Report of the Academic Program Review Team
Department of Earth and Planetary Sciences
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Opening Comments and Acknowledgments

The review team wishes to thank the following individuals for their valued assistance with the Academic Program Review process for the Earth and Planetary Sciences Department of the University of New Mexico. The review process operated smoothly and efficiently, and we know this reflects the efforts of the following people:

Ms. Bessie Gallegos, APR specialist
Ms. Nancy Middlebrook, University Accreditation Director
Dr. Diane Marshall, Associate Dean, College of Arts and Sciences
Dr. Chaouki Abdallah, UNM Provost
Dr. Greg Heileman, UNM Associate Provost

We particularly acknowledge the role played by current EPS chairperson Dr. Laura Crossey, immediate past chair and current associate chair, Dr. Adrian Brearley, and EPS department administrator Ms. Paula Pascetti for their assistance in organizing our departmental visit and in preparing an excellent and thorough self-study that made our task much easier.

Overview

The report is divided into three sections: strengths of the department; shortcomings (and opportunities) of the department; and finally, recommendations for action. In keeping with the APR's policies, principles and procedures, it is the review team's expectation that the department, working with the administration, will draw up an action plan and that this will be shared with the review team. It is also our expectation that there will be annual reviews to determine if tangible progress has been made in meeting goals of the action plan.

Strengths of Department

There are several aspects of the performance of the Earth and Planetary Science program that were perceived as significant strengths by the review team.

Outstanding Faculty

The department has a top-notch faculty with a very high research profile, one that is recognized nationally and internationally, and that achieves it's full-flowering in the form of publications that regularly appear in scientific journals of the highest caliber: *Science*, *Nature*, *PNAS*, etc. These papers often reflect highly collaborative interactions among the EPS faculty members, both tenure track and research faculty, and prominently include their students! One thing that is exceptional about the faculty's success in securing extramural funding is that it has occurred broadly across most of the faculty, this at a highly competitive time when getting new grants funded has been extremely difficult. All metrics with respect to publication and grant numbers and impact are very strong. Performance at such a high level is a precious and not-easily-attained asset for the university.

Excellent Scientific Staff Support

One of the significant strengths of the department is an outstanding scientific support staff. The presence of partially-supported state-funded staff lines who meticulously overlook, upgrade and maintain an impressive array of analytical equipment is one of the real keys to the department's strength, and its success in research. These facilities are often widely used across the UNM community (Biology, Chemistry, Engineering) and by other research units in the state. The presence of these highly qualified staff members significantly increases the competitiveness of the EPS faculty for NSF, NASA, and other extramural support. Importantly, the staff constantly works with both undergraduate and graduate students on their research projects, imparting a high level of training and expertise not easily available anywhere else in our community. The availability of these key support people puts EPS in an excellent position to build larger-scale partnerships with other UNM departments and research groups around our state. The presence of these staff lines within the department reflects well on UNM's willingness to support the research mission, and happily it pays off in the form of considerable success in securing grants. An important lesson here too is that there has been considerable stability in the funding of these lines, allowing a mature and very capable infrastructure to develop, clearly one that can function at a very high scientific level.

Synergistic Relationship with IOM

The close relationship EPS enjoys with the Institute of Meteoritics adds strength to EPS's academic programs, and creates a true synergy and impact that will continue to benefit the UNM research enterprise.

Impressive Analytical Capability

The EPS department is extraordinary for the impressive breadth of analytical equipment it houses. The department has proven to be very competitive in preparing NSF Major Research Instrumentation grants, and works very effectively to maintain and improve its instrumentation over the long haul. This is by no means always the case at UNM. These instruments, as noted above, are used heavily by students and by other researchers across

UNM and beyond, and are part of self-sustaining cost centers. They comprise a much-valued part of the overall UNM research infrastructure.

Establishing a Culture for Individualized Learning

With respect to its educational mission, EPS should be commended for establishing a culture in which both undergraduate and graduate students receive much individualized attention, and are strongly encouraged to work closely with faculty in developing research projects. The review team heard time and again about the individualized attention that students received regarding their projects. Their ability to also partner with research scientists operating state-of-the-art equipment makes it all the more likely the students will achieve research success.

Special Attention Paid to the Needs of Minority Students

Another strength of EPS is that there has been considerable effort expended to seek funding to expand and improve experiences for minority students within UNM, like the long-standing "Alliance for Minority Programs" run by Dr. Crossey. The department has also been an active participant in the UNM Honors Program.

Outstanding Professors Teach Introductory Courses

Yet another strength of EPS is that their teaching, particularly at the beginning undergraduate levels, is undertaken by tenure-track faculty, often the very faculty who have been involved in the research activities lauded in the first paragraph above. It is this ability of UNM to put high caliber research-intensive faculty in a classroom—where they speak with an expert's authority on the subject—that separates UNM from most other learning institutions in the state. This is a sign that the research university is functioning at its highest level, when the high flyers are getting into the classroom and rubbing elbows with impressionable young students.

EPS Has a Proud Tradition of Excellence in Field-Oriented Courses

Another cornerstone of the EPS teaching program is its emphasis on field geology. The importance of their summer capstone field geology courses cannot be overstated. Such courses not only take advantages of the wonderful geological assets provided by our state, but they also foster formative learning experiences that last a lifetime in their impact. It is especially impressive that EPS has included students with disabilities in their field programs. UNM's EPS department is renowned for the impact they have in teaching earth-related sciences in the field, an outstanding departmental tradition that needs to be maintained and encouraged.

Important New Educational Programs Have Been Created with Minimal Resources

The department is to be commended for developing the Environmental Sciences program, a boot-strapping operation that they have managed to pull off without a large influx of

resources. This program has proven to be popular with UNM undergraduates, has steadily increased in enrollment since its inception ten years ago, and has clearly helped fill a void in the undergraduate curriculum. To an even greater extent, the department should be commended for taking on and doing what it can to breath life into the Natural Sciences program, a program that is quietly very important because it helps our future K-8 school teachers achieve competence in basic science education.

EPS Graduates Have an Impact

Because of the attention provided to individual students, including minority students, along with the outstanding individualized research and field experiences provided to students, many of the EPS undergraduate and graduate degree recipients go on to have outstanding careers in earth or planetary science-related disciplines, and have a significant impact in their field!

Shortcomings (and Opportunities)

Unmet student demand for undergraduate teaching

The Blue Planet series of courses (ENVS 101 and 102L) has an annual enrollment >600 students per year. Students have the option of taking a laboratory section. Currently enrollments are capped in the laboratories because all sections are "at capacity" and there is not staffing (Teaching Assistants: TAs) sufficient to handle additional sections. The demand for this course (102L) presently exceeds the departmental capacity and thus the larger undergraduate population is being underserved.

In addition, several courses required for graduation of EPS majors are "at capacity" due to their laboratory component (e.g., Mineralogy Laboratory, EPS 302L) having only a single section. Additional section offerings would require additional resources (i.e., TAs). The "at capacity" nature of required courses in the program impacts the graduation rate and the number of majors in the program. Several other advanced courses have enrollment caps because no teaching assistants are available for some higher-level courses.

Summer field course needs reliable funding structure

The summer field course (319) is a "capstone" course required of EPS undergraduates for the BS degree (but not the BA degree, nor the Environmental Science BS degree). This course is considered essential in geology programs across the country and is typically taught in the summer. Thus, UNM follows the normal path nationwide for this course. The funding structure of the UNM for summer courses follows a different model than funding for regular Fall and Spring term courses. This means that each year the departmental chair must apply for funds for this course; in some recent years there have been problems with this financial model.

Inadequate staffing for Natural Science Education program

The Natural Science Program (NPS) prepares K-8 teachers with training in the natural sciences. Adequate science knowledge is key towards preparing the next generation of responsible citizens of New Mexico. The NPS is orphaned in UNM structure and the department should be commended for taking on this responsibility. However, staffing is not adequate for the teaching load required to handle the volume of students in the core classes, which each has multiple "hands-on" sections.

Potential vulnerability of research staff

The department has an excellent research staff, mostly associated with analytical laboratories. Overall, this is about 5.5 FTE supported through I&G. They play an important and key role in both the teaching and research function of the university; students are involved at all levels, including undergraduates. The staff is important in providing services widely across campus. This investment by the department provides a unique environment for learning at all levels and across the university. The retention of these positions is key for this department, and for the university, in maintaining its national and international reputation.

Student navigation through UNM system

Undergraduate Program. Conversations with undergraduate students regarding academic advising in the ENVS program identified some confusion. This was related as discrepancies between information provided by A&S advisors and those in EPS, by similar inconsistencies between departmental and college websites, and by uncertainty about whom a student should contact for advising. Anecdotally, difficulties in securing helpful advising resulted in some students being delayed in the pursuit of their degrees.

Graduate Program. There is a perception among graduate students that there is a lack of consistency in the application of graduate program requirements, especially in adherence to Policy and Procedure guidelines relating to qualifying exams. These include issues related to timelines in the overall process.

Demographics

It seems likely that this department might have a "bulge" of potential retirements, or impending retirements, coming in the next decade. The department should be considering how transitions will be made, and how facilities will be maintained or replaced with other capabilities.

Aging infrastructure

This department is housed in a building that is now 60 years old, and now houses instrumentation that has needs that could not have been anticipated during construction (e.g., communications, cooling capabilities, power transmission). In can only be anticipated that the next decades will place more strain on this infrastructure, and that new demands will arise.

The department, and the university, need to begin to consider the timeline, the space needs, and the finances needed to address this looming issue.

Effective strategic planning

This department has done quite well over the past few decades in growing to a program of international stature. The department has initiated a strategic planning committee. This committee will have to address some of the challenges and opportunities discussed in this review. Although we recognize that strategic plans are always in a state of flux due to changing opportunities, we believe that constantly updated thinking will give the department the ability to better decide how to take advantage of opportunities, and to recognize how to develop opportunities.

Development effort

The department development effort rests largely on historical gifts to the department through a few individuals. The historical record of development, through the university structure, has had limited impact. The current trend for public universities relies increasingly on funding derived from outside that provided by state legislatures. We have no confidence that state legislators will reverse this trend. It is incumbent on universities to fill this need.

The UNM EPS program is well suited to development efforts. The long field tradition in the department engenders a unique loyalty and camaraderie that could be better exploited by the department. We recognize that this is a long-term effort that will have a long-term benefit that may not be immediately felt by the entire program. However, the long-term benefits must be considered.

Faculty salary stagnation

EPS faculty have a salary structure with two significant problems: first, the overall salary levels are considerably lower than those in the peer institutions to which the UNM review is based. Within UNM, the salary structure is lower than other STEM fields.

The second problem is the salary compression that has resulted from years of salary stagnation for long-term faculty. Thus, new faculty hired at "market price" may have salaries higher than long-term, well-deserving faculty.

Together, these issues breed internal department resentment, and some wider intra-university resentment. Overall, these issues make the EPS faculty vulnerable to plundering by other universities.

The incredible shrinking departmental budget

Departmental I&G support has declined considerably in the past decade. This provides key support for many departmental activities that should not be made up at the expense of a quality educational experience. Important issues include elements essential to the teaching

mission of the university. Many of these are common across universities in USA (photocopier, mailing, telephone, supplies). However, some are critical to the smaller, more isolated universities such as UNM: a key example is adequate support for an external speakers program to expose students to other faculty; this also increases the visibility of the UNM program to those visiting the campus and department. Other needs are unique to a program such as EPS which places high reliance on giving students a field experience: this includes maintenance of vehicles and other supplies needed for field trips. These needs should not be met with yet more funds extracted from students in the form of fees.

Recommendations

In making the following recommendations, the review team has endeavored to avoid being prescriptive; instead our intent is to capture some of the ideas that arose during our conversations that we believe would be beneficial to the department as it addresses the team's report. We focus strongly on potential actions that can be implemented at no cost or low cost. Nonetheless, we also include suggestions for taking initial steps toward potential actions that we feel are critical to the long-term vitality of the department, even though these actions will eventually require investment of more substantial resources.

1. **EPS should work with A&S Dean's office to establish a mechanism that ensures secure, reliable, and predictable funding of the capstone summer field course.**

   Such a capstone course is essential to any top-flight instructional program in geosciences, as proven by its near-ubiquitous inclusion in curricula elsewhere. Because it requires extended (weeks-long) travel away from campus, it must be taught during the summer, and the mechanism for funding of summer courses at UNM appears to be inconsistent with the requirement for such a course to taught annually without fail.

2. **EPS, in coordination with A&S, should strive to improve academic counseling of undergraduates, particularly for ENVS majors.**

   The discrepancies and ambiguities in advising information reported by ENVS students should be eliminated, and increased frequency of advising contact appears needed to ensure expeditious progress toward degrees.

3. **EPS should implement mechanisms to ensure consistency in administration of qualifying exams for the PhD and MS degrees, and to ensure adequate communication of expectations to all faculty.**

   Appropriate policies appear to be in place, as is well documented in the self-study, but anecdotally, adherence to those policies is spotty, so clearer communication among all parties is desirable.

4. **EPS should articulate to higher administration the vital importance to its success of the contributions by its research staff.**

The large and stable research staff enjoyed by EPS is an undeniable factor contributing to the department's enviable research productivity. Yet because that support is clearly an anomaly within the University, it is potentially vulnerable. It is vital that EPS ensure that the immensely beneficial role of this support does not escape the cognizance of the higher administration.

5. **EPS should implement an effective, inclusive, and visionary means of strategic planning, addressing not only short-term goals but also long-term issues including the unfavorable demographic make-up of its faculty and its aging infrastructure.**

   The newly formed strategic planning committee within the department is clearly a much-needed and potentially effective vehicle for planning. In our discussions, however, the items on this group's radar were (doubtless of necessity) focused on shorter-term goals, but we identify two key items that are longer term and need to be addressed: faculty demographics and building infrastructure, as described above.

6. **EPS, in partnership with the A&S Dean's Office and the UNM Foundation, should initiate a sustainable and effective alumni relations / development operation.**

   The department's strong commitment to direct and supportive mentoring of students—along with its strong field emphasis and the close bonds formed in its capstone field course—has generated a group of loyal and grateful alumni that represent a largely untapped resource of potential philanthropy. An active effort to maintain contact with alumni and to make them aware of the department's needs can be expected to reap tangible financial benefits. If a *sustainable* operation can be constructed (one that survives across multiple changes in department leadership), these relationships can be maintained long-term, and the resulting benefits can then become substantial.

7. **EPS should initiate a sustainable program aimed at identifying and expanding employment options for its graduates.**

   A program that bring students directly into contact with potential employers— and brings those employers into contact with bright, well-trained students—benefits both EPS students and the department's external relations. The fact that such a program in nascent form has arisen speaks clearly to the need for it. As with development efforts, such a program must be a long-term priority, one that survives changes in leadership.

8. **EPS should partner with all other relevant stakeholders in the University to resolve the status of the Natural Science education program in a way that ensures its continued success.**

   EPS should be commended for its recognition of the importance of this orphaned program, and for taking it into the EPS organizational structure. Modest resources are required to guarantee adequate staffing for it (beyond PTIs), so this funding needs to be identified.

9. **EPS, in partnership with the A&S Dean's office and/or the Graduate Office, should identify means to rapidly increase the TA support available, in terms of both numbers and levels of support.**

   This is a linchpin for immediate program improvement: additional numbers are required to meet unserved educational needs in EPS's course-offerings, both in the core curriculum (ENVS 101) and for its own majors, and it would grow the very successful EPS graduate program towards filling currently unused supervisory and research capacity.

   Increased support levels for TAs are essential not only to increase the competitiveness of UNM in the battle to recruit top-quality students, but also to remedy the inequity between TA and RA salaries.

10. **EPS should work with the higher administration to continue to address salary inequities within the faculty ranks, exploring options beyond the remedies so far employed; and to whatever extent possible, action should be taken to render salaries in EPS competitive with those in competing departments in its peer institutions.**

    Inequities, including compression and longevity issues, have become built into the EPS faculty salary structure over a long period of time, and overall, faculty salaries are low in comparison with peer institutions hungry for faculty who have proven themselves successful. Available remedies have proven to be inadequate, so alternative approaches should be explored.

11. **EPS should coordinate with the higher administration to ensure that a well-justified, carefully constructed strategic plan will eventually lead to infrastructural improvements that will ensure the long-term excellence of EPS's extraordinary laboratory facilities.**

    Eventually, the venerable but aging Northrop Hall will fail to support the demands of the top-flight, state-of-the-art instrumentation on which so much of the unit's research excellence is built. Infrastructural support for the extraordinary facilities already in place, and for expansion into new fields, must become an institutional priority for the not-too-distant future.