. *Service to the institution at large*

1. Committee work

Professional Development Committee Fall2008–

***Committee Chair*** Spring 2009

Off-Campus Programs Committee Fall 2009 –

Spring 2012

Institutional Review Board (1 semester replacement) Fall 2012

Faculty Council (elected as 1 semester replacement) Spring 2013

Athletic Committee (1 semester replacement) Fall 2013

Faculty Council Fall 2014 – present

***Committee Secretary 2014-2015***

***Vice-chair 2015-2016***

2. Other, arranged chronologically from start date

Keynote speaker, Celebration of Summer Research Fall 2006

Symposium

Phi Kappa Phi student induction dinner – faculty Spring 2007 and

host Spring 2011

Campus host: Invited Speaker (Peggy Cotter, UCSB) Spring 2007 for Natural/Behavioral Sciences Seminar Series

Co-organizer – Student/Faculty Research Lunches Summer 2007

Secretary of the Faculty Fall 2007 –

Spring 2008

Panelist, New Faculty Workshop Fall 2007 and

Fall 2008

Faculty participant, Spring Sing Spring 2008

Spring 2009

Selection committee, David K. Winter Servant Spring 2009 and

Leadership Award Spring 2010

Ad hoc committee to review the Westmont College Fall 2009

academic home page (invitation by the Provost)

Search committee, Tenure-track position in Fall 2010

Kinesiology

Organizer, Natural and Behavioral Sciences Fall 2010 –

Seminar Series present

Interviewer for Monroe Scholar candidates Spring 2011

Devotional presentation at Faculty meeting Fall 2011

Faith/Science Faculty Book Discussion Group Fall 2008

Fall 2009

Fall 2011

Fall 2012

Presentation at first-year faculty Faith/Learning Spring 2012 (invited)

Seminar

Chapel Ash Wednesday service; ash provider Spring 2012

Panel member, Page men discussion “Living as Spring 2012

a Godly man”

Spring Sing kickoff participant Spring 2012

Summer faculty assessment workshop: writing Summer 2012

across the curriculum

Faculty search committee: Kinesiology open position Fall 2012 –

Spring 2013

Discussion panel: Faculty Reading Group on Fall 2012

Implications of Darwinism and Christianity

Presentation to Board of Trustees on Faculty/Student Fall 2012

collaborative research

Panel member: Parents’ Weekend discussion on Spring 2013

sophomore/junior student time management

Presentation to Board of Advisors on Faculty/Student Spring 2013

collaborative research

Panel member, New Student Orientation Weekend Fall 2014

(for Parents)

Interviewer of Panel consisting of Provost and VP of Fall 2014

Student Life, Faculty Forum

Presentation at first-year faculty Faith/Learning Fall 2014

Seminar

Interviewer/Facilitator, Panel on Student Conduct, Fall 2014

Faculty Forum

B. *Service on behalf of the Biology department*

Biology Department Representative, Spring 2007;

Westmont College Preview Days Spring/Fall 2008

Fall 2009

Fall 2010

Spring 2010

Fall 2011

Spring 2015

Introduction of Outstanding Biology Major, Chapel Spring 2008

Spring 2010

Spring 2011

Keynote speaker, Biology Department Chapel Fall 2008

Organizer, Biology Department Chapel Fall 2008

Fall 2009

Fall 2010

Fall 2012

Search committee, Tenure-track position in Biology Fall 2010

Department Reader, Commencement Spring 2010

Coordinator and report writer, Annual departmental Summer 2011

assessment activity

Poster session judge, West Coast Biological Sciences

Undergraduate Research Conference Spring 2015

Department Chair Fall 2015 - present

C*. Service on Student Major Honors Committees* (\* denotes committee chair)

*Michelle Evans* 2006-2007

*Alaina Phillips* 2007-2008

*Roberto Valladares* 2007-2008

***\*****Callan Kaut* 2007-2008

*Brittney Hammer* 2008-2009

*Taylor Judkins* 2009-2010

*Christine Binkley* 2009-2010

*Angela Do* 2009-2010

*Callie Howland* 2010-2011

*Jeff Kuwahara* 2010-2011

*Katherine Shaum* 2010-2011

*William Hoshberger* 2010-2011

*Rachel Teranishi* 2010-2011

*Samantha Gardner* 2011-2012

*Kelsey Cannon* 2011-2012

*David Thompson* 2012-2013

***\*****Brittany McHargue* 2013

D. *Church and community service*

Sunday School Leader, grade 4, Santa Barbara Fall 2010 –

Community Church Spring 2011

Sunday School Teacher, Kindergarten, Santa Summer 2008 -

Barbara Community Church Spring 2010;

Fall 2012 – Spring 2015

Christmas Choir, Santa Barbara Community Church Fall 2007, 2008, 2013, 2014

Nature hike leader for Peabody Charter School Summer 2011

Advisor for science project for San Spring 2012

Marcos High School

Advisor for science project for La Colina Junior Spring 2013, 2015

High School and California State Science Fair

**Curriculum Vitae**

**Frank Percival**

**Education**

B.A. (Biology) 1969, Occidental College

Ph.D. (Bio. Sci., Plant Biochemistry) 1973, University of California,   
 Santa Barbara

Postdoctoral Study, 1973-75, Michigan State University

**Professional Experience**

Professor of Biology, Westmont College, 1987-present

Sabbatical Leave, University of California, Santa Barbara, 2008

Sabbatical Leave, University of California, Santa Barbara, 2001

Sabbatical Leave, University of California, Santa Barbara, 1991-1992

Associate Professor of Biology, Westmont College, 1981-1987

Sabbatical Leave, Stanford University, 1984

Assistant Professor of Biology. Westmont College, 1975-1981

Major teaching areas include Biochemistry, Microbiology and Plant Sciences

**Administration**

Chair, Department of Biology, 1979-82, 1985-89, 1996-99, 2003-06

**Professional Affiliations**

American Society of Plant Biology

American Society for Microbiology

American Scientific Affiliation

**Honors and Awards**

Outstanding Teacher Award, Natural Sciences 1990, 1996, 2002

NSF Research Opportunity Award 1991

Faculty Research Award 1990

NSF Predoctoral Fellow, 1970-1973

**Publications**

Courtney, K.J., F.W. Percival, D.L. Hallahan, and R.E. Christoffersen. 1996. Cloning and sequencing of a cytochrome P-450, CYP89, from *Arabidopsis thaliana* (Accession No. U61231) (PGR96-061). *Plant Physiol.* 112: 445.

Christoffersen, R.E., F.W. Percival, and K.R. Bozak. 1995. Functional and DNA sequence divergence of the CYP71 gene family in higher plants. *Drug Metabol. Drug Interact.* 12: 207-219.

Kutsunai, S.Y., A.C. Lin, F.W. Percival, G.G. Laties, and R.E. Christoffersen. 1993. Ripening-related polygalacturonase cDNA from avocado. *Plant Physiol.* 103: 289-290.

Percival, F.W., R.E. Christoffersen, L.G. Cass, and K.R. Bozak. 1991. Avocado fruit protoplasts: a cellular model system for ripening studies. *Plant Cell Reports* 10: 512-516.

Christoffersen, R.E., L.G. Cass, D.J. McGarvey, F.W. Percival, and K.R. Bozak. 1989. Characterization and expression of a ripening-induced cellulase gene from avocado. In: Osborne, D. and M. Jackson (eds). *Cell Separation in Plants: Physiology, Biochemistry, and Molecular Biology*. Springer-Verlag, Berlin, pp. 21-30.

Koch, G.W., E.-D. Schulze, F. Percival, H.A. Mooney, and C. Chu. 1988. The nitrogen balance of *Raphanus sativus* x *raphanistrum* plants. II. Growth, nitrogen redistribution and photosynthesis under nitrate deprivation. *Plant Cell and Environ.* 11: 755-767.

Williams, K., F. Percival, J. Merino, and H.A. Mooney. 1987. Estimation of tissue construction cost from heat of combustion and organic nitrogen content. *Plant, Cell and Environ.* 10: 725-734.

Percival, F.W. 1986. Isolation of indole-3-acetyl amino acids using polyvinylpolypyrrolidone chromatography. *Plant Physiol.* 80: 259-263.

Schulze, E.D. , G. Koch, F. Percival, H.A. Mooney, and C. Chu. 1985. The nitrogen balance of *Raphanus sativus* x *raphanistrum* plants. I. Daily nitrogen use under high nitrate supply. *Plant Cell and Environ.* 8: 713-720.

Percival, F.W. and R.S. Bandurski. 1976. Esters of indole-3-acetic acid from *Avena* seeds. *Plant Physiol.* 58: 60-67.

Percival, F.W. and W.K. Purves. 1974. Multiple amine oxidases in cucumber seedlings. Plant Physiol. 54: 601-607.

Percival, F.W., W.K. Purves, and L.E. Vickery. 1973. Indole-3-ethanol oxidase: kinetics, inhibition, and regulation by auxins. Plant Physiol. 51: 739-743.

**Posters and Oral Presentations by Students**

Yamaki, S. and F. Percival. 2015. Bioinformatics pipeline for analyzing community 16S rRNA amplicons.

Yamaki, S., J. Warren, D. Baird, W. Yi, and F. Percival. 2015. Coastal marsh halophyte leaf surface bacterial communities.

Warren, J. and F. Percival. 2014. Preparation of DNA from leaf surface bacteria for next-generation sequencing.

Huang, P., C. O’Neil, T. Paras, and F. Percival. 2014. Harvesting phylloplane bacterial communities for molecular analysis.

Avila, S., M. Coleman, D. Donner, and F. Percival. 2013. Removal of epiphytic bacteria from *Macrocystis pyrifera* fronds using a triple-enzyme detergent.

Baik, J. and F. Percival. 2010. EdU Labeling Detects Newly Synthesized DNA in a Limited Group of Microorganisms.

Do, A. and F. Percival. 2010. Survey of 5-Bromodeoxyuridine Incorporation by Prokaryotes

Haggard, E. and F. Percival. 2007. Leaf Associated Microbial Communities of Riparian Woodland Trees

Bechler, K., E. Grieco, E. Wiegand and F. Percival. 2007. Community Profile of Phyllosphere Bacteria from *Quercus agrifolia* Using DGGE

Parrish, H., L. Pugh, and F. Percival. 2005. Ribosomal Intergenic Spacer Polymorphism Analysis of Bacterial Communities

Pugh, L. and F. Percival. 2004. Identification of an Unknown Strain of Bacteria

Spears, T. and F. Percival. 2003. Identifying Leaf Surface Bacteria From a Chaparral Shrub

Easley, M. and F. Percival. 2002. Construction of a Clone Library Based on 16S ribosomal RNA Genomic Data

**CURRICULUM VITAE**

# EILEEN MCMAHON MCQUADE

## PERSONAL

Home Address: 928 Westmont Rd

Santa Barbara, CA 93108

Home Phone: (805) 698-9751

Work Address: Westmont College

Biology Department

955 La Paz Rd

Santa Barbara, CA 93108

Work Phone: (805) 565-6117

Email Address: mcquade@westmont.edu

Other Names: Eileen Joan McMahon

## EDUCATION/TRAINING

1992 - 1996 B.S., Marine Biology, Eckerd College, St. Petersburg, Florida

1996 - 2001 Ph.D., Department of Microbiology and Immunology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina (advisor: Glenn K. Matsushima; dissertation title: *Macrophage/microglial recruitment and chemokine function in CNS demyelination*)

2002 - 2004 Postdoctoral Research Fellow, Northwestern University, Chicago, IL (advisor: Stephen D. Miller)

2009 Participant, *50th Annual Short Course on Medical and Experimental Mammalian Genetics*, the Jackson Laboratory, Bar Harbor, Maine

**ACADEMIC POSITIONS**

2002 **Instructorship**, Westmont College, Santa Barbara, California.

2004-2010 **Assistant Professor**, Westmont College, Santa Barbara, California.

2010-present Granted tenure and promoted to **Associate Professor**,Westmont College

2010-2011 **Visiting Assistant Professor**, Diabetes Center, University of California, San Francisco, CA (also Summer 2012)

**HONORS AND AWARDS:**

1998-2001 University of North Carolina-Chapel Hill Graduate NIH Training Grant

2002-2003 Northwestern University Postdoctoral NIH Training Grant

2005 Westmont College Professional Development Grant

2007 Westmont College Professional Development Grant

2007 Westmont College Wandering Scholar Grant

2008 AAI Junior Faculty Travel Award to Experimental Biology Conference

2009 Westmont College Professional Development Grant

2009 Westmont College Faculty Research Award

2012 Westmont College Outstanding Teacher of the Year for Natural Sciences Division

**MEMBERSHIP IN PROFESSIONAL SOCIETIES**

Sigma Xi (1996-2004)

American Association of Immunologists (2004-present)

American Scientific Association (2004-present)

Phi Kappa Phi (2009-present)

### PUBLICATIONS (undergraduate co-authors underlined)

1. Wu, Y.P., **McMahon, E.J.**, Kraine, M.R., Tisch, R., Meyers, A., Frelinger, J., Matsushima, G.K., Suzuki, K. (2000) Distribution and characterization of GFP(+) donor hematogenous cells in twitcher mice after bone marrow transplantation*. American Journal of Pathology* *156*(6):1849-54.
2. Serody, J.S., Burkett, S.E., Panoskaltsis-Mortari, A., Ng-Cashin, J., **McMahon, E.J.**, Matsushima, G.K., Lira, S.A., Cook, D.N., Blazar, B.R. (2000) T-lymphocyte production of macrophage inflammatory protein-1alpha is critical to the recruitment of CD8 (+) T cells to the liver, lung, and spleen during graft-versus-host disease. *Blood* *96*(9):2973-80.
3. Scott, R.S., **McMahon, E.J.**, Pop, S.M., Carrichio, R., Reap, E.A., Cohen, P.J., Earp, H.S., Matsushima, G.K. (2001) Phagocytosis and clearance of apoptotic cells is mediated by Mer. *Nature* *411*:207-211.
4. **McMahon, E.J.**, Cook, D.N., Suzuki, K., Matsushima, G.K. (2001) Absence of macrophage inflammatory protein-1α delays CNS demyelination in the presence of an intact blood-brain barrier. *Journal of Immunology*, 167 (5): 2964-2971.
5. Wu, Y.P., **McMahon, E.J.**, Matsuda, J., Suzuki, K., Matsushima, G.K., Suzuki, K. (2001) Expression of immune-related molecules is downregulated in twitcher mice following bone marrow transplantation. *Journal of Neuropathology and Experimental Neurology*, *60*: 1062-1074.
6. **McMahon, E.J.**, Suzuki, K., Matsushima, G.K. (2002) Peripheral macrophage are recruited across an intact blood-brain barrier during primary CNS demyelination. *Journal of Neuroimmunology, 130*: 32-45.
7. Yagi T., **McMahon E.J**., Takikita S., Mohri I., Matsushima G.K., Suzuki K. (2004) Fate of donor hematopoietic cells in demyelinating mutant mouse, twitcher, following transplantation of GFP+ bone marrow cells. *Neurobiology of Disease*, *16*(1): 98-109.
8. **McMahon, E.J.,** Bailey, S.L., Castenada, C.V., Waldner, H., Miller, S.D. (2005) Epitope spreading initiates in the CNS in two mouse models of multiple sclerosis. *Nature Medicine*, *11*(3):335-339.
9. **McMahon, E.J.,** Smith-Begolka, W., Miller, S.D. (2005) Cytokines and Immune Regulation in the Nervous System. In R. Ransahoff, and E. Benveniste (eds), *Cytokines in the CNS, 2nd Edition.* (pp137-162). Boca Raton: Taylor and Francis.
10. Plant, S.R., Wang, Y., Vasseur, S., Thrash, J.C., **McMahon, E.J.**, Bergstralh, D.T., Arnett, H.A., Miller, S.D., Carson, M.J. , Iovanna, J.L., Ting, J.P. (2005) Upregulation of the stress-associated gene p8 in mouse models of demyelination and in multiple sclerosis tissues. *Glia 53*(5): 529-537.
11. Bailey, S.L., Carpentier, P.A., **McMahon, E.J.**, Begolka, W.S., Miller, S.D. (2006) Innate and adaptive immune responses of the central nervous system. *Critical Reviews in Immunology,* *26*(2): 149-188.
12. **McMahon, E.J.**, Bailey, S.L., Miller, S.D. (2006) CNS dendritic cells: Critical participants in CNS inflammation? *Neurochemistry International, 49*(2): 195-203.
13. Bailey, S.L., Schreiner, B., **McMahon, E.J.**, Miller, S.D. (2007) CNS myeloid DCs presenting endogenous myelin peptides “preferentially” polarize CD4+ Th17 cells in relapsing EAE. *Nature Immunology*, *8*(2): 172-180
14. Miller, S.D., **McMahon, E.J.**, Schreiner, B., and Bailey, S.L. (2007) Antigen Presentation in the CNS by myeloid dendritic cells drives progression of relapsing-remitting experimental autoimmune encephalomyelitis. *Annals of the New York Academy of Sciences*, *1103*:179-191
15. Balabanov, R., Strand, K., Goswami, R., **McMahon, E.J.**, Begolka, W., Miller, S.D., and Popko, B. (2007) Interferon-gamma-oligodendrocyte interactions in the regulation of experimental autoimmune encephalomyelitis. *Journal of Neuroscience*, *27*(8): 2013-2024
16. Adipue, I.A., Wilcox, J.T., King, C., Rice, C.A.Y., Shaum, K.M., Suard, C., ten Brink, E., Miller, S.D., **McMahon, E.J**. (2011) Characterization of a novel and spontaneous mouse model of inflammatory arthritis. *Arthritis Research and Therapy 13*:R114
17. Doan, V., Kleindiest, A.M., **McMahon, E.J.,** Long, B.L., Matsushima, G.K., Taylor, L.C. (2013) Abbreviated exposure to cuprizone is sufficient to induce demyelination and oligodendrocyte loss. *Journal of Neuroscience Research, 91*(3): 363-73.
18. Gardner, J.M., Metzger, T.C., **McMahon, E.J**., Au-Yeung, B. B., Krawisz A.K., Lu W., Price, J.D., Johannes K.P., Satpathy, A.T., Murphy, K.M., Tarbell, K.V., Weiss, A., Anderson, M.S. (2013) Extrathymic Aire-expressing cells are a distinct bone-marrow-derived population that that induce functional inactivation of CD4+ T cells. *Immunity,* *39* (3):560-572.

### PRESENTATIONS (undergraduate co-authors underlined)

1995 **Eleventh Biennial Conference on the Biology of Marine Mammals**, Orlando, Florida. Characterization and expression of the interleukin-2 gene from the Florida manatee, *Trichechus manatus latirostris*. E.J. McMahon, M.A. King, T.L. Ness, M.E. Cashman, W.G. Bradley, J.E. Reynolds, and W.B. Roess. (Poster presentation)

1999 **Keystone Symposia: Effectors of Inflammation in the CNS**, Taos, NM. Macrophage inflammatory protein-1α is a mediator of macrophage/microglia accumulation and histopathology in cuprizone-induced demyelination. E.J. McMahon, K. Suzuki, D.N. Cook, and G.K. Matsushima. (Poster presentation)

2000 **Midwinter Conference of Immunologists**, Asilomar, CA. Chemokines and chemokine receptors in cuprizone-induced demyelination. E.J. McMahon, K. Suzuki, D.N. Cook, N. Maeda, J.S. Serody, and G.K. Matsushima. (Poster presentation)

2001 **International Neuroimmunology Symposium**, Edinburgh, U.K. Peripheral macrophage recruitment during CNS demyelination in the context of an intact blood-brain barrier. E.J. McMahon (Invited oral presentation)

2002 **Westmont College NBS Seminar Series.** Santa Barbara, CA. Leukocyte recruitment and chemokine function in two murine models of CNS demyelination. (Oral presentation)

2002 **FASEB Summer Conference on Autoimmunity**, Saxons River, VT. Tracking Myelin-specific

T cells during epitope spreading in murine models of multiple sclerosis. E.J. McMahon and S.D. Miller (Poster presentation)

2003 **Autumn Immunology Conference**, Chicago, IL. Epitope spreading occurs in the CNS and not in the periphery in 2 murine models of multiple sclerosis. E.J. McMahon, G. Hoffmann, and S.D. Miller (Oral and Poster presentation)

2004 **4th Annual Conference of FOCIS,** Montreal, Canada. Epitope spreading occurs in the CNS and not in the periphery in 2 murine models of multiple sclerosis. (Poster and invited oral presentation)

2004 **UCSB Molecular and Cellular Biology Program Research Seminar.** Epitope Spreading in Murine Models of Multiple Sclerosis: Is the brain just one big lymph node? (Oral Presentation)

2005 **FASEB Summer Conference on Autoimmunity**, Saxons River, VT. Characterization of a

novel mouse strain that spontaneously develops arthritis: a potentially new model of rheumatoid arthritis. J.F. Morrow. J.T. Wilcox, H.L. Parrish, W. Iba, S.D. Miller, E.J. McMahon(Poster presentation)

1. **Midwinter Conference of Immunologists**, Pacific Grobe, CA. Characterization of a potentially new

murine model of spontaneous, immune-mediated arthritis. J. Wilcox, C. King, J. Mayer, K. Holshausen, S.D. Miller, and E.J. McMahon (Poster presentation)

1. **The American Association of Immunologists Conference at Experimental Biology 2008**, San Diego, CA. Characterization of the immune response in a new murine model of autoimmune arthritis. E.J. McMahon, I. Adipue, J. Wilcox, C. Suard, and J. Nolte (Poster presentation)
2. **Dean's Research Seminar Series,** University of Florida, Gainesville, FL. Another murine model of inflammatory arthritis:  How does it compare and what can it teach us. (Invited lecture). Cancelled because of Tea Fire.

2008 **Junior Biology Seminar Series**, Eckerd College, St. Petersburg, FL. Animal models of arthritis. (Invited lecture). Cancelled because of Tea Fire

1. **50th Annual Short Course on Medical and Experimental Mammalian Genetics Symposium,** The Jackson Laboratory,Bar Harbor, ME. Characterization of a novel and spontaneous mouse model of inflammatory arthritis. I. Adipue, J.Wilcox, J. Stephens, C. Rice, C. King, E. ten Brink, E. Glover, S. D. Miller, and E. J. McMahon (Poster Presentation)
2. **Research Seminar,** Feinberg School of Medicine, Northwestern University, Chicago, IL. The

IIJ line: A novel and spontaneous mouse model of inflammatory arthritis. (Invited lecture).

1. **Research Seminar,** Anderson-Bluestone joint lab meeting, University of California, San Francisco, CA. The IIJ line: A novel and spontaneous mouse model of inflammatory arthritis. (Invited lecture)

2011 **The UCSF Diabetes Center Seminar Series,** San Francisco, CA. Aire expression in human

lymph nodes: a comparison between type-1 diabetics and healthy controls. (Invited talk)

1. **The American Association of Immunologists Conference,** San Francisco, CA. Aire expression in human lymph nodes: a comparison between type-1 diabetics and healthy controls. (Poster presentation)
2. **nPOD Annual Meeting**, Miami, FL. Aire expression in human spleen and lymph node: a

comparison between type-1 diabetics and healthy controls. E.J. McMahon, T. Metzger, M.S.

Anderson (invited talk & poster presentation)

1. **Research Seminar,** Azusa Pacific University, Azusa, CA. Something new in the Aire? Aire expression and its possible role in autoimmune disease (Invited lecture)
2. **Westmont College NBS Seminar Series.** Santa Barbara, CA. Sabbatical report - Something new in the Aire? Aire expression and its possible role in autoimmune disease (Oral presentation)
3. **Midwinter Conference of Immunologists**, Pacific Grove, CA. Thymic defects, lymphopenia, and elevated double-negative T cells occur before clinical arthritis in Inherited Inflamed Joints (IIJ) mice. J.A. West, D.B. Thompson, K.A. Shaum, M.L. Combs, E.M. McQuade (poster)

**UNDERGRADUATES SUPERVISED IN RESEARCH & THEIR PRESENTATIONS:**

**Julia Morrow** (Fall 2004, Spring 2005): Major Honors Project

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2005. “Characterizing clinical disease in a novel strain of spontaneous arthritis in mice”
* Entered University of Minnesota Medical School in 2007

**Laurraine Gereige** (Spring 2005)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2005. “Detecting the Presence of Immunoglobulins in Arthritic and Nonarthritic Mice”

**Joel Wilcox** (Summer 2005, Fall 2006, Fall 2007)

* Presented poster at *Celebration of Summer Research Symposium*, Westmont College, Sept. 2005. “Quantitation of serum immunoglobulin levels in a new mouse model of rheumatoid arthritis”
* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2006. “Transfer of immune cells to induce rheumatoid arthritis in mice”
* Entered Master’s program in Technical and Science Writing at Miami University in Ohio in 2008

**Heather Parrish** (Summer 2005)

* Presented poster at *Celebration of Summer Research Symposium*, Westmont College, Sept. 2005. “Quantitating the number of antibody-producing B cells in arthritic and non-arthritic mice using ELISPOT”

**Kirsten Holshausen** (Spring, 2005, Summer 2006, Fall 2006, Spring 2007)

* Major Honors Project
* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2006. “Continuing Study of Rheumatoid Arthritis in Mice”
* Presented poster at *Celebration of Summer Research Symposium*, Westmont College, Sept. 2006. “Quality Management and accountability in humanitarian assistance: Applying a decade of lessons to short-term medical missions”
* Research technician at Institute for Genome Sciences and Policy, Duke University in 2007

**Cody King** (Fall 2006)

* Entered Creighton Medical School 2010

**Iris Adipue** (Summer 2007)

* Presented poster at *Celebration of Summer Research*, Westmont College, Sept. 2007. “Characterization of the immune response in a new mouse model of rheumatoid arthritis using flow cytometry”
* Poster accepted for *Southern California Conference for Undergraduate Research*, California State University at Los Angeles, Nov. 2007
* Entered Medical College of Wisconsin in 2010

**Cory Suard** (Fall 2007, Spring 2008)

* Presented poster at *West Coast Biological Sciences Undergraduate Research Conference*, Point Loma Nazarene University, April 2008. “Determination of rheumatoid factor levels in arthritic mice using ELISA”. Co-authored with Julie Nolte
* Poster also presented at *Spring Undergraduate Research Symposium*, Westmont College, April 2008.
* Entered Loma Linda Medical School in 2008

**Julie Nolte** (Spring 2008)

* Presented poster. See above
* Entered University of Washington School of Medicine in 2010

**Carolyn Rice** (Spring 2008)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2008. “Correlation between arthritis and inflammatory bowel disease in mice”
* Entered medical school in Israel in 2009

**Elri ten Brink** (Summer 2008)

* Presented poster at *Celebration of Summer Research*, Westmont College, Sept. 2008. “Confirming irritable bowel disease in a strain of arthritic mice”

**Jenna Stephens** (Summer 2008)

* Presented poster at *Celebration of Summer Research*, Westmont College, Sept. 2008. “Characterizing the immune response in a murine model of inflammatory arthritis”

**Lauren Brown** (Fall 2008, Spring 2009)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2009. “Increased T cell proliferation in arthritic mice compared to non-arthritic mice”. Co-authored with Eva Glover
* Entered University of Southern California Medical School in 2009

**Eva Glover** (Spring 2009)

* Presented poster. See above.

**Matthew Combs** (Fall 2009-Spring 2010)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2010 and *West Coast Biological Sciences Undergraduate Research Conference,* Santa Clara, CA. April 2010 “Disregulation of thymic development in Inherited Inflamed Joint (IJJ) mice, a new spontaneous model of inflammatory arthritis.” Co-authored with Katherine Shaum
* Entered Loma Linda Medical School in 2011

**Katherine Shuam** (Fall 2009-Spring 2011)

* Completed Major Honors
* Presented posters at *Celebration of Summer Research*, Westmont College, Sept. 2010 and *American Association of Immunologists* Conference (2011), San Francisco, CA. “The Role of T cells in the Inherited-Inflamed Joints model of inflammatory arthritis”
* Entered University of Colorado Medical School in 2011

**David Thompson** (Fall 2011, Fall 2012-Spring 2013)

* Completed Major Honors
* Gave oral presentation at *West Coast Biological Sciences Undergraduate Research Conference,* Point Loma, CA. April 2013. “T cell activation and development in the IIJ mouse, a strain that spontaneously develops a rheumatoid arthritis-like disease”. Won best session talk award.
* Presented poster, April 2013. See below.
* Entered Creighton University Medical School in 2013

**Kelly Egusa** (Fall 2011-Spring 2012)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2012. *“Flow cytometric analysis of T cell composition in the blood Inherited Inflamed Joints (IIJ) mice”.* Co authored with Philip Sanchez

**Philip Sanchez** (Spring 2012-Spring 2013)

* Presented poster, April 2012. See above.
* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2013. *“Prevalence of Double Negative T cells and thymic atrophy occur before clinical symptoms in the IIJ model of inflammatory arthritis”.* Co-authored with Brooke Eusebio and David Thompson.

**Brooke Eusebio (**Fall 2012-Spring 2013)

* Presented poster, April 2013. See above.
* Entered Western University of Health Science, Veterinary Sciences program, 2013

**Jake West** (Summer 2013-Spring 2014)

* Completed Major Honors
* Presented posters at *Celebration of Summer Research*, Westmont College, Sept. 2013. *“Lymphopenia and T cell homeostatic proliferation, potential drivers of autoimmunity, occur in the Inherited Inflamed Joints (IIJ) model of arthritis”*
* Gave oral presentation at *West Coast Biological Sciences Undergraduate Research Conference,* Point Loma, CA. April 2014. “*Lymphopenia and T cell homeostatic expansion may contribute to clinical arthritis in inherited inflamed joints (IIJ) mice*”. Won best session talk award.
* Entered Loma Linda Medical School, Fall 2014

**Kyle C. Phipps** (Fall 2013-Spring 2014)

* Presented poster at *Spring Undergraduate Research Symposium*, Westmont College, April 2014. *“Examination of Genetic Drift in the Inherited Inflamed Joints (IIJ) mouse strain: comparison of F1-8 and F12-16”.* Co-authored with Ben West and Jake West.

**Ben West** (Spring 2014)

* Presented poster, April 2014. See above
* Entered Loma Linda Medical School, Fall 2015

**Tyler Paras** (Fall 2014-present)

* Major Honors in progress
* Presented posters at *Spring Undergraduate Research Symposium*, Westmont College, April 2015 and *West Coast Biological Sciences Undergraduate Research Conference,* Point Loma, CA., April 2015. “*A novel anti-inflammatory compound failed to ameliorate inflammation in the inherited inflamed joints (IIJ) model of arthritis.”* Co-authored with Emma Huebner, Blake Ebert, and Brooke Hobbs.

**Blake Ebert** (Fall 2014-Spring 2015)

* Presented poster, April 2015. See above.

**Emma Huebner** (Fall 2014-present)

* Presented poster, April 2015. See above.

**Brooke Hobbs** (Spring 2015)

* Co-authored poster, April 2015. See above.

**TEACHING EXPERIENCE**

*Non-Majors, Non-disciplinary Courses:*

APP-090 Inoculum

*Non-Majors, Disciplinary Courses:*

LS-012 Introduction to Life Science

BIO-012 Human Physiology

*Majors, Disciplinary Courses:*

Bio-102L Physiology lab

BIO-110 Microbiology (Co-taught with Frank Percival)

BIO-114 Genetics lecture and lab

BIO-130 Cell Biology lecture and lab

BIO-132 Molecular Biology lecture and lab

BIO-155: Infectious Disease and Immune Response (Co-taught with Steve Julio)

BIO-162 Neuroscience (Co-taught with Tom Fikes)

*Tutorials, Seminars, Research:*

BIO-194 Bioethics Tutorial on Embryonic Stem Cells

BIO-195 Seminar in Biological Literature

BIO-198 Research

**WESTMONT COLLEGE INSTITUTIONAL SERVICE**

*Committees & Taskforces*

Chemistry Faculty Search Committee 2005-2006

Biology Faculty Search Committee 2005-2006

Institutional Review Board 2005-2006

Student Life Committee (chair for ’09-present) 2006-2007, 2009-2010

Program Review Committee Spring 2007

Resident Director Search Committee Spring 2007

General Education Committee Fall 2008

Biblical & Theological Foundations for

Diversity Taskforce 2009-2010

Faculty Council 2011-2014

Psychology Faculty Search Committee 2011-2012

Strategic Planning Committee 2012-present

President’s Council 2012-2013

CIP Committee (a Strategic Planning Track of Work) 2013-2015

WASC Review Steering Committee 2013-present

Futures Group (A Presidential taskforce) 2014-present

Computer Science Faculty Search Committee 2014-2015

Academic Senate 2015-present

*Administrative service*

Dept. Representative for Secondary Education

Advisory Committee 2005-2007

Department Assessment Coordinator Fall 2006-Spring 2007

Coordinator, NBS Seminar Series Fall 2006-2010

Inoculum Program Co-director Summer 2007-present

Department of Biology Chair 2011-2015

Faculty Vice-Chair 2012-2013

*Invited service*

Preview Days Faculty Panel 2005, 2006

Panel Chair, Conference in the Liberal Arts,

*Beyond Two Cultures: Science as Liberal Arts* Spring, 2005

Faculty Panelist for Colloquy for Accepted Students April 2005

Mini-class Parent’s Weekend:

*HIV/AIDS: The Science and Societal Impact* April 2006

Faculty Participant in Search for

Director of Leadership and Learning June 2006

Faith-Learning Workshop Presenter:

*When Science and Ethics Meet* Oct 2006, Mar 2010

Panelist for Faculty Exchange:

*Survival, Sanity, and Success: “Getting a Life”*

*at a Christian Liberal Arts College* Oct 2006

Horizon Editorial on Embryonic Stem Cells Nov 2006

Led Prayer in Chapel Nov 2006

Presentation at Westmont Urban Program:

*AIDS: The Science and Societal Impact* April 2007

Presentation to Board of Trustees: *Science*

*Research at Westmont* May 2007

Mini-class Parent’s Weekend: *Building Better Babies:*

*The Hopes & Fears of Genetic Engineering* Sept 2007

Pickle Address Speaker Dec 2007

Spring Sing Judge April 2009

Chapel Speaker April 2009

Speaker at *Celebration of Summer Research* Sept 2009

Wrote Annual Fund letter to Alumni Sept 2009

Panelist, Tea Fire Reflection Nov 2009

Faculty Devotional at Faculty Meeting Jan 2010

Spoke at Urban Program on Vocation Nov 2010

Panelist: *Awakening the Moral Imagination* Oct 2012

Respondent, Gayle Beebe’s Westmont

Downtown Lecture on Leadership Feb 2013

Taught mini-class, Faculty Retreat Aug 2015

Panelist, Parents session at Orientation Aug 2015

*Volunteer service*

Westmont in the Arts Faculty Sponsor 2004-2005

Tuesday with Morals Discussion Leader Spring 2005, Fall 2006, Spring 2007, Spring 2010

Attendant, Presidential Scholars Breakfast Aug 2005

Admitted Students Days: Faculty Small Group Leader 2006, 2009, 2010

Co-hosted 1st year Progressive Dessert Aug 2006, 2007

Co-coordinator for Faculty Prayer Meeting Fall 2006-2008

Faculty participant in Intercultural

Programs Department Audit Jan 2007

Westmont Women’s Retreat, Small Group Leader Sept 2009

RD interview Faculty participant Mar 2010

Faculty participant in Admissions Audit Aug 2015

Panelist, Parents session at Orientation Aug 2015

**CHURCH AND COMMUNITY SERVICE**

SB Community Church Nursery Worker 2004-present

2nd-grade Teaching Team Member, SB

Community Church Retreat April 2006

Pre-K Summer Sunday School Teacher Summer 2006

United Way, *Day of Caring,* Volunteer Sept 2006,

Panelist, Science and Faith Panel, High School

Youth Group, SB Community Church Oct 2006

Panelist, God and Science Forum, 7-5-9 Series,

SB Community Church Nov 2006

Home Group Leader, SB Community Church 2007-2009

Arthritis Foundation, SB chapter, Event Volunteer May 2007-2010

4-week series on Science and Faith for Adult

Sunday School, SB Free Methodist Church Nov 2007

Architectural Review Board member, Las Barrancas

Homeowners Association Fall 2008-2010

Volunteer for HabitatWorks Fall 2008

Nursery Supervisor, SB Community Church July 2009-2010

Keynote Speaker at Women’s Council Annual Dinner,

First Presbyterian Church of Santa Barbara April 2013

2-week series, Adult Sunday School at

First Presbyterian Church Oct 2014

Presentation to Science and Religion Study Group

at Trinity Episcopal Church Dec 2015

**CURRICULUM VITAE**

**Amanda Marie Sparkman**

**CURRENT POSITION**

Assistant Professor Biology Department, Westmont College January 2012-present

**PROFESSIONAL PREPARATION:**

Post-doctorate Trent University 2009-2011

Graduate Iowa State University Ecology & Evolution Ph.D., 2009

Undergraduate Westmont College Biology BA, 2003 (Summa Cum Laude)

Westmont College English BA, 2003

**PREVIOUS APPOINTMENTS:**

2009-2011 Post-doctoral Researcher, Department of Biology, Trent University

2007-2008 Teaching Assistant, Human Anatomy and Physiology, Department of Biology, Iowa State University

Fall 2006 Research Assistant, Gerontology Fellow, Department of Ecology, Evolution, and Organismal Biology. Iowa State University

Spring 2006 Teaching Assistant, General and Comparative Endocrinology, Department of Biology. Iowa State University

2004-2005 Research Assistant, Biotechnology Fellow, Department of Ecology, Evolution, and Organismal Biology. Iowa State University

2003-2004 Biology Laboratory Coordinator, Department of Biology, Westmont College

2002-2003 Summer Research Assistant, Department of Biology, Westmont College

Fall 2003 Teaching Assistant, Genetics, Department of Biology, Westmont College

Spring 2003 Teaching Assistant, Physiological Ecology, Department of Biology, Westmont College

**PUBLICATIONS:**

**Sparkman, A.M.**, Palacios, M.G., & Bronikowski, A.M. (2014). Physiological indices of stress in wild and captive garter snakes: correlations, repeatability, and ecological variation. *Comparative Biochemistry and Physiology Part A* 174 (2014): 11-17

**Sparkman, A.M.**, Billings, J.G., von Borstel, D., Bronikowski, A.M., and Arnold, S.J.(2013). Avian predation and the evolution of life histories in the garter snake *Thamnophis elegans*. *American Midland Naturalist* 170(1), 66-85.

**Sparkman, A. M.,** Adams, J. R., Steury, T. D., Waits, L. P., & Murray, D. L. (2012). Pack social dynamics and inbreeding avoidance in the cooperatively breeding red wolf. *Behavioral Ecology*. *doi: 10.1093/beheco/ars099*

**Sparkman, A. M.**, Schwartz, T. S., Madden, J. A., Boyken, S. E., Ford, N. B., Serb, J. M., & Bronikowski, A. M. (2012). Rates of molecular evolution vary in vertebrates for insulin-like growth factor-1 (IGF-1), a pleiotropic locus that regulates life history traits. *General and Comparative Endocrinology* 178(1):164-173.

**Sparkman, A.M.**, Adams, J., Steury, T.D., Waits, L., Murray, D.L. (2012). Evidence for a genetic basis for delayed dispersal in a cooperatively breeding canid. *Animal Behavior* 83(4):1081-1098.

\*Palocios, M.G., **Sparkman, A.M., Bronikowski, A.M**. (2012). Corticosterone and pace of life in two life-history ecotypes of the garter snake Thamnophis elegans. *General and Comparative Endocrinology* 175: 443-448.

**Sparkman**, A.M., Waits, L.P., Murray, D.L. (2011) Social and Demographic Effects of Anthropogenic Mortality: A Test of the Compensatory Mortality Hypothesis in the Red Wolf. PLoS ONE 6(6): e20868.

**Sparkman, A.M.**, Adams, J., Steury, T.D., Waits, L., Murray, D.L. (2011) Direct fitness benefits of delayed dispersal in the cooperatively breeding red wolf (*Canis rufus*).*Behavioral Ecology* 22(1):199-205.

\* Palacios, M.G., **Sparkman, A.M.,** and Bronikowski., A.M. (2011) Developmental plasticity of immune defence in two life-history ecotypes of the garter snake *Thamnophis elegans* – a common-environment experiment. *Journal of Animal Ecology* 80(2):431-437.

**Sparkman, A.M.**, Adams, J., Steury, T.D., Beyer, A., Waits, L., Murray, D.L. (2011) Helper effects on pup lifetime fitness in the cooperatively breeding red wolf (*Canis rufus*). *Proceedings of the Royal Society B: Biological Sciences* 278(1710)L1381-1389. Featured in New Scientist, 21 October 2010, <http://www.newscientist.com/article/dn19604> ,Wired.com, 22 October 2010 <http://www.wired.com/wiredscience/2010/10/red-wolf-puppy-nanny>.

**Sparkman, A.M.**, Ford, N.B., Bronikowski, A.M. (2011) The Role of IGF-1 in Snake Reproduction. In: Aldridge, R.D., Sever, D.M. (Eds.), Reproductive Biology and Phylogeny of Snakes. Volume 9, Reproductive Biology and Phylogency Series, Jamieson, B.G.M. (Ed). CRC Press, Boca Raton, Florida.

Byars, D.J., Ford, N.B., **Sparkman, A.M.**, Bronikowski, A.M. (2010) Influences of diet and family on age of maturation in brown house snakes, *Lamprophis fuliginosus*. *Herpetologica* 66(4):456-463.

**Sparkman, A.M.**, Byars, D., Ford, N.B., and Bronikowski, A.M. (2010) The role of insulin-like growth factor-1 (IGF-1) in growth and reproduction in female brown house snakes (*Lamprophis fuliginosus*). *General and Comparative Endocrinology* 168(3):408-414.

**Sparkman, A.M.**, and Palacios, M.G. (2009) A test of life-history theories of immune defense in two ecotypes of the garter snake*, Thamnophis elegans.* *Journal of Animal Ecology* 78(6): 1242-1248.

**Sparkman, A.M.**, Vleck, C.M., and Bronikowski, A.M. (2009) Evolutionary ecology of endocrine-mediated life-history variation in the garter snake, *Thamnophis elegans*. *Ecology* 90(3): 720-728. Featured in Faculty of 1000 Biology, 16 April 2009 (selected by Tim Coulson). [http://www.f1000biology.com/article/id/1158825](https://webmail.iastate.edu/cgi-bin/mailman?NOFRAMES=TRUE&BACKGROUND=http%3a%2f%2fwww%2ef1000biology%2ecom%2farticle%2fid%2f1158825).

**Sparkman, A.M.**, Arnold, S.J., and Bronikowski, A.M. (2007) An empirical test of evolutionary theories for reproductive senescence and reproductive effort in the garter snake *Thamnophis elegans*. *Proceedings of the Royal Society B: Biological Sciences* 274(1612): 943-950.

\*These articles contain a statement that the two lead authors (Dr. Palacios and myself) contributed equally to the research contained therein.

**PRESENTATIONS & POSTERS:**

**Sparkman, A.M.,** and Zylstra, S.Z. (2015). Accommodating conscientious objections by researchers in the biological sciences. Oxford Center for Animal Ethics Summer School on the Ethics of Animal Research, Oxford, UK.

Howe, S.P. and **Sparkman, A.M.** (2015). Testing for effects of urbanization on morphology in the western fence lizard, *Sceleporous occidentalis.* International Urban Wildlife Conference, Chicago, IL.

**Sparkman, A.M.**, Palacios, M.G., and Bronikowski, A.M. (2013) Long-term elevation of indicators of physiological stress in captive garter snakes. Annual Meeting for the Society of Integrative and Comparative Biology (SICB), San Francisco, CA.

Palacios, M. G., **Sparkman, A. M.**, and A. M. Bronikowski. (2010) Unraveling the causes of immune defense variation between life-history ecotypes of the garter snake *Thamnophis elegans*. American Physiological Society Intersociety Meeting: Global Change and Global Science: Comparative Physiology in a Changing World", August 4-7, 2010. Westminster, Colorado.

**Sparkman, A.M.**, Adams, J., Steury, T.D., Beyer, A., Waits, L., Murray, D.L. (2010) Socially-mediated sex differences in lifetime reproductive success in the red wolf, *Canis rufus*. Canadian Society for Ecology and Evolution, Quebec City, QC.

**Sparkman, A.M.**, Adams, J., Steury, T.D., Beyer, A. Waits, L., Murray, D.L. (2010) Effects of delayed dispersers on pup lifetime fitness in the red wolf, *Canis rufus*. Midwest Wolf Stewards Conference, Dorset, ON.

Bronikowski, A.M., **Sparkman, A.M.**, Byars, D. and Ford, N.B. (2009) The role of insulin/IGF1 signaling (IIS) in snake reproduction. Joint Meeting of Ichthyologists and Herpetologists, Portland, WA.

**Sparkman, A.M.**, Vleck, C.M., and Bronikowski, A.M. 2009. Hormones and life history: A Study of IGF-1 and population divergence in the garter snake *Thamnophis elegans.* Ecology and Evolution Department Seminar, University of Toronto, Toronto, ON.

**Sparkman, A.M.**, Vleck, C.M., and Bronikowski, A.M. 2008. Evolution of life histories in the garter snake: Endocrine control. Annual Meeting for the Society for the Study of Evolution, Minneapolis, MN.

**Sparkman, A.M.**, and Bronikowski, A.M. 2007. Endocrine-mediated evolution of life history traits: A atudy of IGF-1 and population divergence in the garter snake *Thamnophis elegans*. Annual Ecology and Evolutionary Biology Symposium, Ames, IA.

**Sparkman, A.M.**, Arnold, S.J., and Bronikowski, A.M. 2006*.* Evolutionarily divergent patterns of age-specific reproduction in the garter snake *Thamnophis elegans*. Annual Meeting for the Society of Integrative and Comparative Biology (SICB), Orlando, FL.

**UNDERGRADUATE STUDENT RESEARCHERS:**

2015 Mindy Chow (Fall), John Wong (Fall), David Baird (Fall)

2015 Brooke Hobbs (Summer), Stephanie Hynes (Summer)

2014-2015 Stephen Howe (Major Honors: Fall Spring)

2013-2014 Kiera Kauffman (Summer, Fall, Spring)

2013-2014 Stephanie Brooks (Fall, Spring)

2013 Nicole Carver (Summer)

2012-2013 Matt Blois (Fall, Spring)

**MEMBERSHIP IN PROFESSIONAL SOCIETIES:**

Society for the Study of Evolution

Society for Integrative and Comparative Biology (SICB)

Society for the Study of Reptiles and Amphibians (SSAR)

**GRANTS, FELLOWSHIPS, AWARDS, & HONORS:**

2013 Southern California Research and Learning Center (SCRLC) Grant ($3,500)

2009 Research Excellence Award for Outstanding Dissertation, Iowa State University

2007-2009 Doctoral Dissertation Improvement Grant, National Science Foundation ($12,000)

2007 William R. Clark Award, Iowa State University ($500)

2007 Grants-in-Aid of Research, Sigma Xi, ($400)

2007 Grants-in-Aid of Research, Society for Integrative and Comparative Biology

($1000)

2006 Gerontology Fellowship, Iowa State University

2005 Professional Advancement Grant, Iowa State University ($300)

2005 Honourable Mention, NSF Graduate Research Fellowship Program

2004 Premium for Academic Excellence Award, Iowa State University

2004 Biotechnology 1-Year Graduate Fellowship, Iowa State University

CURRICULUM VITAE

Elizabeth (Beth) Anne Horvath

Education:

--May, 1976, Bachelor of Arts, Biology--Westmont College

--August, 1981, Masters of Science, Biology--Cal. State Univ., Long Beach

Dissertation Title: Experiences in Marine Science, an Introductory Text

Additional shorter research projects: Pelagic Snails; Development in

Pelagic Tunicates; SEM studies of luminescence in Pelagic Tunicates

--Selected Graduate Level Courses beyond Master's; subjects include--

Channel Island Biology, Deep Sea Biology, Conservation Biology; also

field course on the Natural History of the Galapagos Islands

Teaching Experience:

(Emphasis on: Marine Biology, Invertebrate Zoology, Ecology, Natural History, Zoology)

--Westmont College, 1978-1998, Part time to Full time Instructor

--Santa Barbara City College, 1989-1990, Instructor (Human Anatomy)

--Westmont College, 1998-2013, Assistant Professor; presently, Associate Professor

--AuSable—Pacific Rim, on faculty as Assistant Professor, 1998-2006 (still “on call,”

through Pacific Rim Environmental Institute)

--CCSP-New Zealand, spring, 2010, fall, 2011, fall, 2012 and continuing

Rank:

First Year at Westmont: Instructor (part-Time), 1978; Full-Time, 1988

Previous Rank: Instructor of Biology, 1990-1998; Assistant Professor, 1998-2013

Present Rank: Associate Professor, Fall 2013 to the present

Administrative Duties Have Included:

Laboratory Coordinator and oversaw other Laboratory Personnel for Biology Department (prior to full time faculty status); Student Academic Advisor; Standing Committee Work (at least five different committees); Served 4 years on Academic Advisory Board for Creation Care Stewardship Program; Consultant for AuSable marine course curriculum; Practicum Supervisor for all Biology Practicum student experiences; Two-year service--Vice President of Westmont Chapter of Phi Kappa Phi Honor Society; Two-year service--President of the Westmont Chapter of Phi Kappa Phi; Interim Chair of campus Institutional Review Board; Interim member of Academic Senate: Academic Resources Committee; Interim Department Chair (Fall, 2009-Spring, 2010); Advisory Board for Pacific Rim Environmental Institute; Chair of Westmont IRB Committee (2.5 years); authored Biology Department Annual Report (2011-2012); Served on Search Committee for the Westmont Director of Global Education position;

(Spring, 2013 to Spring 2015) on Off Campus Programs Committee; for academic year 2015-2016, 1-year replacement on Program Review Committee

Research Studies: (Most current listed first)

--Gorgonian Corals of the CA Bight: Taxon reorganization/ecology, 2002-Present,

(also as Research Associate for Santa Barbara Museum of Natural History)

--Shell Selectivity of Inter-tidal Hermit Crabs, 1994-Present

--Water Quality of Coastal Waters, 1990-Present

--Management/Conservation Strategies of Wildlife, Kenya, E. Africa, 1989

--Speciation of Galapagos Finches, 1987 (with American Museum. of Nat. History)

--Honeycreeper Bird Count, 1987, Hawaii (with Nature Conservancy of Hawaii)

--Kelp Forest Monitoring Program, 1986-1989, Channel Islands National Park

Professional Memberships have included:

--Western Society of Naturalists

--National Marine Educators Association

--The Nature Conservancy

--The Society for Conservation Biology (current)

--East African Wildlife Society

--Santa Barbara Museum of Natural History (current)

--Biological Society of Washington (current)

--Southern California Association of Marine Invertebrate Taxonomists (current)

Member: Phi Kappa Phi Honor Society, election at CSULB, 1976-Present (Served as Vice President 2003-2005 and as President, of the Westmont College Chapter of PKP, for the years 2005-2007)

Honors and Awards:

--Who’s Who of America’s Teachers, 2000, 2002, 2005, 2007

--Teacher of the Year, Behavioral and Nat. Sciences, Westmont College, 1999-2000

Community Service:

--Research Associate, Santa Barbara Museum of Natural History (current)

--Naturalist, expeditions-Baja/Sea of Cortez on R/V *Searcher* out of San Diego

--Research Associate, Santa Barbara Museum of Natural History (early ‘90’s)

--Naturalist, Santa Barbara Museum of Natural History, Whale Watch Trips

--Guest Lecturer:

SCAMIT Workshops

Providence High School, biology courses

Santa Barbara City Schools

Santa Barbara Malacological Society

Westmont College: Origin's Course--Bio. 31

--Lay Reader/Intercessor: Trinity Episcopal Church (for ~13 years and continuing)

--Consultant for following governmental/private agencies (all currently being served):

Alaska Fisheries Science Center, NOAA Fisheries, Alaska

NOAA, Northwest Fisheries Science Center, Port Orchard, WA

Olympic Coast National Marine Sanctuary, WA

NOAA, National Marine Fisheries Service, Santa Cruz, CA

Monterey Bay Aquarium Research Institute (MBARI), Monterey,

CA

Research Lab of Dr. Milton Love, UC Santa Barbara, CA

Natural History Museum of Los Angeles County, CA

Los Angeles County Sanitation District, CA

Long Beach Aquarium of the Pacific, CA

Orange County Sanitation District, CA

SCAMIT (So. CA Assoc. of Marine Invertebrate Taxonomists)

NOAA, Fisheries Service—Southwest Fisheries Science Center,

La Jolla, CA

Graduate students at Temple University, Philadelphia, PA

NOAA, National Centers for Coastal Ocean Science, Center for

Coastal Environmental Health and Biomolecular

Research, South Carolina

NIWA (National Institute of Water and Atmospheric Research),

Wellington, New Zealand

Laboratorio de Invertebrados Bentonicos, Universidad Nacional

Autonoma de Mexico, Mazatlan

Publications:

--Horvath, E.A. 2011. *An Unusual new “sea fan” from the northeastern Pacific Ocean (Cnidaria: Octocorallia: Gorgoniidae)*. Proceedings of the Biological Society of Washington, 124(1): Pages 45-52.

--Horvath, E.A. 2012. Workshop Powerpoint Presentation: *Taxonomic Issues for some of the California Bight’s more “problematic” Gorgonian Genera (Identifying Gorgonian Corals of the California Bight)*. Posted on SCAMIT Website, “Taxonomic Tool Box.”

--(In Press) Horvath, E.A. Spring, 2014-Summer, 2015: *A Taxonomic Atlas of the Gorgonian Corals of the California Bight (based on the Gorgonian Collection, Santa Barbara Museum of Natural History), including descriptions of new species and reports of several genera not previously reported from the area*. SB Museum of Natural History, 200+ pages. Resubmission to publisher with revisions to occur in Fall, 2015.

--In progress: *Sclerite morphology within the genus Swiftia: A geographical trend seen in two species of Swiftia from the eastern Pacific may indicate a single species which demonstrates a transition in sclerite form with two distinct colony morphologies* (Projected Publication, Fall 2015).

--In progress: *Description of a new species in the deep-water genus Acanthogorgia from the Gulf of California, San Francisquito Bay, Baja, Mexico.* (Projected Publication, Spring, 2016)

--In progress: *Description of a new, deep-water species of Gorgonian Coral from the western Aleutian Islands, genus Alaskagorgia* (with Robert Stone, Alaska Fisheries Science Center). (Projected Publication, Spring, 2016)

--In Progress: *Description of a new, deep-water Gorgonian Coral in the genus Leptogorgia from the waters of Olympic Coast National Marine Sanctuary* (with staff of Olympic Coast National Marine Sanctuary). (Projected Publication, Summer, 2016)

1. **Core faculty instructional and advising loads**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | | | | | | CORE FACULTY INSTRUCTIONAL LOAD | | | | | | | | | |  | |  | |  |  | |  |  | |  | |  |  | | |  |  |  |  | |  | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | **FALL 2009** | | | | | | | **SPRING 2010** | | | | | **2009-10 TOTALS** | | |  | |  |  |  | Units | Enrolled | Student Credit Hours | Fac. Load Credit |  | Units | Enrolled | Student Credit Hours | Fac. Load Credit | Dept. Student Credit Hrs | Faculty Load Credit Hrs | Dept. Faculty Credit Hrs |  | | FT | Horvath | Gen'l Biology II | 2 | 68 | 136 | 2 | Human Phys | 4 | 41 | 164 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 24 | 0 | 3 | Marine Bio | 4 | 17 | 68 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 27 | 0 | 2 | Marine Bio Lab | 0 | 17 | 0 | 3 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 16 | 0 | 2 | Practicum | 1 | 11 | 11 | 1 |  |  |  |  | |  | Horvath | Practicum | 1 | 9 | 9 | 1 |  |  |  |  |  |  |  |  |  | |  | Horvath | Chair | 0 | 0 | 0 | 2 |  |  |  |  |  |  | 597 |  |  | |  | Julio | Gen'l Bio II | 2 | 68 | 136 | 2 | Genetics Lab | 0 | 10 | 0 | 2 |  |  |  |  | |  | Julio | Physiology | 4 | 23 | 92 | 4 | Molecular Bio | 4 | 21 | 84 | 4 |  |  |  |  | |  | Julio | Phys Lab | 0 | 7 | 0 | 3 | Molec Bio Lab | 0 | 21 | 0 | 3 |  |  |  |  | |  | Julio | Phys Lab | 0 | 16 | 0 | 2 | Infec Dis/Immun | 2 | 19 | 38 | 2 |  |  |  |  | |  | Julio | Tut: Sem in Bio | 1 | 1 | 1 | 0 | Sem in Bio Lit | 1 | 7 | 7 | 1 |  |  |  |  | |  | Julio | Sem in Bioethics | 1 | 13 | 13 | 1 | Research | 1 | 1 | 1 | 0 |  |  |  |  | |  | Julio | Research | 1 | 4 | 4 | 0 |  |  |  |  |  |  | 506 |  |  | |  | McMahon | Cell Bio | 4 | 9 | 36 | 4 | Genetics | 4 | 46 | 184 | 4 |  |  |  |  | |  | McMahon | Cell Bio Lab | 0 | 9 | 0 | 3 | Genetics Lab | 0 | 17 | 0 | 3 |  |  |  |  | |  | McMahon | Sem in Bio Lit | 1 | 5 | 5 | 1 | Genetics Lab | 0 | 19 | 0 | 3 |  |  |  |  | |  | McMahon | Research | 1 | 2 | 2 | 0 | Infec Dis/Immune | 2 | 19 | 38 | 2 |  |  |  |  | |  | McMahon | Intro Life Sci | 4 | 17 | 68 | 4 |  |  |  |  |  |  | 466 |  |  | |  | Percival | Microbio | 4 | 3 | 12 | 4 | Gen'l Biology I | 4 | 75 | 300 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 3 | 0 | 3 | Sem in Bioethics | 1 | 8 | 8 | 1 |  |  |  |  | |  | Percival | Biochem | 4 | 28 | 112 | 3 | Major Honors | 3 | 1 | 3 | 0 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 28 | 0 | 4 | Intro Life Sci | 4 | 35 | 140 | 4 |  |  |  |  | |  | Percival | Major Honors | 2 | 1 | 2 | 0 | Gen'l Bio I Lab | 0 | 28 | 0 | 1 |  | 693 |  |  | |  | Schloss | Grant funded release |  |  |  |  | Comp/Env Physiol | 4 | 8 | 32 | 4 |  |  |  |  | |  | Schloss |  |  |  |  |  | Comp/Env Phys Lab | 0 | 8 | 0 | 3 |  |  |  |  | |  | Schloss |  |  |  |  |  | Bio & Faith | 4 | 8 | 32 | 4 |  |  |  |  | |  | Schloss |  |  |  |  |  | Chair | 0 | 0 | 0 | 2 |  | 88 |  |  | | Adj. | Atterbury |  |  |  |  |  | Human Phys Lab | 0 | 20 | 0 | 3 |  |  |  |  | |  | Atterbury |  |  |  |  |  | Human Phys Lab | 0 | 22 | 0 | 2 |  |  |  |  | |  | Carroll | Gen'l Ecology | 4 | 7 | 28 | 4 |  |  |  |  |  |  |  |  |  | |  | Carroll | Gen'l Eco Lab | 0 | 7 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Hernandez |  |  |  |  |  | Intro to Med | 1 | 18 | 18 | 0 |  |  |  |  | |  | Hobbs |  |  |  |  |  | Human Nutrition | 4 | 40 | 160 | 4 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 28 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 22 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 25 | 0 | 2 |  |  |  |  | |  | Marsh | Animal Behav | 4 | 7 | 28 | 4 |  |  |  |  |  |  |  |  |  | |  | Marsh | Animal Behav Lab | 0 | 7 | 0 | 3 |  |  |  |  |  |  | 512 |  |  | | TOTALS | |  | 37 | 409 | 684 | 64 |  | 45 | 612 | 1288 | 74 | 1972 |  | 2862 |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | **FALL 2010** | | | | | | | **SPRING 2011** | | | | | **2010-11 TOTALS** | | |  | |  | | | Units | Enrolled | Student Credit Hours | Fac. Load Credit |  | Units | Enrolled | Student Credit Hours | Fac. Load Credit | Dept. Student Credit Hrs | Faculty Load Credit Hrs | Dept. Faculty Credit Hrs |  | | FT | Horvath | Animal Div | 4 | 14 | 56 | 4 | Sabbatical |  |  |  |  |  |  |  |  | |  | Horvath | Animal Div Lab | 0 | 13 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Horvath | Practicum | 1 | 12 | 12 | 1 |  |  |  |  |  |  |  |  |  | |  | Horvath | Prof devel release | 0 | 0 | 0 | 4 |  |  |  |  |  |  | 107 |  |  | |  | Julio | Gen'l Biology II | 2 | 62 | 124 | 2 | Genetics Lab | 0 | 23 | 0 | 3 |  |  |  |  | |  | Julio | Physiology | 4 | 34 | 136 | 4 | Genetics Lab | 0 | 23 | 0 | 3 |  |  |  |  | |  | Julio | Phys Lab | 0 | 15 | 0 | 3 | Molecular Bio | 4 | 12 | 48 | 4 |  |  |  |  | |  | Julio | Phys Lab | 0 | 18 | 0 | 2 | Molecular Bio Lab | 0 | 12 | 0 | 3 |  |  |  |  | |  | Julio | Sem in Bio Lit | 1 | 11 | 11 | 1 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | Julio | Research | 1 | 3 | 3 | 0 |  |  |  |  |  |  | 574 |  |  | |  | McMahon | Major Honors | 4 | 1 | 4 | 0 | Major Honors | 2 | 1 | 2 | 0 |  |  |  |  | |  | McMahon | Sabbatical |  |  |  |  | Sabbatical |  |  |  |  |  | 0 |  |  | |  | Percival | Microbiology | 4 | 7 | 28 | 4 | Gen'l Biology I | 4 | 78 | 312 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 7 | 0 | 3 | Sem in Bioethics | 1 | 14 | 14 | 1 |  |  |  |  | |  | Percival | Biochemistry | 4 | 31 | 124 | 4 | Research | 1 | 3 | 3 | 0 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 31 | 0 | 3 | Intro Life Sci | 4 | 42 | 168 | 4 |  |  |  |  | |  | Percival |  |  |  |  |  | Gen'l Bio I lab | 0 | 0 | 0 | 1 |  | 760 |  |  | |  | Schloss | Gen'l Biology II | 2 | 62 | 124 | 2 | Tropical Eco w/lab | 4 | 12 | 48 | 7 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 23 | 0 | 1.5 | Bio & Faith | 4 | 14 | 56 | 4 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 23 | 0 | 1 | Practicum | 1 | 10 | 10 | 0 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 16 | 0 | 1 | Chair | 0 | 0 | 0 | 2 |  |  |  |  | |  | Schloss | Sem in Bio Lit | 1 | 9 | 9 | 1 | Endowed Chair | 0 | 0 | 0 | 2 |  |  |  |  | |  | Schloss | Sem in Bioethics | 1 | 2 | 2 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Chair | 0 | 0 | 0 | 2 |  |  |  |  |  |  |  |  |  | |  | Schloss | Walker Chair | 0 | 0 | 0 | 2 |  |  |  |  |  |  | 348.5 |  |  | | Adj | Carroll | Gen'l Ecology | 4 | 12 | 48 | 4 | Plant Class | 4 | 16 | 64 | 4 |  |  |  |  | |  | Carroll | Gen'l Eco Lab | 0 | 12 | 0 | 3 | Plant Class Lab | 0 | 14 | 0 | 3 |  |  |  |  | |  | Hernandez |  |  |  |  |  | Intro to Med | 1 | 19 | 19 | 0 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 27 | 0 | 3 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 29 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 22 | 0 | 2 |  |  |  |  | |  | Moore,A | Gen'l Bio II Lab | 0 | 23 | 0 | 1.5 | Human Phys | 4 | 37 | 148 | 4 |  |  |  |  | |  | Moore,A | Gen'l Bio II Lab | 0 | 23 | 0 | 1 | Human Phys Lab | 0 | 19 | 0 | 3 |  |  |  |  | |  | Moore,A | Gen'l Bio II Lab | 0 | 16 | 0 | 1 | Human Phys Lab | 0 | 17 | 0 | 2 |  |  |  |  | |  | Moore,A | Cell Biology | 4 | 15 | 60 | 4 | Genetics | 4 | 46 | 184 | 4 |  |  |  |  | |  | Moore,A | Cell Bio Lab | 0 | 15 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Sommer. E. | Intro Life Sci | 4 | 22 | 88 | 4 |  |  |  |  |  |  | 1062.5 |  |  | | TOTALS | | | 36 | 532 | 829 | 71 |  | 35 | 492 | 1078 | 65 | 1907 |  | 2852 |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | **FALL 2011** | | | | | | | | **SPRING 2012** | | |  | **2011-12 TOTALS** | | |  | |  |  |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit | Dept. Student Credit Hours | Faculty Load Credit Hours | Dept. Faculty Credit Hours |  | | FT | Horvath | Gen'l Biology II | 2 | 73 | 146 | 2 | Marine Bio | 4 | 20 | 80 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 28 | 0 | 3 | Marine Bio Lab | 0 | 20 | 0 | 3 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 30 | 0 | 2 | Practicum | 1 | 20 | 20 | 1 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 13 | 0 | 2 | Major Honors | 4 | 1 | 4 | 0 |  |  |  |  | |  | Horvath | Animal Diversity | 4 | 15 | 60 | 4 |  |  |  |  |  |  |  |  |  | |  | Horvath | Animal Div Lab | 0 | 15 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Horvath | Practicum | 1 | 17 | 17 | 1 |  |  |  |  |  |  | 598 |  |  | |  | Julio | Gen'l Biology II | 2 | 73 | 146 | 2 | Genetics Lab | 0 | 16 | 0 | 2 |  |  |  |  | |  | Julio | Physiology | 4 | 30 | 120 | 4 | Molecular Bio | 4 | 13 | 52 | 4 |  |  |  |  | |  | Julio | Phys Lab | 0 | 12 | 0 | 3 | Molecular Bio Lab | 0 | 13 | 0 | 3 |  |  |  |  | |  | Julio | Phys Lab | 0 | 17 | 0 | 2 | Infect Dis & Imm | 2 | 15 | 30 | 2 |  |  |  |  | |  | Julio | Sem in Bioethics | 1 | 14 | 14 | 1 | Sem in Bio Lit | 1 | 11 | 11 | 1 |  |  |  |  | |  | Julio | Research | 1 | 4 | 4 | 0 | Research | 1 | 5 | 5 | 0 |  | 514 |  |  | |  | McMahon | Cell Biology | 4 | 10 | 40 | 4 | Infect Dis & Imm | 2 | 15 | 30 | 2 |  |  |  |  | |  | McMahon | Cell Bio Lab | 0 | 10 | 0 | 3 | Genetics | 4 | 49 | 196 | 5 |  |  |  |  | |  | McMahon | Sem in Bio Lit | 1 | 12 | 12 | 1 | Genetics Lab | 0 | 17 | 0 | 3 |  |  |  |  | |  | McMahon | Chair |  |  |  | 4 | Genetics Lab | 0 | 15 | 0 | 2 |  |  |  |  | |  | McMahon | Research | 1 | 3 | 3 | 0 | Research | 1 | 3 | 3 | 0 |  | 438 |  |  | |  | Percival | Microbiology | 4 | 18 | 72 | 4 | Gen'l Biology I | 4 | 40 | 160 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 18 | 0 | 3 | Gen'l Biology I | 4 | 23 | 92 | 4 |  |  |  |  | |  | Percival | Biochemistry | 4 | 23 | 92 | 4 | Sem in Bioethics | 1 | 12 | 12 | 1 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 23 | 0 | 3 | Sem in Bioethics | 1 | 10 | 10 | 1 |  |  |  |  | |  | Percival |  |  |  |  |  | Research | 1 | 1 | 1 | 0 |  | 561 |  |  | |  | Schloss | Sabbatical |  |  |  |  | Sabbatical |  |  |  |  |  | 0 |  |  | |  | Sparkman | (Spring semester hire) |  |  |  |  | Intro to Life Science | 4 | 36 | 144 | 4 |  |  |  |  | |  | Sparkman |  |  |  |  |  | Topic: Behavioral Ecol | 4 | 7 | 28 | 4 |  |  |  |  | |  | Sparkman |  |  |  |  |  | Behavioral Eco Lab | 0 | 7 | 0 | 4 |  | 200 |  |  | | Adj | Carroll | Gen'l Ecology | 4 | 15 | 60 | 4 |  |  |  | 0 |  |  |  |  |  | |  | Carroll | Gen'l Ecology Lab | 0 | 15 | 0 | 3 |  |  |  | 0 |  |  |  |  |  | |  | Drake | Intro Life Sci | 4 | 35 | 140 | 4 |  |  |  | 0 |  |  |  |  |  | |  | Hernandez |  |  |  |  |  | Intro to Med | 1 | 20 | 20 | 0 |  |  |  |  | |  | Hobbs |  |  |  |  |  | Human Nutrition | 4 | 39 | 156 | 4 |  |  |  |  | |  | Jones | Gen'l Bio II Lab | 0 | 28 | 0 | 1 | Gen'l Bio I Lab | 0 | 25 | 0 | 3 |  |  |  |  | |  | Jones | Gen'l Bio II Lab | 0 | 30 | 0 | 1 | Gen'l Bio I Lab | 0 | 22 | 0 | 2 |  |  |  |  | |  | Jones | Gen'l Bio II Lab | 0 | 13 | 0 | 1 | Gen'l Bio I Lab | 0 | 16 | 0 | 2 |  | 623 |  |  | | **TOTALS** | |  | 35 | 594 | 926 | 69 |  | 41 | 491 | 1054 | 65 | 1980 |  | 2934 |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  | **FALL 2012** | | | | | **SPRING 2013** | | | | | **2012-13 TOTALS** | | |  | |  |  |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit | Dept. Student Credit Hours | Faculty Load Credit Hours | Dept. Faculty Credit Hours |  | | FT | Horvath | Gen'l Bio II Lab | 0 | 23 | 0 | 1.5 | Marine Biology | 4 | 19 | 76 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 25 | 0 | 1 | Marine Bio Lab | 0 | 19 | 0 | 3 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 8 | 0 | 1 | Practicum | 1 | 12 | 12 | 1 |  |  |  |  | |  | Horvath | Animal Diversity | 4 | 11 | 44 | 4 | Intro Life Sci | 4 | 38 | 152 | 4 |  |  |  |  | |  | Horvath | Animal Div Lab | 0 | 11 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Horvath | Animal Diversity Lab | 1 | 8 | 8 | 1 |  |  |  |  |  |  | 449.5 |  |  | |  | Jones | Biochemistry Lab | 0 | 17 | 0 | 2 | Gen'l Bio I Lab | 0 | 26 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  | 10 | Gen'l Bio I Lab | 0 | 28 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 28 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Lab coordinator |  |  |  | 6 |  | 198 |  |  | |  | Julio | Gen'l Biology II | 4 | 56 | 224 | 2 | Genetics Lab | 0 | 18 | 0 | 2 |  |  |  |  | |  | Julio | Research | 1 | 3 | 3 | 0 | Molecular Bio | 4 | 10 | 40 | 4 |  |  |  |  | |  | Julio | Physiology | 4 | 37 | 148 | 4 | Molecular Bio Lab | 0 | 10 | 0 | 3 |  |  |  |  | |  | Julio | Phys Lab | 0 | 14 | 0 | 3 | Topics: Infectious Disease | 2 | 16 | 32 | 2 |  |  |  |  | |  | Julio | PhysLab | 0 | 22 | 0 | 2 | Sem in Bio Lit | 1 | 14 | 14 | 1 |  |  |  |  | |  | Julio | Sem in Bioethics | 1 | 12 | 12 | 1 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | Julio |  |  |  |  |  | Major Honors | 2 | 1 | 2 | 0 |  | 510 |  |  | |  | McQuade | Cell Bio | 4 | 11 | 44 | 4 | Genetics | 4 | 35 | 140 | 5 |  |  |  |  | |  | McQuade | Cell Bio Lab | 0 | 11 | 0 | 3 | Genetics Lab | 0 | 17 | 0 | 3 |  |  |  |  | |  | McQuade | Sem in Bio Lit | 1 | 9 | 9 | 1 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | McQuade | Research | 1 | 2 | 2 | 0 | Major Honors | 2 | 1 | 2 | 0 |  |  |  |  | |  | McQuade | Major Honors | 4 | 1 | 4 | 0 | Adm assignment (Vice Chair) | |  |  |  |  |  |  |  | |  | McQuade | Dept Chair |  |  |  | 4 |  |  |  |  |  |  | 312 |  |  | |  | Percival | Microbio | 4 | 7 | 28 | 4 | Gen'l Biology I | 4 | 46 | 184 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 7 | 0 | 3 | Gen'l Biology I | 4 | 34 | 136 | 4 |  |  |  |  | |  | Percival | Biochemistry | 4 | 39 | 156 | 4 | Sem in Bioethics | 1 | 12 | 12 | 1 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 22 | 0 | 3 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | Percival | Research | 1 | 3 | 3 | 0 | Gen'l Bio I Lab | 0 | 0 | 0 | 1 |  | 603 |  |  | |  | Schloss |  |  |  |  |  | Comp/Env Phys | 4 | 11 | 44 | 4 |  |  |  |  | |  | Schloss |  |  |  |  |  | Comp/Env Phys Lab | 0 | 12 | 0 | 3 |  |  |  |  | |  | Schloss |  |  |  |  |  | Tutorial: Bioethics | 1 | 1 | 1 | 0 |  |  |  |  | |  | Schloss |  |  |  |  |  | Biology & Faith | 4 | 20 | 80 | 4 |  | 160 |  |  | |  | Sparkman | Gen'l Biology II | 4 | 56 | 224 | 2 | Orn/Herp | 4 | 5 | 20 | 4 |  |  |  |  | |  | Sparkman | Gen'l Bio II Lab | 0 | 23 | 0 | 1.5 | Orn/Herp Lab | 0 | 5 | 0 | 4 |  |  |  |  | |  | Sparkman | Gen'l Bio II Lab | 0 | 25 | 0 | 1 | Research | 1 | 1 | 1 | 0 |  |  |  |  | |  | Sparkman | Gen'l Bio II Lab | 0 | 8 | 0 | 1 | New faculty load reduction | |  |  | 4 |  |  |  |  | |  | Sparkman | Research | 1 | 1 | 1 | 0 |  |  |  |  |  |  |  |  |  | |  | Sparkman | Intro Life Sci | 4 | 25 | 100 | 4 |  |  |  |  |  |  | 319.5 |  |  | | PT | Carroll | Gen'l Ecology | 4 | 7 | 28 | 4 | Plant Class | 4 | 10 | 40 | 4 |  |  |  |  | |  | Carroll | Gen'l Ecology Lab | 0 | 7 | 0 | 3 | Plant Class Lab | 0 | 9 | 0 | 3 |  |  |  |  | |  | Hernandez |  |  |  |  |  | Intro to Med | 1 | 17 | 17 | 0 |  | 116 |  |  | | **TOTALS** | |  | **39** | **399** | **1038** | **78** |  | **46** | **481** | **1011** | **84** | **2049** |  | **2668** |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  | | **FALL 2013** | | | | | **SPRING 2014** | | | | | **2013-14 TOTALS** | | |  | |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit |  | Units | Enrolled | Student Credit Hours | Faculty Load Credit | Dept. Student Credit Hours | Faculty Load Credit Hours | Dept. Load Credit Hours |  | | FT | Horvath | Gen'l Bio II Lab | 0 | 24 | 0 | 1.5 | Marine Biology | 4 | 24 | 96 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 26 | 0 | 1 | Marine Bio Lab | 0 | 24 | 0 | 3 |  |  |  |  | |  | Horvath | Gen'l Biol II Lab | 0 | 23 | 0 | 1 | Practicum | 1 | 23 | 23 | 1 |  |  |  |  | |  | Horvath | Animal Diversity | 4 | 7 | 28 | 4 | Intro Life Sci | 4 | 39 | 156 | 4 |  |  |  |  | |  | Horvath | Animal Diversity Lab | 0 | 7 | 0 | 3 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | Horvath | Practicum | 1 | 10 | 10 | 1 |  |  |  |  |  |  | 491 |  |  | |  | Jones | Biochem Lab | 0 | 9 | 0 | 2 | Gen'l Bio I Lab | 0 | 30 | 0 | 2 |  |  |  |  | |  | Jones | Lab coordinator |  |  |  | 10 | Gen'l Bio I Lab | 0 | 27 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Gen'l Bio I Lab | 0 | 28 | 0 | 2 |  |  |  |  | |  | Jones |  |  |  |  |  | Lab coordinator |  |  | 0 | 6 |  | 188 |  |  | |  | Julio | Gen'l Biology II | 2 | 73 | 146 | 2 | Sabbatical |  |  | 0 |  |  |  |  |  | |  | Julio | Physiology | 4 | 24 | 96 | 4 |  |  |  | 0 |  |  |  |  |  | |  | Julio | Phys Lab | 0 | 13 | 0 | 3 |  |  |  | 0 |  |  |  |  |  | |  | Julio | Phys Lab | 0 | 11 | 0 | 2 |  |  |  | 0 |  |  |  |  |  | |  | Julio | Sem in Bioethics | 1 | 13 | 13 | 1 |  |  |  | 0 |  |  |  |  |  | |  | Julio | Major Honors | 2 | 1 | 2 | 0 |  |  |  | 0 |  |  | 316 |  |  | |  | McQuade | Leave (maternity) |  |  |  |  | Genetics | 4 | 48 | 192 | 5 |  |  |  |  | |  | McQuade | Dept. Chair |  |  |  | 4 | Genetics Lab | 0 | 20 | 0 | 3 |  |  |  |  | |  | McQuade |  |  |  |  |  | Genetics Lab | 0 | 8 | 0 | 2 |  |  |  |  | |  | McQuade |  |  |  |  |  | Genetics Lab | 0 | 18 | 0 | 2 |  |  |  |  | |  | McQuade |  |  |  |  |  | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | McQuade |  |  |  |  |  | Major Honors | 2 | 1 | 2 | 0 |  | 352 |  |  | |  | Percival | Microbiology | 4 | 21 | 84 | 4 | Gen'l Biology I | 4 | 48 | 192 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 20 | 0 | 3 | Gen'l Biology I | 4 | 37 | 148 | 4 |  |  |  |  | |  | Percival | Biochemistry | 4 | 27 | 108 | 4 | Sem in Bioethics | 1 | 8 | 8 | 1 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 18 | 0 | 3 | Research | 1 | 2 | 2 | 0 |  |  |  |  | |  | Percival | Research | 1 | 2 | 2 | 0 | Gen'l Bio I Lab |  |  | 0 | 1 |  | 654 |  |  | |  | Schloss | Gen'l Biology II | 2 | 73 | 146 | 2 | Bio & Faith | 4 | 15 | 60 | 4 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 24 | 0 | 1.5 | Grant funded crs release |  |  |  |  |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 26 | 0 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 23 | 0 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Sem in Bio Lit | 1 | 9 | 9 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Endowed chair |  |  |  | 4 |  |  |  |  |  |  | 300 |  |  | |  | Sparkman | Gen'l Ecology | 4 | 6 | 24 | 4 | Behav Eco | 4 | 10 | 40 | 4 |  |  |  |  | |  | Sparkman | Gen'l Eco Lab | 0 | 6 | 0 | 4 | Behav Eco Lab | 0 | 10 | 0 | 3 |  |  |  |  | |  | Sparkman | Research | 1 | 1 | 1 | 0 | Evolution | 4 | 6 | 24 | 4 |  |  |  |  | |  | Sparkman | Intro Life Sci | 4 | 26 | 104 | 4 | Sem in Bio Lit | 1 | 14 | 14 | 1 |  |  |  |  | |  | Sparkman |  |  |  |  |  | Research | 1 | 2 | 2 | 0 |  | 260 |  |  | | Adj | Hernandez |  |  |  |  |  | Intro to Med | 1 | 18 | 18 | 0 |  |  |  |  | |  | Pennington | Cell Bio | 4 | 13 | 52 | 4 |  |  |  |  |  |  |  |  |  | |  | Pennington | Cell Bio Lab | 0 | 13 | 0 | 3 |  |  |  |  |  |  | 91 |  |  | | **TOTALS** | | | 35 |  | 825 | 83 |  | 35 |  | 981 | 62 | 1806 |  | 2652 |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  | **FALL 2014** | | | | |  | **SPRING 2015** | | |  | **2014-15 TOTALS** | | |  | |  |  |  | **Units** | **Enrolled** | **Student Credit Hours** | **Faculty Load Credit** |  | **Units** | **Enrolled** | **Student Credit Hours** | **Faculty Load Credit** | **Dept. Student Credit Hours** | **Faculty Load Credit Hours** | **Dept. Load Credit Hours** |  | | FT | Horvath | Gen'l Bio II Lab | 0 | 28 | 0 | 1.5 | Marine Bio | 4 | 10 | 40 | 4 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 29 | 0 | 1 | Marine Bio Lab | 0 | 10 | 0 | 3 |  |  |  |  | |  | Horvath | Gen'l Bio II Lab | 0 | 16 | 0 | 1 | Practicum | 1 | 9 | 9 | 1 |  |  |  |  | |  | Horvath | Marine Mammal | 4 | 6 | 24 | 4 | Intro Life Sci | 4 | 34 | 136 | 4 |  |  |  |  | |  | Horvath | Marine Mam Lab | 0 | 6 | 0 | 3 |  |  |  |  |  |  |  |  |  | |  | Horvath | Practicum | 1 | 7 | 7 | 1 |  |  |  |  |  |  | 351 |  |  | |  | Julio | Gen'l Biology II | 2 | 40 | 80 | 2 | Genetics Lab | 0 | 17 | 0 | 2 |  |  |  |  | |  | Julio | Gen'l Biology II | 2 | 33 | 66 | 2 | Molecular Bio | 4 | 20 | 80 | 4 |  |  |  |  | |  | Julio | Physiology | 4 | 24 | 96 | 4 | Molecular Bio Lab | 0 | 20 | 0 | 3 |  |  |  |  | |  | Julio | Phys Lab | 0 | 13 | 0 | 3 | Infect Dis & Imm | 2 | 12 | 24 | 2 |  |  |  |  | |  | Julio | Phys Lab | 0 | 11 | 0 | 2 |  |  |  |  |  |  |  |  |  | |  | Julio | Research | 1 | 2 | 2 | 0 |  |  |  |  |  |  | 501 |  |  | |  | Leivan | Biochemistry Lab | 0 | 15 | 0 | 2 | Gen'l Bio I Lab | 0 | 24 | 0 | 2 |  |  |  |  | |  | Leivan | Biology lab coordinatior | 0 | 0 | 0 | 10 | Gen'l Bio I Lab | 0 | 24 | 0 | 2 |  |  |  |  | |  | Leivan |  |  |  |  |  | Gen'l Bio I Lab | 0 | 25 | 0 | 2 |  |  |  |  | |  | Leivan |  |  |  |  |  | Gen'l Bio I Lab | 0 | 16 | 0 | 2 |  |  |  |  | |  | Leivan |  |  |  |  |  | Bio lab coordinator | 0 | 0 | 0 | 6 |  | 208 |  |  | |  | McQuade | Cell Bio | 4 | 16 | 64 | 4 | Genetics | 4 | 47 | 188 | 5 |  |  |  |  | |  | McQuade | Cell Bio Lab | 0 | 16 | 0 | 3 | Genetics Lab | 0 | 13 | 0 | 3 |  |  |  |  | |  | McQuade | Sem in Bio Lit | 1 | 11 | 11 | 1 | Genetics Lab | 0 | 17 | 0 | 2 |  |  |  |  | |  | McQuade | Research | 1 | 3 | 3 | 0 | Infect Dis & Immun | 2 | 12 | 24 | 2 |  |  |  |  | |  | McQuade | Chair |  |  |  | 4 | Research | 1 | 4 | 4 | 0 |  | 455 |  |  | |  | Percival | Microbio | 4 | 17 | 68 | 4 | Gen'l Biology I | 4 | 50 | 200 | 4 |  |  |  |  | |  | Percival | Microbio Lab | 0 | 17 | 0 | 3 | Gen'l Biology I | 4 | 39 | 156 | 4 |  |  |  |  | |  | Percival | Biochemistry | 4 | 39 | 156 | 4 | Tutl: Human Microbiology | 1 | 1 | 1 | 0 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 23 | 0 | 3 | Sem in Bioethics | 1 | 15 | 15 | 1 |  |  |  |  | |  | Percival | Biochem Lab | 0 | 15 | 0 | 1 | Research | 1 | 3 | 3 | 0 |  |  |  |  | |  | Percival | Research | 1 | 1 | 1 | 0 | Gen'l Bio I Lab | 0 | 0 | 0 | 1 |  | 730 |  |  | |  | Schloss | Gen'l Biology II | 2 | 40 | 80 | 2 | Biology & Faith | 4 | 9 | 36 | 4 |  |  |  |  | |  | Schloss | Gen'l Biology II | 2 | 33 | 66 | 2 | Prof Devel Cr Release |  |  |  | 4 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 28 | 0 | 1.5 | Endowed Chair release |  |  |  | 4 |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 29 | 0 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Gen'l Bio II Lab | 0 | 16 | 0 | 1 |  |  |  |  |  |  |  |  |  | |  | Schloss | Research | 1 | 1 | 1 | 0 |  |  |  |  |  |  | 269 |  |  | |  | Sparkman | Gen'l Eco | 4 | 7 | 28 | 4 | Evolution | 4 | 5 | 20 | 4 |  |  |  |  | |  | Sparkman | Gen'l Eco Lab | 0 | 7 | 0 | 3 | Orn/Herp | 4 | 5 | 20 | 4 |  |  |  |  | |  | Sparkman | Sem Bioethics | 1 | 7 | 7 | 1 | Orn/ Herp Lab | 0 | 5 | 0 | 3 |  |  |  |  | |  | Sparkman | Research | 1 | 1 | 1 | 0 | Sem in Bio Lit | 1 | 6 | 6 | 1 |  |  |  |  | |  | Sparkman | Intro Life Sci | 4 | 33 | 132 | 4 | Major Honors | 2 | 1 | 2 | 0 |  | 249 |  |  | | **TOTALS** | |  | 39 |  | 893 | 83 |  | 43 |  | 964 | 83 | 1857 |  | 2763 |  | | | | | | | | | | | | | | | | | |  | |  | | |  | | |  | |  | | |  |  | | | | |  | |
|  |  | |  | | |  | |  | |  | |  | |
| STUDENT ADVISING LOADS | | | | | | | | | | | | |
|  |  |  | |  | | |  | |  | |  | |
| Instructor | 2009-10 | 2010-11 | | 2011-12 | | | 2012-13 | | 2013-14 | | 2014-15 | |
| Horvath | 26 | 27 | | 22 | | | 22 | | 23 | | 24 | |
| Julio | 25 | 27 | | 37 | | | 30 | | 23 | | 21 | |
| McQuade | 24 | 20 | | 24 | | | 33 | | 26 | | 31 | |
| Percival | 21 | 25 | | 24 | | | 29 | | 24 | | 24 | |
| Schloss | 18 | 19 | | 17 | | | 4 | | 18 | | 21 | |
| Sparkman |  |  | |  | | | 8 | | 20 | | 22 | |
| **TOTAL** | **114** | **118** | | **124** | | | **126** | | **134** | | **143** | |

1. **Faculty race/ethnicity and gender breakdown**

|  |  |  |
| --- | --- | --- |
|  | **Male** | **Female** |
| **Full-time** |  |  |
|  |  |  |
| White | 3 | 4 |
|  |  |  |
| **Adjunct** |  |  |
|  |  |  |
| White | 1 | 1 |
| Hispanic/Latino | 1 |  |

1. **Adjunct faculty profiles**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Profile of Part-time Faculty** | | | | **Years Employed** | | | | | |
| **Faculty Member** | **Date Hired** | **Gender** | **Ethnicity** | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
| Cody Atterbury | 2009 | Male | Caucasian | X |  |  |  |  |  |
| Mary Carroll |  | Female | Caucasian |  | X | X | X |  |  |
| Laura Drake | 2011 | Female | Caucasian |  |  | X |  |  |  |
| David Hernandez | Staff | Male | Hispanic/  Latino |  | X | X | X | X |  |
| Rhonda Hobbs |  | Female | Caucasian | X |  | X |  |  |  |
| Jennifer Marsh | 2009 | Female | Caucasian | X |  |  |  |  |  |
| Alex Moore | 2004 | Male | Caucasian |  | X |  |  |  |  |
| Britney Pennington | 2013 | Female | Caucasian |  |  |  |  | X |  |
| Erika Sommermann | 2010 | Female | Caucasian |  | X |  |  |  |  |

1. [**Overview of proposed changes**](http://www.westmont.edu/_offices/institutional_portfolio/program_review/documents/OverviewofProposedChanges_.doc)

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1. A brief description of each significant proposed change | 1. Rationale and evidence that support this change. Please, refer to the relevant page(s) in your Six-year Report | 1. Rationale and evidence from outside sources beyond your Six-year Report. Please, refer to the relevant page(s) in an external reviewer’s report and the PRC’s response |
| **1** | **Improve career and professional guidance for students.** | Alumni survey (p12) |  |
| **2** | **Increase our coverage of plant biology in our current classes.** | MFT in Biology (p5) |  |
| **3** | **Expand curriculum in key areas.** | Curriculum review (p14) |  |
| **4** | **Seek more external grant funding.** | Research capability and resources section (p19) |  |
| **5** |  |  |  |

1. **Student race/ethnicity and gender breakdown**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | |  |  |  |  |  |
| **2010** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native | 0 |  | 2 |  | 2 |  |  |
| Asian/Pacific Islander | 0 |  | 5 |  | 5 |  |  |
| Black | 0 |  | 3 |  | 3 |  |  |
| Hispanic/Latino | 0 |  | 0 |  | 0 |  |  |
| More than one | 0 |  | 0 |  | 0 |  |  |
| Two or more | 0 |  | 0 |  | 0 |  |  |
| Unknown | 0 |  | 1 |  | 1 |  |  |
| White | 7 |  | 7 |  | 14 |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  | 25 |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **2011** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native | 0 |  | 0 |  | 0 |  |  |
| Asian/Pacific Islander | 1 |  | 3 |  | 4 |  |  |
| Black | 0 |  | 0 |  | 0 |  |  |
| Hispanic/Latino | 0 |  | 2 |  | 2 |  |  |
| More than one | 0 |  | 0 |  | 0 |  |  |
| Two or more | 0 |  | 0 |  | 0 |  |  |
| Unknown | 0 |  | 2 |  | 2 |  |  |
| White | 10 |  | 10 |  | 20 |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  | 28 |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **2012** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native | 0 |  | 0 |  | 0 |  |  |
| Asian/Pacific Islander | 3 |  | 7 |  | 10 |  |  |
| Black | 0 |  | 0 |  | 0 |  |  |
| Hispanic/Latino | 3 |  | 3 |  | 6 |  |  |
| More than one | 0 |  | 0 |  | 0 |  |  |
| Two or more | 0 |  | 1 |  | 1 |  |  |
| Unknown | 0 |  | 2 |  | 2 |  |  |
| White | 5 |  | 9 |  | 14 |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  | 33 |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **2013** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native | 0 |  | 2 |  | 2 |  |  |
| Asian/Pacific Islander | 0 |  | 2 |  | 2 |  |  |
| Black | 0 |  | 0 |  | 0 |  |  |
| Hispanic/Latino | 3 |  | 3 |  | 6 |  |  |
| More than one | 0 |  | 0 |  | 0 |  |  |
| Two or more | 0 |  | 0 |  | 0 |  |  |
| Unknown | 0 |  | 2 |  | 2 |  |  |
| White | 10 |  | 12 |  | 22 |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  | 34 |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **2014** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native | 0 |  | 0 |  | 0 |  |  |
| Asian/Pacific Islander | 2 |  | 2 |  | 4 |  |  |
| Black | 0 |  | 0 |  | 0 |  |  |
| Hispanic/Latino | 2 |  | 4 |  | 6 |  |  |
| More than one | 1 |  | 5 |  | 6 |  |  |
| Two or more | 0 |  | 0 |  | 0 |  |  |
| Unknown | 0 |  | 1 |  | 1 |  |  |
| White | 11 |  | 14 |  | 25 |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  | 42 |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **2015** | Male |  | Female |  | Total |  |  |
|  |  |  |  |  |  |  |  |
| Race/Ethnicity |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| American Indian/Alaska Native |  |  |  |  |  |  |  |
| Asian/Pacific Islander |  |  |  |  |  |  |  |
| Black |  |  |  |  |  |  |  |
| Hispanic/Latino |  |  |  |  |  |  |  |
| More than one |  |  |  |  |  |  |  |
| Two or more |  |  |  |  |  |  |  |
| Unknown |  |  |  |  |  |  |  |
| White |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| TOTAL |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

1. **Student graduation rates**

We do not have access to these data

1. **Review of library holding**

**Resources and Use**

One of the ways the library supports Biology students and faculty is by providing access to print and electronic resources. In 2014-15, the library made additional purchases to support the evolution and creation debate assignment that students engage with every year. Many of these titles are often put on reserve for students use by faculty members, but the library did not own all of them. Purchasing this set of titles not only supports that assignment, but enhances the collection for students that might otherwise be engaged in research in this area.

The library provides access to article and research databases for students and faculty, many of which are interdisciplinary in nature (Academic Search Elite, ProQuest Research Library, Springer Journals, etc.). Beyond these interdisciplinary resources, the library also subscribes to electronic collections and resources particular to the biological sciences. *Annual Reviews* provides access to more than forty titles, giving students and faculty access to articles that review and synthesize the most significant primary research contributions made each year across a spectrum of scientific fields (Annual Review of Marine Science, Annual Review of Microbiology, Annual Review of Genetics, etc.). Among the many JSTOR collections to which the library provides access, the *JSTOR - Life Sciences* collection provides access to 164 journal titles, covering the Biological Sciences, Ecology, Botany, Conservation, Paleontology, Zoology, General Science, Epidemiology, Nursing, and Health Sciences.

After a brief blip in access, the library restarted a subscription to the journal *Science* in 2013, providing faculty and students access to articles from this essential publication from its inception in 1880 to the present. JSTOR provides archival access to *Science*, which the library has long maintained, supplemented by a direct institutional subscription to the journal, providing access to the most recent content.

**Expenditures**

In the most recent academic year, the library spent more than $10,000 on biology-related databases and more than $2,000 on biology-related journals. However, it’s worth noting that this total does not include the cost of resources that have broad applicability to the natural and behavioral sciences, but only those most directly applicable to the biological sciences.

Over the past six years, the library has made a concerted effort to increase the number and breadth of print sources purchased every year for the Biology department, paying particular attention to purchasing items closely connected to the subject areas taught at Westmont. Though spending was relatively low during the first three years of this review period, the past three years have seen more regular spending. Typically, the library budgets $1500 for books and other media for each academic department and in the past three years the library has spent all of the allocated funds for Biology.

For a detailed breakdown of journal, database, and book expenditures, please see Appendix A.

**Staffing**

The Library’s liaison program was reinvigorated in 2009, creating a better framework for partnership between librarians and classroom faculty. Because of internal staffing changes at the library, the library assigned a new liaison to the Biology department In the fall of 2012. This new liaison has particularly focused on purchasing and resources, ensuring that the library is keeping up with essential works published in the field each year. During the 2012-13 academic year, purchasing was particularly focused on materials supporting the research areas for the newest Biology faculty member.

**Instruction and Research Help**

Since 2009, librarians and faculty have only occasionally collaborated specifically on in-class library instruction. Beyond these sessions, the library has experimented with creating course-specific online guides to further support student research and point students to appropriate and applicable resources for particular assignments.

At the Research Help Desk in the library, librarians offer in-person research help to students from all disciplinary backgrounds. Though exact statistics are not kept on the disciplinary background of every student who works with a librarian at the desk, over the past two years librarians have helped biology students locate reference materials, find basic information about particular species, explore issues in biomedical ethics, and access articles discovered through PubMed.

**Future Directions**

The library’s own departmental efforts will focus specifically on collections during the 2016-17 academic year. All the science areas would benefit from some thoughtful deaccessioning, and the health sciences are a particular concern. We plan to involve biology faculty in some of the decision making process for this project.

The biology department supports faculty research needs by providing individual subscriptions to certain key journals. However, this access does not extend to students. The library is committed to exploring ways to provide access to some of the essential resources that are not currently part of the library’s holdings.  The biology department and the library have begun initial conversations to this end and this year and next, the library will explore resources for potential addition.

**Appendix A**

**Library Expenditures - Biology Resources**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Books/Media (cost)** | **Books/Media (quantity)** | **e-Journals Purchased (cost)** | **e-Journals Purchased (quantity)** | **Databases Purchased (cost)** | **Databases Purchased (quantity)** |
| **2014-2015** | $1883 | 53 | $2022 | 10 | $10,200 | 5 |
| **2013-2014** | $1525 | 31 | $2022 | 10 | $8395 | 5 |
| **2012-2013** | $1598 | 18 | $1190 | 6 | $8258 | 4 |
| **2011-2012** | $427 | 10 | $1190 | 6 | $8261 | 4 |
| **2010-2011** | $203 | 7 | $3310 | 10 | $7903 | 4 |
| **2009-2010** | $868 | 6 | unknown | unknown | unknown | unknown |

**Library Expenditures - General Science Resources\***

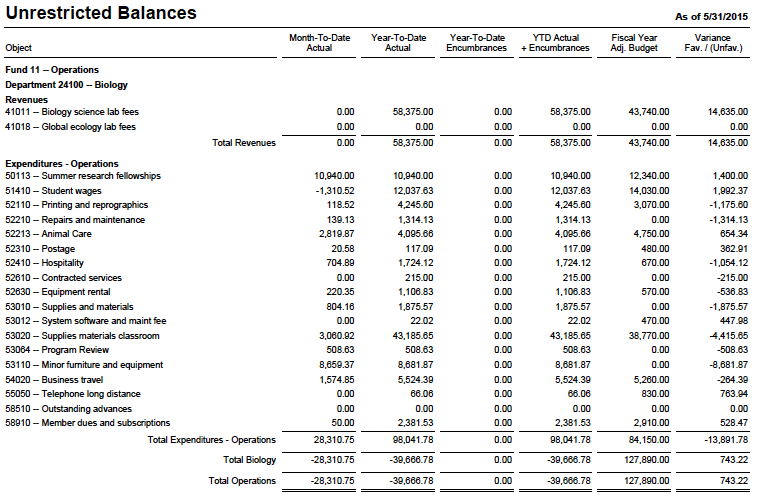
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **e-Journals Purchased (cost)** | **e-Journals Purchased (quantity)** | **Databases Purchased (cost)** | **Databases Purchased (quantity)** |
| **2014-2015** | $4011 | 10 | $10,119 | 4 |
| **2013-2014** | $4012 | 10 | $8580 | 4 |
| **2012-2013** | $1350 | 9 | $8077 | 4 |
| **2011-2012** | $1350 | 9 | $8048 | 4 |
| **2010-2011** | $2248 | 9 | $2668 | 3 |
| **2009-2010** | unknown | unknown | unknown | unknown |

\*these expenditures exclude any departmentally-specific resources (biology, chemistry, physics, etc.)

1. **Internships report**

See Section II, E, 4

1. **Budget**

****

1. [**Inventory of Educational Effectiveness Indicators**](http://www.westmont.edu/_offices/institutional_portfolio/program_review/documents/IEEIforacademicprograms.docx)

**Department or Program:**

Biology

**Have formal learning outcomes been developed? (Y/N)**

Yes.

**Where are these learning outcomes published?**

http://www.westmont.edu/\_academics/departments/biology/program-review.html

**Other than GPA, what data/evidence is used to determine that graduates have achieved stated outcomes for the degree?**

|  |  |
| --- | --- |
| **Outcome** | **Evidence** |
| PLO #1 Core Knowledge | Scores on the Major Field Test in Biology |
| PLO #2 Experimental Investigation | Bio-005 posters, Research student survey and focus group |
| PLO #3 Scientific Communication | Samples of student research papers in 3 different upper division courses (Bio-110, -130, -132) |
| PLO #4 Biology/Faith Integration | Bio-006 and Bio-197 Student survey; Evaluation of assignments and end-of-semester questionnaire from Bio-196 students and Student Focus Group |

**Who interprets the evidence? What is the process?**

All full-time biology faculty in the department review and evaluate the evidence together at the end of each academic year.

**How are the findings used?**

The following list identifies some changes that have been made in the last 5 years as a result of the findings from our annual assessment:

|  |  |
| --- | --- |
| **Outcome** | **Example Use of Findings** |
| PLO #1 | Currently in process of researching and discussing re-arranging our 3-course introductory sequence |
| PLO #2 | Increased expectation for summer research student summative experiences |
| PLO #3 | Changed writing instruction in Bio-114; began a Biology tutoring program |
| PLO #4 | Modified instruction in Bio-196; Held a joint brainstorming session with Philosophy faculty |

**Date of last program review for this degree program?**

September 2015

1. **Student Focus Groups**

**A. Independent Research (questions and responses)**

**1.) How many summers or semesters have you conducted faculty-supervised Independent research in the Biology department?**

* Summer
* 2 Semesters
* 1 Summer
* 2 Semesters
* 2 Semesters

**2.) Have you conducted research in any other department or at any other institution? (Note: All of the question below pertain only to the independent research experience in Westmont’s Biology department although you can use other experiences for comparative purposes)**

* One student did participated in summer research at a different college, for one summer.
* The comparison between both of the research is that, At the other College faculty mentors weren’t as involved or felt a personal connection. Where at Westmont there faculty mentor was amazing and very helpful, encouraging and involved when needed.

3**.) How would you rate your experience in conducting independent research in**

* 8.5
* 8
* 9
* 9
* 8

**the Biology Department (Very positive, positive, neutral, negative, very negative)? Why?**

* Positive
* Very positive
* Very Positive
* Positive
* Positive

**Why:** There is a fellowship among the department. Where yes you work alone but you are very well supported and when asked for help or even need a second opinion there always someone to guide you or give their opinion in a very supporting way.

**4.) a.) What have been the most (important experiences) you have had through independent research?**

* Not being afraid to fail
* Time management
* Finding inner confident to proceed with the project even though you’re not 100 percent sure it was going to result in correct data.
* Asking for help when needed without fear of being judge or discourage
* Taking the risk that there might be mistake and set back

**b.) What are the most valuable lessons you have learned? What has been most (enjoyable in the experience)?**

* Working with a well known scientist was a blast
* Enjoy working through problem solving
* Appreciation of what goes on into medication impact of on population
* Critical thinking
* Having a great connection with mentor
* Finding independence to where you learn on how to handle time management, discipline and sharing data they have completed on their own.

**5.) What have been the biggest challenges in conducting independent research with a faculty member?**

* Being nervous of not meeting their expectations. Working with a real scientist can be intimidating.

**6.) How could faculty members and/or the department as a whole improve the research experiences for students?**

* One student suggested more lectures or readings on a project before starting the research. This one student also felt like they should have been challenged more.

**7.) How confident do you feel in your ability to describe the experimental methods, results, and conclusions of your project? What could the faculty member do to increase your confidence?**

* There was one student who is generally shy, which made her nervous presenting her project. A way the faculty members can help is by doing a run-through of the presentation on more of a one on one basis. And getting more feedback from their mentor.

**8.) Are faculty members too ambitious in what they want you to accomplish in a summer or semester or are they not ambitious enough? challenged (not enough, just the right amount, too much)?**

* Two students felt like there could have been more on hands mentors. And others felt the right fit.

**9.) Did the independent research experience increase your appreciation for Biology or science in general? In what ways?**

* Student felt that it help with more critical thinking.
* Problem solving
* Time management
* Boost confidence
* Helped them to understand more of the why’s of the classes and labs they are mandatory to take.
* Taking risk in decision making.
* Learning to trust their decision and making a decision on their own.

**10.) Has the research experience equipped you for your future goals beyond Westmont? If so, how?** I think question 8 response is the same as this question

**11.) How has the independent research experience differed from the research experience you have gotten from your Biology lab classes?**

* First there is no manual that has step by step process with doing researching. So feels like lab is unrealistically needed.
* Other student thought it was good to learn the tools in a lab.
* Research helped with understanding why you need to take a step back and also learn on how to follow instructions on a lab manual.

**B. Student Focus Group:**

**Faith/Biology Integration across the Curriculum**

Questions:

As a Christian educational community, Westmont seeks to understand the disciplines through the lens of faith, while also developing faith in light of what we know from other means of inquiry. The biosciences involve many observations and topics that inspire faith in a Creator, that actually seem to support some theological beliefs of the Christian tradition, and that seem to raise challenges.

* What are some of the disciplinary issues related to faith raised by your major that you found especially interesting or important? In what classes and by what means were they raised?
* Were there issues you think are important that were not raised or did not receive adequate attention? [bearing in mind the mandate to give adequate coverage to mainstream biology itself]
* There is a balance between raising challenging questions in a way that provides openness and independence for inquirers while also affirming shared beliefs as a community and giving adequate support to students as they wrestle with issues. Different students, at different stages of their journey, may benefit from different approaches. In terms of feeling free to inquire in an environment that too Christian faith seriously, and supported but did not coddle you:
  + Were there some issues that were handled particularly well? Or not well?
  + Were there some approaches that worked well/not well?
  + Were you exposed to a range of views and resources?
  + Did the range and depth of issues increase as you moved from Bio5 through the curriculum?
* Do you believe your biology major at Westmont has left you with a more substantial understanding of the relationship between faith and learning? Are you better equipped to appreciate harmony and work through ambiguity?

Transcript of discussion:

*Dr S.- As a Christian educational community, Westmont seeks to understand the disciplines through the lens of faith while also developing faith in light of what know from other means of inquiry. The bio sciences involve observations and topics that inspire faith and a creator that actually seems to support some theological beliefs of the Christian traditions, and seem to raise challenges. So the first question is- What are some of the disciplinary issues related to faith raised by your major that you found especially interesting or important? In which classes and by what means were they raised?*

Student 1- A few of the points that I thought were more interesting was the topics of historical Adam and Eve or on moral ity whether or not you need God to have a true sense of morality, and being made in the image of God and what that means from a biological basis, given evolutionary and other factors.

*Dr. S- So can you clarify a little bit in what you mean when you say, made in God’s image, and evolution?*

Student 1- Or through the lens of Evolution, the idea that essentially there is a more long drawn out version of creation that got us to the way that He initially intended us to be.

*Dr. S- And were there specific classes in which this was touched upon in particularly important ways?*

Student 1- Bio 6 was the first one that I felt it was introduced, and then this class, Bio and faith touched on it a lot.

*Dr. S- And what are some means in which they were raised that you felt were particularly helpful, was it discussion, or, what are some of the different ways?*

Student 1- Yeah, some of it was discussion, and other was lecture based, but it was nice that a lot of the professors would allow us to give our input, and not just lecture solely about it; they would allow us to have our own interpretations.

*Dr. S- So it was discussion back and forth, with a professor, or with other students as well?*

Student 1- With both, yeah

*Dr. S- Anything else?*

Student 1- Nope

*Dr. S- Ok.*

Student 2- I remember in Physiology with Dr. Julio we were talking about evolution and he gave us an article, and then we had a class discussion about it, and I think that was one of the first classes that I remember having an open dialogue about it. W did talk about it in bio 6, but that was more of a formal debate situation, but in phys it was more of a informal kind of understand it kind of thing, so I enjoyed that.

Intervening student- Yeah I did too.

Student 2- And then, also in bio and faith of course, that’s like all we talked about, so that was really nice.

*Dr. S- What types of means was it brought up in Bio and faith? I know that’s what the class is all about, but what techniques seemed to be particularly important or interesting?*

Student 2- Mostly what it was is we would all read an article, then come to class and discuss the article and discuss our opinions on them, but it was also helpful that we didn’t just focus on the articles, if the discussion took us else where, we would discuss that topic also.

*Dr. S- Anything Else?*

Student 3- I was really interested in the discussion that we had, in at least physiology, about two falls ago, about the use of embryonic stem cells, and what was really cool was just hearing everyone’s ideas about what they thought, at least ethical issues behind stem cells, and seeing the different range of views as Christians or even Non-Christians had about it. Another topic that really intrigued me was homosexuality, and whether or not there is a biological basis behind it, and that was discussed in my bio-lit seminar class, and the bio and faith course. I think what was really good about those things is that they were raised through discussion and a little bit of lecture.

*Dr S.- Is that all?*

Student 4- I think this has to do with homosexuality too, but the broader category there that I have been pretty fascinated by, especially with the last couple of years, once we have gotten into the upper division courses, has been the genetic determinance of our behaviors, and how much is predetermined by our DNA, and how much is learned or brought in by social environment, and some of that is homosexuality, or some of that is abuse, cause certain genes have been linked to abusive homes, so you wonder how much of that is nature, and how much is nurture. And obviously it’s a crossover between those two things. And kind of an extension of that too is then if these behaviors are indeed determined by genetics in some cases, what are the dangers then of trying to fix those or trying to return to some kind of normal genome free of errors. Because it kind of brings up the question of what is a normal genome, which is also kind of a social question I think too. So it has been fun to explore not just the biological implication of this stuff, but the social implications too, and it stretched into race and all that as well. And then we talked about that a lot in cell bio and phys as well, and then this year I think evolution as a whole has been made more important in my mind because I knew that Christians have often clashed with idea of Darwinian evolution, but it has been a very interesting and fun process trying to reconcile the two, and realizing how much they compliment one another, but also kind of realizing how deep and complex looking at the world through an evolutionary point of view is while also being a Christian and being faithful to God, because it brings up all sorts of issues when it comes to the basis of religion or altruism, like where does our self giving love come from, in evolutionary terms. So I think it is interesting to figure out where some of this might be coming from.

*Dr. S- Those are some great topics. One thing you mention that I was hoping you could expand on what race implications, what did you mean by that?*

Student 4- I think I connected that with genetics, and that as kind a topic we brought up in class as well.

*Dr S.- In which class?*

Student 4- In bio and faith, it was fun because we went through a historical point of view of it, and different theories we have had in the past. And also it has been, I guess looking at it from a biological point of view makes race issues even more complicated for me because its not as black and white as we would like it to be, I think the biology even says that there might be inequalities. But I put that in quotation marks, because who know what inequalities are sometimes, but even the biology says that there are differences between genomes of different ethnicities, and in biology we call this differences in populations, and so I think its been a complex, but also a very enriching process to explore those issues in the context of biology.

Student 5- I feel like I resonated with a lot of things people said, I’ll try not to be too redundant of anything. I guess specifically for me it was really interesting coming into this environment, wen the Christian environment I was raised is was very anti-evolution, it was a very exciting process to deal with that and asked some hard questions, and look at the science behind it, and I think Westmont was a very good environment for that kind of thing, and I think the professors do a good job of sharing their beliefs and science in a gentle, but thorough way.

*Multiple students voice agreement*

*Dr. S- In terms of Westmont bringing in a gentle, but, what did you say?*

Student 5- Well gentle, but I am trying to think of a good word for it. Strong.

Intervening student- A serious way, not pushy

Student 5- Yeah, but at the same time, not like half way.

Intervening Student- Yeah, like this is what we believe, but you don’t have to believe it.

*Dr. S- Like in a scientific way?*

Student 5- Yeah, but not trying to baby you.

*Dr. S- Not trying to caudal you?*

Student 5- It is direct, that’s the word

*Dr. S- Ok, direct, but gentle, is that fair?*

Student 5- Yes. And I think that by far hands down the class that has been the most valuable for me with any kinds of issues with my faith and biology, has been this class, bio and faith.

*Student voices agreement*

*Dr. S- You said that this has been the best class that looks at the intersection?*

Student 5- Yeah, hands down. Because it, it literally shows… Dr. Schloss chose a ton of specific topics that I have totally shied away from in the past because they make me feel uncomfortable, like things we talked about like biology and homosexuality, differences between genders, and evolution and its implications on the problems of evil, and just finding a theodicy, and its been an extremely enriching and challenging experience, but I am very thankful for this class.

Student 6- A lot of the stuff that I was thinking of has already come up, but I really appreciated how we have discussed evolution throughout my time at Westmont, I also grew up in an environment, that was like, evolution cannot have happened from a Christian standpoint. So I really appreciated how it seemed to be woven into so many classes within the bio department, bio 6, physiology, molecular bio, bio and faith, and I am sure it was raised in more, those are just the first that I remember the conversations coming to mind. And then also I really appreciated the conversation we had, well all the conversations we had in cell bio about stem cells, and stem cell research, and the ethics and theology behind that, and what it means, and when does life start, and all of those conversations, and I really appreciated the way that Dr. McQuade had us think about that, and learn about that, and read articles about it, and present it, and go over to her house and talk, and that was just so nice, and really helpful. And then agreeing with somebody else that I am not going to name, all of the conversations we have had about behavioral genetics, both in genetic and molecular biology and this class have been so interesting, to think about what it means to be made in the image of God, but also be genetically predisposed to certain behaviors that are seen as negative, and what that means. And also race and genetic engineering came up in genetics, and I appreciated that, with both of them, what it means from a theological, and biological standpoint. And then the theological implications behind genetically engineering embryos, and what that means. And then in my infectious disease class its been fun to talk about the theology of disease and our responsibility as Christians in the face of disease around the world, and our role in that as scientists and Christians. And I’d say throughout all of these issues I appreciated how the professors approached it from, they never approached in from a binary thing, like you have to believe this or this, it was always pretty moderate. Different people believe different things, these are some of the major view points, and I really appreciated that moderation that they showed, and sometimes we discussed it in round tables, and sometimes it was integrated with class material, where during lecture a professor would pause and say this has implications for this theological issue, and I really appreciated both of those ways of talking about it.

Student 5- I was just thinking with the behavioral genetics, and what not, one thing that has really struck me, and I realized it more and more through each class, just by the little things we learn that the professors don’t even necessarily direct us to thinking about theologically, but I just feel like its given me, its been very humbling, to consider how powerless people are to a lot of different biological and genetic factors, and predispositions, I think it has been really awesome in the context of a college environment with a lot of high achieving student and people who are considered intelligent and gifted in a lot of ways, just to recognize hwo much of our abilities or our tendencies toward being kind, patient, can be at least in part attributed to our biology, and I think that, it gives us all the more reason to be humble in that knowledge and thankful for God for giving us those gifts, and also less judgmental, and show more empathy towards people that we could consider as bad or having bad qualities, I just think it has been really humbling.

Student 7- A couple semesters ago I took bio and lit, it was really interesting because we looked at sexual development in different animals, and at the end of the course, we kind of got together and talked about ethical uses of animals, and it was really interesting because each of us had a paper that we presented, and I never stopped to think about the animals that were being used, and it was a good conversation talking about how animals should be used, and our call as Christians to take care of creation and how using animals fits in, and obviously we all had different view points, and different stages, but it was an issue that was very welcoming, it wasn’t stand offish, and its something that is really important.

*Dr. S- The Discussion?*

Student 7- Mhm

Intervening student- Yeah I agree, because I feel like in the science we often like just dismiss it like we can use animal for whatever, so I think its good to question whether or not its ethical, and in what capacity to use them.

Student 8- I found something that we discussed a little bit in this class, was genetic determinance of behavior, echoing (inaudible) commons, I think that’s one of the most fascinating things in biology as it pertains to faith, especially looking at consciousness in lieu of evolution and being created in Gods image, what does the mean? What responsibility does that entail? And how is it, It is uniquely human. I would have liked to have done more on that, but I think it was a really important and good thing.

*Dr S.- Done more on evolution being uniquely human?*

Student 8- Consciousness

*Dr S.- Ok, and when you say consciousness in lieu of evolution?*

Student 8- Like how we got consciousness, cause we are the only conscious mammals, or creatures. Also the historical Adam and Eve is something I haven’t thought about, and I don’t think a lot of people do because we are taught about Adam and Eve in Sunday school, so there is no reason to question it. The discussions we had in this class were really challenging about that. Because I didn’t know if I had any like, I wasn’t tied to an Adam and Eve, but reading articles from both sides of the argument, from Christians and scientists alike, proved challenging and good for discussion. And bio and faith has been by far the class in which these faith and learning biology issues have been raised in care and consideration, openness, kindness, and honest and integrity, so its been really valuable.

*Other Students voice agreement*

*Dr S.- Ok, so the next question is, were the issues you think are import ant, so think back to the issues that were not raised in your classes or did not receive adequate attention, bearing in mind the mandate to give adequate coverage to mainstream biology itself. So were the any issues that you wish were covered at all, or more than they were?*

Student 1- Yeah two that come to mind, we covered them a little bit, but I would have like to have seen them covered more the first one is homosexuality, I would just on the genetic determinance of it all or just going from a biological standpoint and seeing how the relates with faith or even judgment, I feel like there is a lot of judgment in that community.

*Dr. S- Judgment from God, or judgment from others?*

Student 1- From others, and social influences, but I think that would have been interesting to dive into a little bit more, though I did appreciated that we did get into a little bit. And the other point was, moral responsibility for those who done wrong, but they have a genetic disposition that makes them do so. We heard about in bio and faith, a man that committed a lot of pedophilial crimes, because he had a tumor in his brain that was pushing on certain regions that caused him to have these urges, but then when they got rid of the tumor, he no longer had those feelings. And so just to delve into it a little bit more, of how responsibility might work, and this kind of goes onto the fringes of biology and turns into more philosophy, but it would have been interesting to delve in further.

Student 2- I would agree with what the person before me said, and I would say I wish we talked more about genetic components of behavior, and things like that, and stem cell research, but it sounds like from other comments I just didn’t take the classes that they talked about those things in. So I wish that I had a way to be in those discussions, even without taking those classes, I don’t know how that would work.

*Dr S.- So stem cell research and the genetic components of behavior?*

Student 2- Mhm

Student 3- I feel like the conversation we had about Adam an Eve was really interesting and I wish it could have taken place in more than just one class sitting, and I wish that we could have potentially covered more articles on what scientists and also theologians are saying about it, just as it makes sense to understand how this topic is controversial and its also understandable that not that much support is out there that can give us an answer yet, it would be cool to further study the origins or the idea of Adam and Eve.

Student 4- I feel like we covered a lot of topics, and actually for the amount of topics we covered in this class, we explored them in pretty good depth, I think I would comment on just in terms of homosexuality, that is what came to mind first for me as well, but then I recall our discussion on it, and really, I kind of feel like there isn’t much of a place to go quite yet, it is still in development, and even the genetics of it aren’t very clear if at all, like we aren’t eve certain they exists in regards to that subject. SO I would like to say we covered more about homosexuality, but to be fair, there might not even be that much to cover at this point. In terms of the biology at least.

*Dr S.- In terms of the research that has been done?*

Student 4- Yeah on the biological side of things. I think there is plenty to be said socially, without a doubt, but I think if were sticking to a biological framework, we explored almost all of it, and there isn’t much, I was also thinking about again genetic determinance, or pre-dispositions and one thing that fascinated me in some of those discussion is the role of drugs in those subjects because drugs obviously are meant to enhance our lives, meant to ease pain, or help us pay attention when we cant, like in the case of ADD, like somebody was saying earlier, I think empathy is a huge part of that for me, and something I learned this year. Just through the limited discussion we had about how people sometimes need drugs in order to function in a normal way, and there are other cases in where we shouldn’t be taking drugs and are abusing drugs in the wrong way, and at the intersection of taking drugs with our genetic pre-dispositions is kind of a fascinating thing because the lines get blurred there between when its appropriate to take drugs for how you’re feeling and who you are essentially, versus how you want to be or enhance your life in a way that is in excess. Does that make sense?

*Dr. S- So you’re saying, there was some discussion about genetic pre-disposition and determinance, and the role of drugs was raised in that discussion, but you wish that you would have gone deeper into the moral implications?*

Student 4- Exactly, because I think its important to, and this just came to mind, its important to discern in those situation when a drug is taken out of necessity, versus use for performance, and usually when you cross over into taking a drug for performance, you’re getting into some hazy moral ground there, and I think its and appropriate conversation to have when you’re talking about genetic pre-dispositions.

Student 5- I don’t really agree with what other people said, I just have a different opinion of what the role of a Christian college should be when its teaching science, I think that Westmont has done a very good job of introducing us to different topics, although it may have been light exposure. But due to time constraints it not realistic to think that we can, while gaining the knowledge to molecular biology and physiology, we can also figure out the issue of the genetic basis of homosexuality, or behavioral genetics. But I just have been stuck by that I am leaving Westmont with a million more questions and doubts, and things that make me feel uncomfortable when I think about science and faith, way more questions than when I came into Westmont, and I think that is a really good sign because Westmont exposed me to that, and brought up those discussions and I think that the role of Westmont should be more to get us that exposure, and then emphasize the importance of further pursuing these topics, then giving us a nudge out in to the world to keep exploring those things in a life long process, and there is topic after topic, and the main thing is instilling the sense of value and importance in engaging in difficult discussion, but I don’t think its Westmont’s role to completely exhaustively go through each of those, to the point that we feel satisfied about the answers, so I think its done a very good job.

*Dr. S- So you feel that, given the time constraints of bearing in mind the mandate to give adequate coverage to mainstream biology itself is what it says, so you feel that it kind of touched on everything adequately and there wasn’t gaping wholes?*

Student 5- We didn’t cover every single scientific issue that can be raised with our faith, but like we did, and this class is basically the whole point of it is going over those things and I think that is awesome and I am thankful that I am in that, but I think that as a whole I don’t think that the point should be an exhaustive apologetics of Christianity and science, I think that our role as Christian Scientists, our responsibility should be actively engaging in those things on our own and through out our lives, and hopefully at our time at Westmont too. And I think Westmont has done a good job at exposing us to important things, but I don’t think its Westmont’s role to solve all of our spiritual dilemmas for us, I think the bio department has done a very good job. Obviously no institution is perfect, but I have been very satisfied with that aspect of it.

Student 6- I agree with a lot of what the person before me said, but I would say if there were a couple things that I wish the biology department have covered more is the theology of disease and to not be what we determined as normal, and the theological implications of disease and disease inequality, we mentioned that in my infection disease class, and it was so fascinating, and a topic I haven’t heard discussed much, because I always assumed there is just healthy and diseased, and the idea that there is a theology behind the diseases and why disease exists, is something that I wish had been talked about more, and integrated in ways throughout my time here at Westmont, because a lot of times we talk about disease as examples in class, but I never thought about the theology behind what disease is. An then also echoing previous comments, behavioral genetics I something that I find so fascinating that I don’t honestly know if I can ever feel like it was covered enough because there is just so much there, so it just one of those things that discussions in my bio classes have made me more curious about it, so like the previous person said, I can go explore more, but it would also be fun to talk about that more in class settings.

Intervening student- I agree with the disease comments here, and I think that’s actually something that I missed, I am bummed I didn’t get to hear about that, like I bummed I am not in your class. Cause that sounds like something very important and interesting to be discussed.

*Dr. S- Maybe this is a silly question because I am not in the field, but by the theology of disease you mean, why people have diseases and how we should treat them?*

Student 6- Yeah, and how we should be thinking about disease, for example, one of the theologians that Dr, Julio talked about in class, was how diseases in our lives, or first of all how disease in other countries is seen as an integral part of life that shapes the way you live, while in the US it is seen kind of as an annoyance that you go to the doctor, fix it and move on. But disease can actually paly an important role in reminding us that life is short, we don’t live forever, about the fragmented nature of life, can point us to God, lots of the things that disease can do theologically that I had never really thought about, I had just assumed that disease was something that can be instantly cured, but the fact there is things that we can learn about God and our society through being sick, and having a disease was a completely new idea to me, and is something I would love to explore more.

Student 7- There is two things, and they both fall under genetics, but I wish we just had a chance to talk about them a little bit more, one of them was GMOs and pesticides in farming, and the chemistries of food, and just tying it into stewardship, and talked a little bit about poverty and looking at that, and exploring more of that would be interesting. And the other was genetic testing and screening, especially before you were born, we were learning how you can do so much genetic testing, I am just not sure how I feel about that, some arguments would be that it is good because then when your child comes you can be better prepared, but then there is also opportunities to decide you don’t want that child, or become pre-dispositioned to decide what that child is going to be like. Its just a really interesting conversation that I wish we had a chance to explore more about that.

Intervening Student- I would definitely agree with the GMOs, and thinking about genetically modified foods.

Student 8- So I have two things as well, both introduced in genetics, and one of these we discussed here with some emphasis. The first would be stewardship, GMOS, that was in genetics, but I didn’t feel, perhaps we just don’t know enough about the effects of GMOs, but they’re everywhere around us, and I feel like it is really important especially as a Christian, some people here farm, or might have family who farm, just a consumers and informer and researchers, to know our responsibility to the earth and how it effects other people and in conjunction to population and poverty issues, we discussed Malthusian principles, and Anti-Malthusian principles, then just knowing what to do with them as a Christian, I feel like it would be good if there was some common sentiment, rather than just here are some ideas. And then, also race an ethnicity were raised in genetic, but leaving Westmont I still feel really confused about race and ethnicity, both as a scientist an inspiring health field worker. Because its kind of a faux pas, but at the same time there are justifications for doing research and looking at different ethnicities, but I feel if we don’t discuss it I am left confused as to what it really is.

*Dr. S- Ok great. So the next question has several parts, so I will go around and you can just hit the four bullet points beneath there. There is a balance between raising challenging questions in a way that provides openness and independence as inquirers, while also affirming shared beliefs as a community, and giving adequate support to students as they wrestle with issues. Different students at different stages of their journey may benefit from different approaches, in terms of feeling free to inquire in an environment that took Christian faith seriously and supported, but did not caudal you:*

1. *Were there some issues that were handled well, or not particularly well?*
2. *Were there some approaches that worked well or not well?*
3. *Were you exposed to a range of views and resources?*
4. *Did the range and depth of issues increase as you moved from Bio 5 through the curriculum?*

*So even if you just have little short things to say to each of those 4 sub-bullets, that would be helpful.*

Student 1- So for me I don’t feel like any of the issues were raised poorly, I feel like they were all handled carefully, and some were evolution, taking foreign substances, and morality, and many of the other topics that we discussed from previous questions. As to some of the approaches, that did and did not work well for me, I really appreciated the ones that were a bit of a lecture or a bit of information given to you, and then you come into a discussion. So that way your mind is already centered on a topic, and you can think critically in the moment of, and already formatted to what is about to be said, versus just diving into a discussion, I felt like after the class was over I was always wanting to say so much more, but I wasn’t able to wrap my head fully around what was being said until the class had ended. So after many of those sort of round table discussions that we dove into I felt like I wanted to say so much more after every time it ended, but wasn’t quite there all the way. So I like the idea of prodding you with some information, or giving you some time to think about the topic, and then jumping in. Were you exposed to a ranged of view and resources? Yeah, the big bang, evolution, creation and, what it all means, was really good. Did the range and depth of issues increase as you moved from Bio 5 through the curriculum? I would say definitely yes, I felt like we went further into it, or got to expand on it more.

Student 2- I agree, I thought all the issues were handled very well, I don’t think there are any issue that I felt was handled badly. I think especially sensitive issues like homosexuality were handled very well, and we all came to that with an open mind, not trying to judge anyone who had a certain belief. I really liked the discussion in bio and faith, I think that small discussion with a leader who has more knowledge was very helpful to me, and that was probably the most helpful. I don’t think that, some of the more formal debates were super helpful, maybe it will be more helpful in this class, but we haven’t gotten to those yet, I think we were exposed to a range of views and resources, I felt like even in this class there were people with different views, and that was helpful. And yes they definitely increased as they moved from bio 5 through the curriculum, and I think bio and faith was really the culmination of everything, all the curriculum, was kind of preparing us for this, and without that we wouldn’t have been able to take this class.

*Student voices agreement*

Student 3- I think I agree with everyone, I think that issues we talked about in our academic career here has been a very safe environment to talk about the ideas that they hold about certain things, one example can be our discussion in physiology about embryonic stem cells, and we all saw a different array of belief and if they thought it was ethical or people thought it wasn’t ethical, but having a mediator or professor kind of mediate that and to make sure that the discussion is discussion on getting to know peoples thoughts instead of battling peoples thoughts, this isn’t a battle, but an opportunity to understand fellow classmates and literature that we read. I think some of the approached that I have seen work well are the professor introducing a topic through premise or premising topics a week in advance or a couple of days in advance, having us read articles, such as bio and faith, where we have time to read an article and reflect on an article, or more than one article on a subject that we have probably never thought or heard about. And then come into class and have mediated discussion with well though out questions to kind of guide our thoughts and discussion and I think that is probably some of the approaches that have worked well. Resources, definitely, the professors provide a lot of resources that you have probably never thought about before, so its really such a great thing to think about a topic in one certain aspect and then completely change and have your thoughts expanded through what you professors give you on just the fact of resources. And also, speaking of discussion based, we are exposed to a larger range of views because of the discussion and the different thoughts from the different students and professors that share. I think as we increase and expand in our knowledge of biology coming from bio 5 to a cell or molec, or even a bio and faith course, we are able to understand more of the sciences and able to articulate in our brain how more of the biological processes work, therefore I think that the depth of issues have increased because we are able to grasp at least a little bit more than we could in or first year.

*Dr. S.- So just by knowing more about biology you wee able to grasp some of the faith issues better?*

*Sounds of approval*

Student 4- In terms of issues that I thought were handled particularly well, I thought coming in as a freshman and obviously coming from different contexts and backgrounds, I thought they handled age of the earth and evolution very well in Bio 6, kind of letting us know that if the earth isn’t 5000 years old, and if we weren’t created in a literal 7 day creation then our faith does not completely fall into the cracks. And it was reassuring to know that made logical sense to still hold a faith in God and still believe Jesus Christ died, lived, and was resurrected, while holding these other things too, that are considered scientifically relevant and backed by science. So I thought those issues were handled particularly well. I think kind of blending the 2nd question with issues not handled particularly well, I thought that kind of the way we went about discussing world views in bio 5, didn’t really suit my fancy. Instead of introducing a topic and then reading about them from trusted and prominent sources, and then discussing them as a class, really what happened in we talked about what a reductionist was, what a vitalist was, maybe what a naturalist was, and that was talked about in lecture, and then we were tested on it. And really not much else than that. I think that it would have been fun even at the beginning of being together as a class to see where people stood on that spectrum, and to kind of explore those themes in discussion rather than being tested on them, because I felt like it was a very rigid structure, and actually it felt almost wrong to test people on those issues, or those world views, and then mark their answer wrong on the test. That just seemed like kind of a poor way to go about it.

*Dr. S- So you felt almost wrong to be tested and there having been a right answer when you felt these views were more subjective?*

Student 4- Mhm. And it was defining what they were too, which is cool, because he did give a working definition of what each was, but I think also that a lot of what we believe doesn’t fall into working definitions, I think we fall somewhere in between those, so to articulate just one standard definition for what they were kind of felt wrong to me, maybe just personal preference. And I think we were definitely exposed to a range of views and resources, it was cool when we were talking about evolution to look at literal creation, but also arguments like the fine-tuning argument, or intelligent design, and to kind of explore where those actually have a very good point, or where they might not be so logical. To the last question of whether the range of depth of issues increase as you moved from bio 5 through the curriculum? Yes absolutely.

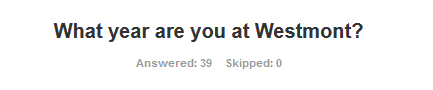
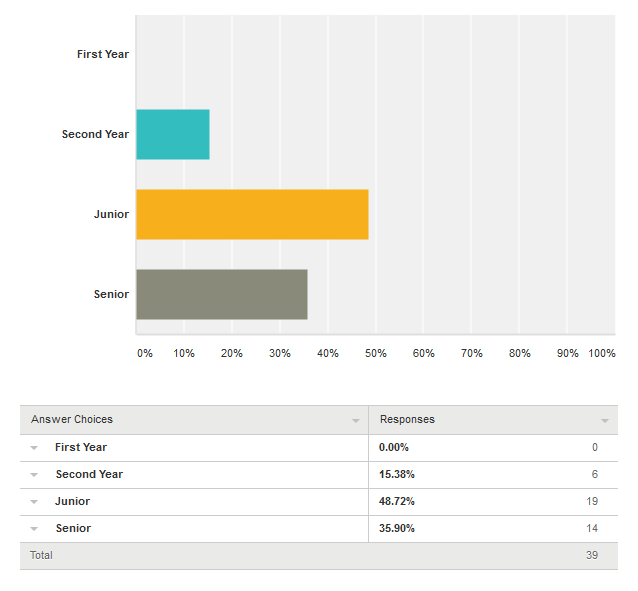
Student 5- I think that, not to be redundant, I agree with the issues that they think they handled well. I think the main thing that I can say that is different is I think that in order to adequately discuss a lot of these issues is does involve a lot of scientific knowledge to get to the little nuances of the biology that can determine whether there can be the make or break of whether you think something is ethical, and I think that could be part of the reason why we haven’t and wouldn’t be capable of covering every issue, because I feel like freshman and sophomore year at least you really with the knowledge you have cant go to far into things, so that definitely is a challenge in trying to address a lot of issues well, but I think that Westmont has done a good job. One thing I especially appreciate is how a lot of times when there is some topic they don’t just let you look at one way, but have to look at both way. All the articles in this class we always read some on one side and some on the other, and I have always been surprised because sometimes it is easy to just brush off someone’s argument that you disagree with, but generally there is some common points that you haven’t thought about, and it helps you understand your own viewpoint, which I appreciate.

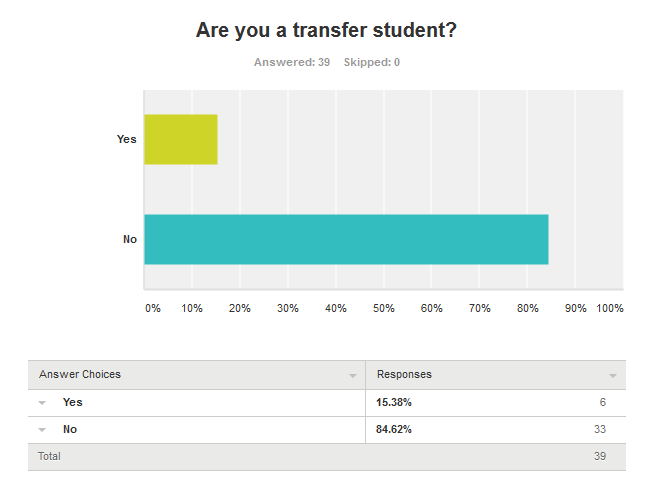
*Dr. S.- So the lack of knowledge in bio that students come in with, like in bio 5 can hinder deeper conversations, is that what you were saying at first?*

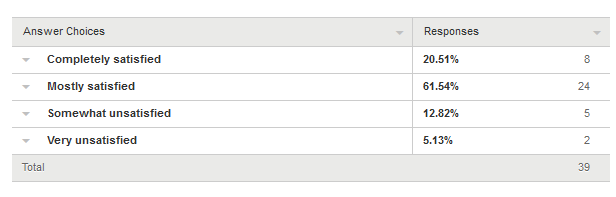
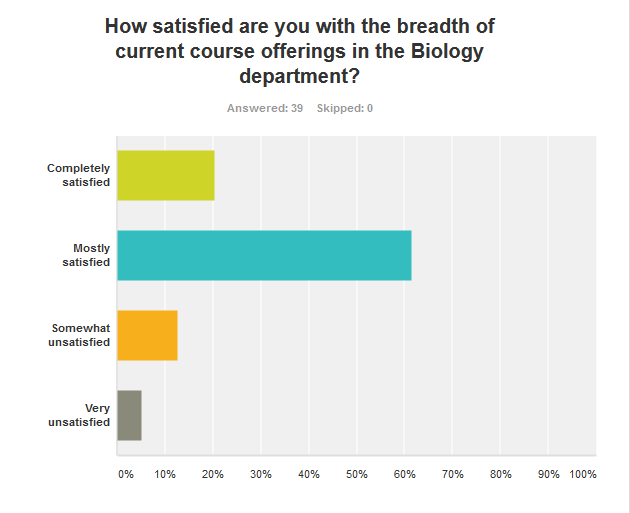
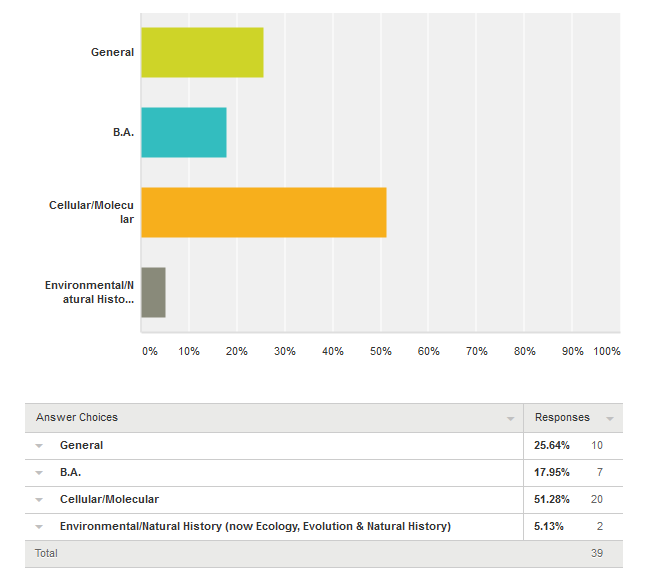
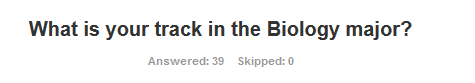
Student 5- Yeah I think just naturally sort of as the questions depth and range will increase as you’re going through the curriculum, and I think that’s part of the reason why in our earlier discussion, its not really possible to go fully in depth on all the different topics.

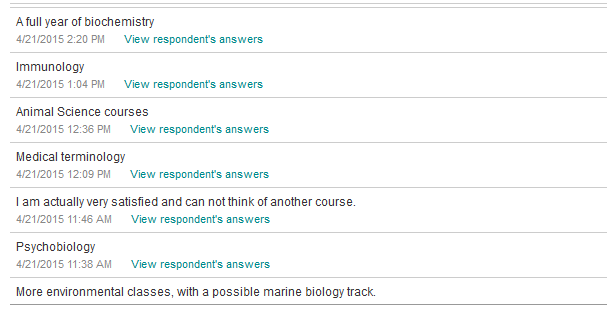
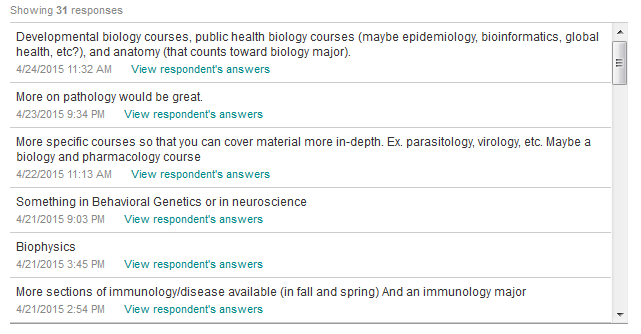
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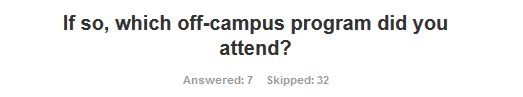
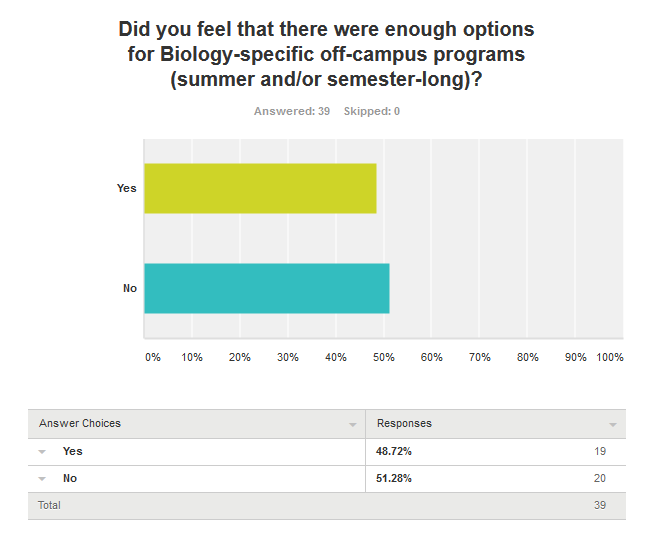
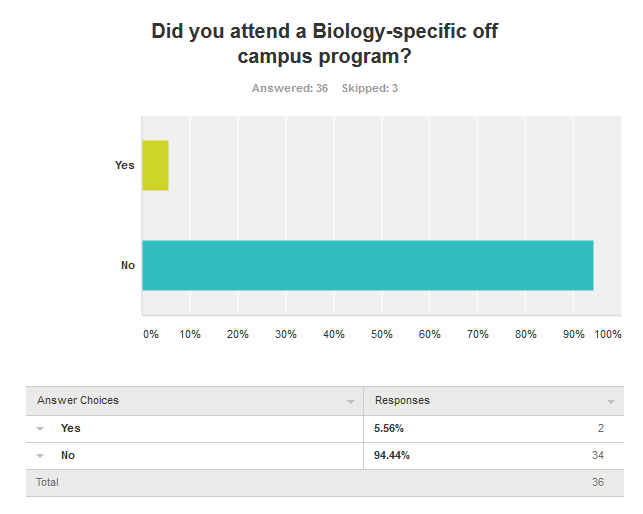
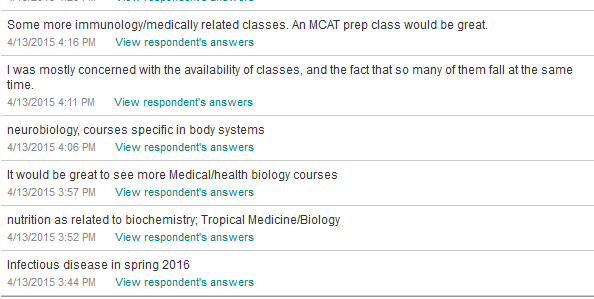
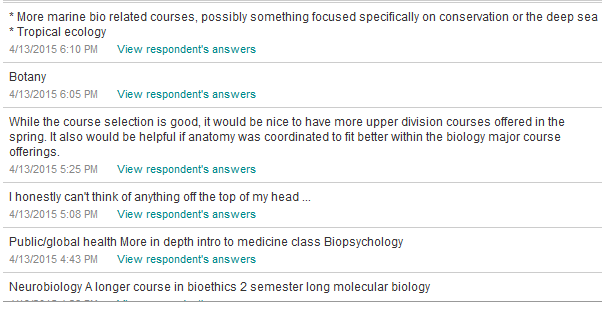
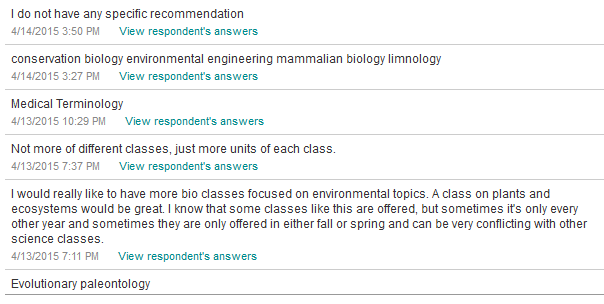
1. **Student survey on curriculum**



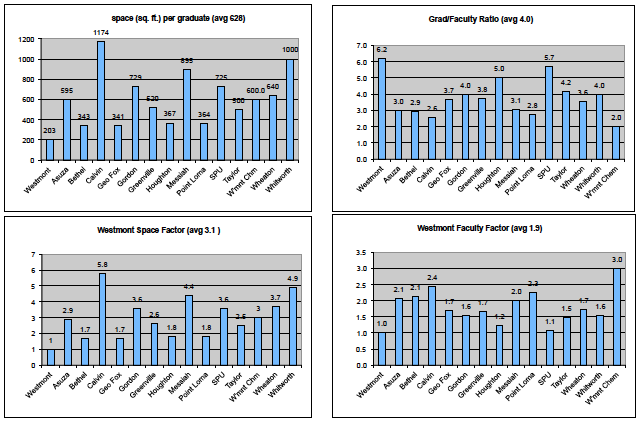








1. **Facilities comparison**

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**22. Total Graduates and Numbers in each track (2016 data points are projected)**



