Faculty Development Plan

Biology
Brigham Young University

University Expectations
The BYU University Policy on Faculty Rank and Status invites new faculty members to create a Faculty Development Plan. According to university documents, this plan should “describe the faculty member’s proposed activities in the areas of citizenship, teaching, and scholarship” focusing on five elements:

1. A self assessment of strengths, skills, competencies, interests, opportunities, and areas of desired development;
2. A list of professional goals in teaching, scholarship, and citizenship and plans to accomplish these goals;
3. The relationship between individual goals and the goals and needs of the department and the university;
4. Resources needed to accomplish individual goals;
5. Activities and accomplishments so far in achieving these goals.

My Faculty Development Plan is presented below in five sections, corresponding to the five elements listed above.

Self-Assessment
Strengths:
My research and teaching interests in insect visual systems, specifically their evolution and ecology, as well as undergraduate education bridge departmental strengths in behavioral ecology, phylogenetics, bioinformatics and science education. These interests are also linked with identified strengths throughout the college. My broad, integrative approach to basic research (from the evolution of fossils to genes as well as student engagement in the classroom) allows me to establish collaborative ties among other members of my department and college. My broad interests are evident in the patterns of publication in a diverse array of journals, and the diversity of my collaborative associations. An additional strength is my ability to teach a variety of courses in biology, ecology, and evolution. My primary assignment now is to teach General Biology (BIOL 100), the main GE in our department offered to all non-biology majors on campus. I am also slated to teach Entomology (BIOL 441) Fall 2015. These courses are a good fit for me as they allow me to integrate foundation principles in evolution, entomology and behavioral ecology while broadly covering major biological concepts (e.g., climate change) in the classroom. I am very excited about continuing to teach these courses.

Areas of Desired Development: I have two areas that I would like to strengthen in the near future. First, while I have a solid history of funding from prestigious external sources, (e.g., NSF) continuing such funding will be a major feat in today’s funding climate. Therefore, I plan to become a more proficient bridge for collaboration between major groups and writing successful grants to sustain the student research in my lab. Second, I have limited
experience utilizing the diverse array of assessment and pedagogy techniques promoted by members of my department and at BYU. I will seek out and attempt to successfully implement many of these techniques to design and teach outstanding courses for BYU students.

**Professional Goals**

My current five-year goals and plans are listed in Appendix 1. Below I describe my philosophy that anchors these goals in the three areas emphasized in the BYU literature on faculty rank and status: scholarship, teaching, and citizenship.

**Scholarship:** My overall goal in the area of scholarship is simple: to have an outstanding research program that is recognized for excellence by the faculty in my department and both nationally, and internationally. The quality of my research program can be best judged using the criteria of peer-review. In my field, this is best evaluated by four measures, posed here as a set of questions. First, am I able to publish my work in the leading journals in my field? Second, does my scholarship result in invitations to give department seminars outside of BYU, to chair symposia at national and international meetings, to sit on grant panels, and to serve as a reviewer for leading journals in my field? Third, does my scholarship attract students and postdoctoral scientists who desire to come and work in my lab? When my lab is fully operational, I hope to have about 5-8 undergraduate students, 2-4 graduate students, and 1-2 postdoctoral scientists working with me. Finally, is my scholarship able to attract outside funding sufficient to conduct my research? At this time, my lab meets criterion 2-5 very well and current data generated by lab members suggests that criterion 1 will shortly be met as well. My objective is to stay fully funded throughout my tenure at BYU, with much of that funding coming from the National Science Foundation or similarly prestigious funding sources. My lab is currently funded by NSF and this fall I will have ~5 undergrads, 4 graduate students and 2 postdocs. I hope to sustain this through scholarship (widely read papers and successful grants).

**Teaching:** My goal in the area of teaching is to become one of the outstanding professors in my department and at BYU. My teaching philosophy has two major pillars: hands on learning and open discussion. I have found that these two pillars rapidly lead students to be critical thinkers, with an ability to synthesize ideas to solve problems. Science provides a powerful way of knowing, and is often a conduit for inspired learning. I hope to instill in my students a habit of identifying and evaluating alternative explanations for the questions that they encounter. This is easily done by allowing them to play with data and have open discussion in class about any topic we cover. A fundamental skill that nests comfortably within the biological sciences is the ability to juggle paradox. Learning to juggle paradox is a critical life skill that is often counterintuitive to the cultural upbringing of many of my students, and I have found it to be a liberating and empowering skill, analytically and spiritually. I want to provide my students with a strong biological foundation from which they can make informed choices in society. I tell my students all the time that many of the biggest dilemmas they will face in the future will be rooted in biology (medicine, personal health, environment, politics, etc.). After graduation, I suspect that only a few of my students will recall the detailed mechanics of DNA replication or the stages of meiosis and mitosis. Yet, each person deserves a biological foundation that will allow him or her to critically examine any issue that centers or fringes on biology that they will undoubtedly face in their lifetimes.
I plan to take several steps to become a master teacher. Peer-review is powerful and I am committed to the process. I will seek out opportunities to receive feedback from my faculty mentor, department chair, and from other outstanding educators in my department and college. I will also consistently use the resources of the Faculty Center and my department to improve weak aspects of my teaching. I have already begun this process by seeking out advice from our biology education faculty and forming collaborative projects that measure student engagement. These collaboration and projects to measure student engagement have been funded by a McKay Award from BYU and will lead to better teaching practicing in my classroom and at a place like BYU where spiritual and intellectual concepts are taught side by side. I recognize that excellent teaching takes practice and consistency over time. BYU has made a generous investment in me as a teacher that will help me improve. My interactions with students will be guided by my belief that teaching must be personal. Fairness, respect, empathy, and charity are as important in a university as anywhere else. Students deserve teachers committed to their learning and life-long progression. Finally, I will remain intellectually active in my field. Excellence in my own scholarship will provide a foundation for me to motivate and mentor my students in their learning endeavors. More importantly, it provides opportunities for me to help place them in graduate programs with my colleagues.

**Citizenship:** My goal in the area of citizenship is to contribute to the success of the mission of BYU, to the success of my department and colleagues at BYU, and to the progress of my scientific discipline. Under this broad umbrella, I have three specific objectives that I hope to accomplish over the next three years. First, I plan to raise the public profile of the graduate program in my department, and work to improve their cohesion and sense of community. I will encourage the involvement of my graduate students in departmental affairs, particularly its seminar program and governing body, and social activities. Second, I will continue to serve on departmental and university committees. I serve on the college safety committee, departmental activity committee, several search committees and have, as part of my first objective, been assigned to several graduate committees. Third, I am in the process of creating an endowment for genomics for the College of Life Sciences (see Citizenship section below). I will continue to work closely with my department chair to ensure that my level of involvement in citizenship activities is appropriate in light of my research and teaching goals.

**Relationship Between Individual Goals and University Objectives**

In generating my goals in each of the three focal areas above, I have taken care to discuss each with my mentor and department chair to ensure that they support the Mission of BYU and the Aims of a BYU education, and that they meet the needs of the college and department. For example, my goals in scholarship reflect the high expectations that I have for myself to become a major contributor in my academic discipline. In so doing, my students and I will uncover important insights about ways that the natural world works. Some of this work will have application for the conservation and protection of the diversity of life on this planet, some will allow for a much deeper appreciation regarding the function and physiology of living (and extinct) animals. All research will provide students a deeper understanding, respect and gratitude for God’s creations. As such, this work will be both intellectually enlarging and spiritually strengthening. My goals in teaching reflect my deep desire to infuse my students with a curiosity about the world around them. Although they
will learn much scientific content in my courses, I am equally interested in equipping them with the tools to view the world as a scientist does—to think critically about things that they hear and encounter, and to use faith and reason to make informed decisions in society and in their personal lives. I will not have achieved my potential if my students do not leave my tutelage with a greater understanding and capacity to be life-long learners. Finally, my goals in citizenship are to a large degree focused on building up individuals with whom I work, increasing their capacity to be happy, productive and successful.

**Resources Needed to Accomplish Goals**
BYU has been generous in offering me a start-up package to establish my research program, an appropriate teaching schedule, and opportunities to serve in ways that take advantage of my personal strengths. In short, my resources have been appropriate to get me off to a good start. I would very much like for my students to have access to funds to support their attendance at meetings as well as necessary fieldwork. To this point all my students have had such support, for which I am deeply grateful. I am sure that as I progress toward continuing status I will need equipment to be successful, but this can be arranged through collaboration with other faculty, grants and capital equipment requests.

**Goals and Plans**
The foundation is in place for accomplishing each of the goals that I have outlined herein. I will continue to work closely with my faculty mentor in order to accomplish and hopefully exceed my goals. I have excellent support in my faculty mentoring committee. External funding has been acquired from the National Science Foundation, my lab is large and beginning to function very well. I'm excited about the future and what it has in store. See Appendix 1 below for a list of specific goals.
**APPENDIX 1: Five-Year Goals and Plans**

**FIVE YEAR GOALS & PLANS**  
*(updated August 2014)*

**CITIZENSHIP**

1. Be an active contributor to the mission of BYU, my college, my department, and my focal groups. As deemed appropriate with feedback from my mentoring committee, accept invitations to serve effectively on committees at each of these levels.

2. Provide positive input and feedback to my peers as they strive toward excellence in scholarship and teaching. Be willing to provide friendly reviews of written work and to be a sounding block for new ideas generated by my colleagues.

3. Develop and post a web page for my laboratory group. Focus web content (1) toward recruiting prospective students and postdocs; (2) toward informing anonymous colleagues about the current strengths of our program.

4. Recruit and effectively mentor 5-8 undergraduate students, 2-4 graduate students, and up to 2 postdocs in my laboratory at any given time. For each person, focus on helping them come to an appropriate level of intellectual independence and personal ownership of their research. Promote these individuals in the academic community.

5. Write recommendation letters for the individuals that I mentor directly in the lab and otherwise (committee work) and the numerous students in more classes who require them for admission to graduate and professional school.

6. Review up to 6 manuscripts/year for scientific journals in my discipline. Serve as associate editor for one or more journals in my field (5 year goal).

**SCHOLARSHIP**

1. Publish at least two papers each year in high-impact journals in my field. In my view, these include (but are not limited to) *Science, Nature, PNAS, PLoS Biology, Evolution, Annual Review of Ecology and Systematics, The American Naturalist, Systematic Biology, Molecular Biology and Evolution,* and *BMC evolutionary biology.* I currently have research started that, if successful, would fit well within *Nature* and/or *PNAS,* journals that are considered some of the top in my field and ones where I have yet to be to publish (*Nature*) or be the first author (*PNAS*).

2. Regularly attend scientific meetings and present my research findings. These meetings include Entomological Society of America, Evolution, and Arthropod Genomics and the meetings of various odonate societies. Have students and postdocs accompany me to these meetings.

3. Continue to develop national and international collaborations on ‘big picture’ research problems, focusing on my work in odonate phylogenetics, the evolution of insect visual systems, and behavioral ecology.


5. Develop a meaningful education component of my recently funded NSF proposal to produce a phylogeny of Odonata, both fossil and extant groups (museum display focused on odonate vision, ecology and diversity).

6. Advance the careers of my graduate students through helping them present their findings at national and international meetings, publish their results in high-impact journals and produce successful grant applications.
7. Create a solid organization for data maintenance, storage and retrieval for my lab for both RNA grade specimen storage and DNA sequence data (both Sanger and next-gen).

8. Bring each of the research items listed below closer to publication. Use several of these studies as preliminary data for continued funding.

TEACHING

Professional Development
1. Take advantage of department, college, and university programs and faculty provided to help me improve as an instructor.
2. Complete the spring and fall components of the Faculty Development Seminar.
3. Complete the Spring 2015 components of the Faculty Development Seminar.

Biology 100: General Biology for Non-Majors
1. Coordinate the teaching of my course with other instructors.
2. Update and amend the syllabus to include focused reading assignments and more active learning quiz questions.
3. Make regular improvements to the class based on feedback from my students and from faculty peer-review. Make arrangements to have the course peer reviewed Fall 2014.
Original Scholarship Strategies Project Proposal (May 2013):
I have discussed with my faculty mentor (xx) which of my several projects currently underway I should focus on as part of my Scholarship Project Proposal. I presented him with a list of all the manuscripts and grant proposals currently in preparation. He looked the list over and suggested that I start with the one closest to completion, and then start working my way down the list.

Over the last year I compiled a large data of DNA sequence data for >1000 species of dragonfly and damselfly (insect order odonata) from my own data and data deposited in public databases (e.g., GenBank). This is the group that I have studied as a PhD student and published extensively on over the last 6 years. Dragonflies and damselflies represent one of the oldest winged insect groups, are the world’s best flyers and also the world’s most deadly predators (i.e., capture prey successfully 75-90% of the time). Previous research have shown that the classification scheme for odonates is not accurate, especially for damselflies. This research has also shown that the deeper relationships, specifically those corresponding to superfamily, subfamily, tribe, etc., are completely inaccurate. Many odonate researchers felt including more species in the analysis could rectify these inaccuracies. My preliminary molecular genetic analyses demonstrate that what is needed is to include additional genetic marker with evolutionary rates capable of recovering deeper relationships more accurately. This research represents a major step forward and will help to focus researchers studying odonate evolutionary relationships. Further, this research validates a recently awarded NSF proposal to my lab that will attempt to assemble the tree of life for odonates using extensive genetic tools and broad species diversity within odonates.

I have already completed the first round of genetic analyses. Now I need to conduct final analyses and work up a manuscript for MP&E.

Publishing the paper is important for several reasons, primarily that of helping establish me as an odonate researcher as I attempt to attain additional funding. Since 2008, much of my work has focused on other groups of insects (e.g., butterflies and fireflies), fossil dragonflies and damselflies, or problems in phylogenetics (e.g., loss of expertise), and I have not published at the level I would have liked within odonates. Publishing the paper will give added credibility to my
work on odonates, which I hope will further my efforts to secure funding for my
additional odonate related research projects.

**Overall Measurement of Strategies for Scholarship Project:**

My overall goal in the area of scholarship is simple: to have an outstanding research
program that is recognized for excellence within BYU, nationally, and internationally.
The quality of my research program can be best judged using the criteria of peer-
review. In my field, this is best evaluated by four measures, posed here as a set of
questions. First, am I able to publish my work in the leading journals in my field?
Second, does my scholarship result in invitations to give seminars outside of BYU, to
chair symposia at national and international meetings, to sit on grant panels, and to
serve as a reviewer for leading journals in my field? Third, does my scholarship
attract students and postdoctoral scientists who desire to come and work in my lab?
When my lab is fully operational, I hope to have about 4-8 undergraduate students,
2-4 graduate students, and 1-2 postdoctoral scientists working with me. Finally, is
my scholarship able to attract outside funding sufficient to conduct my research? My
objective is to stay fully funded throughout my tenure at BYU, with much of that
funding coming from the National Science Foundation or similarly prestigious
funding sources.

**Scholarship Strategies Project Final Report:** *To be addressed Winter 2015*
FDS COURSE DEVELOPMENT PROJECT

Project: Develop the course *Genetics and Evolution of Vision* and enhance through supplementary texts, physical models and analytical software

Statement on Teaching and Teaching Goals:

My goal in the area of teaching is to become one of the outstanding professors in my department and at BYU. My teaching philosophy has two major pillars: hands on learning and open discussion. I have found that these two pillars rapidly lead students to be critical thinkers, with an ability to synthesize ideas to solve problems. Science provides a powerful way of knowing, and is often a conduit for inspired learning. I hope to instill in my students a habit of identifying and evaluating alternative explanations for the questions that they encounter. This is easily done by allowing them to play with data and have open discussion in class about any topic we cover. A fundamental skill that nests comfortably within the biological sciences is the ability to juggle paradox. Learning to juggle paradox is a critical life skill that is often counterintuitive to the cultural upbringing of many of my students, and I have found it to be a liberating and empowering skill, both analytically and spiritually. I want to provide my students with a strong biological foundation from which they can make informed choices in society. I tell my students all the time that many of the biggest dilemmas they will face in the future will be rooted in biology (medicine, personal health, environment, politics, etc.). After graduation, I suspect that only a few of my students will recall the detailed mechanics of DNA replication or the stages of meiosis and mitosis. Yet, each person deserves a biological foundation that will allow him or her to critically examine any issue that centers or fringes on biology that they will undoubtedly face in their lifetimes.

I plan to take several steps to become a master teacher. I am committed to the practice of peer-review and will seek out opportunities to receive feedback from my faculty mentor, department chair, and from other outstanding educators in my department and college. I will also consistently use the resources of the Faculty Center and my department to improve weak aspects of my teaching. I have already begun this process by seeking out advice from our biology education faculty and forming collaborative projects that measure student engagement. One collaboration has been funded by a McKay Award form BYU and will lead to better overall teaching practicing in my classroom that will allow BYU students to better assess spiritual and intellectual concepts that are taught side by side. I recognize that excellent teaching takes practice and consistency over time. BYU has made a generous investment in me as a teacher that will help me improve. My interactions with students will be guided by my belief that teaching must be personal. Fairness, respect, empathy, and charity are as important in a university as anywhere else. Students deserve teachers committed to their learning and life-long progression. Finally, I will remain intellectually active in my field. Excellence in my own scholarship will provide a foundation for me to motivate and mentor my students in their learning endeavors. More importantly, it provides
opportunities for me to help place them in graduate programs with my colleagues around the US.

FDS Course Development:
The major course that I will be developing is the **Genetics and Evolution of Vision**. This is slated to be an elective for undergraduate students throughout the college that are pre-med/professional track or interested in the role that vision plays in biological systems (e.g., behavioral ecology). I am currently developing this course in consultation with my faculty mentor and department chair.

My general course design involves traditional lecture with reference to texts, discussion oriented reading of the primary literature, and hands on approaches with real data in short focused class experiments. Although the text I have chosen follows the course outline well, I think the students would benefit from having a reading list of other texts that compliment or provide greater conceptual or mechanical details for several of the topics covered in the course.

In addition, the course will focus on several of the molecules that make vision possible (Rhodopsins) and supplying software that will allow student to model the 3-D formation of this molecular and manipulate its amino acids to observe conformational changes.

**Formative Evaluation Plan:**
I expect between 20 and 40 undergraduate students to attend the course each semester. It is possible the course will also be attractive to graduate students, particularly those involved in systems where vision is a central focus of their research (e.g., phenotypic variation). I will encourage them to completed the on-line evaluation of the course. I will also have in-depth discussions with them, individually, and as a group, concerning the strengths and weaknesses of the course, and my teaching style. This will allow me to better tease apart the strengths and weaknesses of the course and my teaching habits through both written and oral comments. In addition, I will specifically seek feedback from two professors outside my mentoring committee (e.g., Gill and Jensen) but that have extensive expertise in science education.

**Strengths:** *To be addressed Winter 2015*

**Plans for change:** *To be addressed Winter 2015*

**Results of the Project:** *To be addressed Winter 2015*
Project: Create an Endowment for “omics” for the College of Life Sciences

Due Date: April 9, 2015

Proposal, May 2014:

Biology is moving rapidly in the direction of genome-centric science, known as “-omics” research. Nearly every field of biology is currently utilizing or switching to omics tools to answer massive, complex and in-depth biological questions. Many, if not most, of our faculty research programs are already using omics tools in their labs and nearly all are looking for ways to incorporate such tools. In fact, BYU has an exceptional group of faculty with extensive omics skills doing cutting edge research. While surveying the landscape of other omics researchers and institutions it becomes clear that our college can compete and collaborate, at a very high level, with other omics institutions. Further, it is likely that we can distinguish ourselves as a leader in omics research due to the infrastructure that we already have in place (DNA Sequencing Center, super computing, ORCA, generous internal funding opportunities, skilled faculty and a mature undergraduate population). Our faculty will benefit greatly from this endowment (e.g., broader collaborations, higher rates of funding, higher impact publication, transition of research focus) by being able to conduct omics studies in their respective organisms or systems. What is needed to become a leader in omics research is an endowment that will provide a significant yearly allotment for our faculty to use to spur new research and form broader collaborations both across campus, nationally and internationally.

I have spoken with my dean, department chair, and faculty in several departments within the college and they are all very supportive of such an endowment. The endowment would be designed and implemented in the same vein as the Roger & Victoria Sant Grant for the Education of a Sustainable Environment. The overall goal of the endowment would be to raise $1 million so that there can be a yearly competition for up to 50K in research funds (depending on the interest accrued in the account). Such an endowment would provide faculty with funds to support the sequencing, assembly, annotation, and basic undergraduate/graduate personnel costs for any omics project and provide faculty with a gigantic leg up over other institutions where almost all funding for omics research comes from federal funding is exceptionally competitive.

How to raise such funding in support of the endowment is always a difficult task. However, I propose a proven method with a game plan that I believe will work and may also provide the framework for other such ventures at the university. We intend to fund this endowment using a "crowdfunding" approach in which we can encourage people/alumni to donate $1-200 (or more) in support of the endowment with an end goal of $1 million (or more). The dean has offered to allow us to use their list serve of 50,000 email addresses from alumni. We also hope to advertise via college and departmental publications. At this point the plan is to construct a genome of a flashing firefly from Utah (very rare that fireflies flash in the west). Fireflies have been an important part of medical research for >30 years and a classical system in biology for >100 years. Thus,
the payoff for producing a firefly genome would be very interesting for both the medical and broader biological community as well as the general public. The flashing firefly we have discovered in Utah is a new species. To provide extra incentive for people to contribute we will incorporate a raffle where the winner will name the species. Essentially, for each dollar donated to the endowment an individual would be given one ticket entry into the naming of the new firefly species (i.e., $200 = 200 chances to name the firefly).

I have listed below some hurdles that still need to be overcome:

1. LDS philanthropies, which oversees donations to BYU, does not allow the use of websites such as kickstarter.com to do crowd sourcing to raise funds. BYU must retain 100% of the profits. We need to create a web presence in order to provide a portal for potential donors to see us, read about us and hopefully donate to the endowment. This will require providing text about the project, making a short 30 second to one minute presentation explaining the endowment and the subject of our first omics project, the firefly.

2. Who will be the long-term administrator of this endowment? Certainly, the college will oversee the endowment and its funds, but as with the Sant Grant, a specific department and committee will oversee the administration of funds and the peer-review process for these funds.

3. I will instigate an informal lunch seminar series to discuss the use of funds (i.e., level of funding), types of projects to be supported, process for application (e.g., rigorous peer-review, demonstrated track record in omics and/or a project that will allow a faculty member to make a significant transition toward omics) and what is the highest priority for the funds. This will function as the rubric for funding for the next several years. I believe that the landscape of omics research is certain to shift dramatically over the coming decades. It is also very likely that the costs to do omics research will continue to decrease significantly. For this reason I propose that the endowment committee, restructure and reframe the focus of the omics endowment every 5 years. This will allow for the endowment to be pushed toward the omics strengths of the departments in the college as well as decide if multiple grants should be funded each year.

Final Report: To be addressed Winter 2015

Progress made in implementing the project proposal: To be addressed Winter 2015
My experience in implementing the project proposal: To be addressed Winter 2015