

University of New Mexico
Department of Earth and Planetary Sciences

**Academic Program Review:
Report of Review Team**

June 28, 2021

Report of Review Team

An Academic Program Review (APR) of the Department of Earth and Planetary Sciences was conducted on March 22-24, 2021. The meetings were held using Zoom video conferencing due to restrictions on travel and face-to-face meetings.

The review team consisted of:

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This report is based on information and materials provided by the Department of Earth and Planetary Sciences and the Office of Academic Affairs in advance of the visit, information obtained from the University of New Mexico (UNM) and Department of Earth and Planetary Sciences websites, and meetings with various individuals and groups on March 22-24, 2021. The Department of Earth and Planetary Sciences self-study, completed in fall 2020, provided the basis for the core of this report. We were also provided with the Office of Academic Affairs “Academic Program Review Manual: Process & Procedures (APRM),” Eighth Edition. An exit meeting to discuss preliminary findings of the review team was held on March 24, 2021. The report follows the format provided by the APRM.

REPORT SUMMARY

By virtually any measure the Department of Earth and Planetary Sciences at the University of New Mexico is an outstanding one. The review team was particularly impressed by 1) its highly research productive faculty and staff; 2) the state-of-the-art analytical research facilities supported by technically knowledgeable personnel that serve UNM faculty across multiple units/colleges; 3) the unique research collections and museums that add value to its programs and 4) a very strong graduate program. Members of the

department are well-aware of their strengths and weaknesses in all areas of responsibility and that they are actively working to sustain or address these as they continuously strive for excellence.

Here, the review team recommends three areas that need attention as soon as possible. First, it will be critical to replace faculty expertise in surficial processes and climate science that has been lost in the last couple of years due to retirements. These hires are also an opportunity to address concerns around current faculty demographics that do not reflect those of the student body. Second, the department should move forward rapidly with its plans to redesign the curriculum for the undergraduate EPS degree, keeping in mind principles of backward design and the need for strong learning assessments. Last, but not least, it is critical to provide the geophysics group with appropriate staff support for research computing to assure that these relatively new and productive faculty members are retained by the institution.

Criterion 1: Introduction and Background

Overall Findings: Exceeds (E)

Discussions over the course of the visit, yielded highlights on a number of strengths and shortcoming, outlined below.

Strengths

- Highly research productive faculty, research faculty and staff, particularly in areas of current societal relevance (such as global climate change, its effects on hydrology & ecosystems, water quality, & distribution in the southwest) as well as planetary science.
- State-of-the-art analytical research facilities supported by technically knowledgeable personnel that serve UNM faculty across multiple units/colleges
- Unique research collections and museums that add value to research programs
- Particularly strong graduate education program
- Strong alumni engagement and development efforts

Shortcomings

- Faculty demographics; need for strategic planning for future faculty hires to shore up areas of strength such as surficial processes and climate science (with attention to diversity and inclusion concerns)
- Curriculum for EPS degree; need for re-design
- Technical support for computationally intensive research
- Building infrastructure (Northrop Hall) in desperate need of renovation

Criterion 2: Teaching and Learning: Curriculum

Overall Findings: Met (M)

The descriptions of curricula, degree offerings, contributions to other curricula at UNM, and modes of delivery provided in the self-study indicate that the department provides robust high-quality educational opportunities for its students. Notable, are the strong graduate

programs. The department employs a suitable range of delivery modes from lecture, in-class activities, experiential learning in laboratories, to high-impact field experiences. During the pandemic, nearly all courses were shifted to an online/remote platform to join two courses (GEOL 1110 and ENVS 1130) that were already online.

Strengths

An indicator of the strengths of the graduate program was students' perceptions that the comprehensive exam served as a valuable formative experience. This exam is comprised of two written research proposals on separate topics, advised by different faculty members, that students write, submit, and defend by their third semester in residence. Normally, one of these proposals forms the basis of the dissertation.

The numerous field experiences included in the curriculum were seen as very valuable by students, although not necessarily in the traditional 6-week summer field camp format. The team notes that the discussion around how best to deliver field experiences without the expense and time commitment in the summer is a matter of discussion across many geoscience departments.

Shortcomings

The department fully recognizes that the undergraduate curriculum in Earth and Planetary Sciences needs substantial updates. Faculties in many departments across the nation are in a similar situation. The UNM Department Chair is well aware of a report, recently released by the American Geosciences Institute on the *Future of Undergraduate Geoscience Education*, which lays out a "consensus" framework for curriculum revision.

A synthesis of discussion with faculty, students, and advisors, suggests that there is some confusion about both the purpose and options with the curriculum for ENVS majors. Students reported that there were few class choices for filling their elective requirements and that those that did exist were too "EPS-oriented". ENVS majors also reported that they felt like "second class" citizens in comparison to EPS majors and their curriculum was "watered-down. Faculty and advisors were puzzled by these perceptions, although they did acknowledge that it has been difficult to get ENVS students into courses in other departments, such as Ecology in the Biology department due to prerequisite issues.

Faculty noted that a larger than ideal number of graduate courses have to be taught as "stacked" w/ undergraduate courses. That is, the enrollment in a given class is comprised of both undergraduate and graduate students, with somewhat different requirements for each.

Recommendations

- Proceed with revising the EPS curriculum, acknowledging that to be done right this may very well take 2-3 years, based on experiences of other departments who have gone through this process recently.
- Improve communication with ENVS majors, acknowledging that more of these students come from minoritized groups or are non-traditional students, than in the other undergraduate majors in the department.
- Examine possible ways to shift resources away from general education requirements to graduate courses.

Criterion 3: Teaching and Learning: Assessment

Overall Findings: Met (M)

The department's self-study provided appropriate information on current assessment plans and reports as well as clearly identifying the primary constituents and stakeholders it serves. The self-study also provided thoughtful reflections on challenges that the faculty have encountered as they implement assessments and how these may be changed in the future to be more effective. Notable is very strong work on the assessment of the ENVIS program.

Strengths

- Overall, the department has well thought out plans for implementing and improving the quality of their assessments.
- The assessment plan for ENVIS is well-designed with program-level student learning outcomes. This effort includes a process underway to develop interim assessments for internal Departmental use.
- The faculty takes assessment of student learning seriously, and is fortunate to have key faculty leaders (Weissmann and Pun) who are committed to developing and executing strong assessment plans.
- The department recognizes its important role in providing options for UNM's general education requirement. Unfortunately, through no fault of its own, the department has lost many hundreds of semester credit hours, including laboratory sections taught by graduate students, due to a recent reduction in the number of hours of science courses required in the lower division.
- The department's research activities serve a significant number of important constituents on UNM campus, within the state of New Mexico, and the nation. These activities include overseeing numerous analytical facilities for faculty and students across campus, interactions with national laboratories, corporations, local businesses, the general public and state policies around water resources.

Shortcomings

- Assessment for the EPS undergraduate program is not as strong as for the ENVIS program. For example, current SLOs do not necessarily align with the actual curriculum.
- Understandably, the pandemic has slowed the pace of change with respect to assessment as faculty focused energy on on-line teaching.

Recommendations

- Sustain the current thoughtful approach to meaningful assessments of student learning.
- Sustain broad base of interactions around research activities.
- Revise assessments of student learning in conjunction with the department's planned effort to revise the EPS curriculum.
- Implement peer teaching evaluation strategies for more effective teaching assessment if these are not already part of the department's repertoire.

Criterion 4: Students (Undergraduate and Graduate)

Overall Findings: Exceeds

The department's success with students from recruitment through placement after graduation meets or exceeds the performance of many comparable programs nationally. Perhaps distinctive among the sciences, the faculty and student advisor must play a more proactive role in recruiting undergraduate majors, because so few students arrive at college planning to major in the Geosciences. Recruitment of undergraduates from introductory courses is essential as are the faculty's proactive efforts to attract students from groups underrepresented in STEM. Highlights in the area are high enrollments of underrepresented groups in the ENVS program and faculty participation in a variety of diversity, equity, and inclusion (DEI) activities that enhance cultural awareness.

Strengths

- The cohort of graduate students that join the department each year is very strong. The faculty is fortunate in that it has colleagues around the country who refer strong student to them and to have substantial scholarship resources that incentivize students to come to UNM over other programs. Graduate students have access to a variety of professional development activities both through the graduate school and the department, such as the opportunities to share their research at weekly brown bag seminars and to publish their research on a regular basis.
- A signature element of the undergraduate program is the large number of research opportunities available to students, many with funding from endowments and elsewhere. Approximately, 25-30% of undergraduate majors participate in research, with many completing senior theses.

Shortcomings

- Students perceived a lack of adequate advisement on diverse career pathways beyond entry into graduate school.
- Some undergraduate students held the perception that research opportunities, especially those that were paid, were inadequately advertised (although faculty suggested that this perception may be a result of the inevitably reduced lines of communication that resulted from the pandemic).
- Time to degree for students in the EPS program is longer than desirable.

Recommendations

- Sustain excellent practices in student recruitment, mentoring, and graduation.
- Re-examine methods for communicating various extra-curricular opportunities to students in light of the effects of the pandemic.

Criterion 5: Faculty

Overall Findings: Exceeds

Overall, the faculty of the department are highly productive in all areas of faculty work, both from an institutional point of view and by national norms. Course loads are appropriate for a research-active faculty in a STEM discipline at a public university. Faculty take full advantage of a variety of professional development opportunities from required university

training, to opportunities to improve teaching and learning strategies, and sabbatical leaves to rejuvenate research and teaching.

Strengths

- By any standard, this is a highly productive faculty in all areas of faculty work.
- Faculty maintain strong relationships with research centers on campus, such as the Institute of Meteoritics (IOM), and the Center of Stable Isotopes (CSI) etc., as well as with member of other departments on campus that support related programs, especially with respect to graduate training and some teaching.
- Over the last 10 years, members of the faculty have really pulled together as a team to achieve common goals, with the result that research, and teaching outcomes have accelerated noticeably.
- The faculty are proactive in building on the interdisciplinary nature of EPS to reach out to colleagues across campus to engage in a variety of interdisciplinary research and teaching projects.

Shortcomings

- The composition of the faculty is dominated by faculty at senior ranks with only a third of the faculty holding appointments at the assistant and associate levels.
- Recent retirements of faculty with expertise in surface processes and climate science, areas of traditional strength that are also important to university priorities such as the grand challenge related to water resources, are a major loss.
- The faculty lacks diversity with respect to ethnicity and gender, especially when compared to the students it serves.

Recommendations

- Sustain the strong ethic of excellence in research, teaching, and collaboration.
- Prioritize the hiring of new faculty with expertise in surface processes and climate science.
- Re-examine recruitment processes with an eye towards including more practices that are known to be effective in recruiting and retaining faculty from groups currently underrepresented in the department.

Criterion 6: Research, Scholarship, and Service

Overall Findings: Exceeds (E)

The content of the self-study related to this criterion shows that the EPS faculty are justifiably proud of their many high-quality contributions to scholarly and creative work, research expenditures, research involvement, student opportunities, and community service.

Strengths

- A strong, widely held (faculty, staff, and students) ethic of striving for and succeeding in publishing high-impact funded research.
- A voluminous record of publishing results in both the leading journals of the field and in more general, high-visibility science journals such as, *Science*, *Nature*, and *Proceedings of the National Academy of Sciences* (PNAS).

- A commitment of service to research at a national level through participation in distinguished lecturer programs, service to national boards, and to national research consortia, including COMPRES which is housed at UNM.

Shortcomings

- There is an apparent lack of a true promotion ladder for people with research scientist or research professor ranks. This is accompanied by confusion over the application of “research scientist” vs. “research professor” designations.
- Lack of adequate matching funding (current \$300K cap) within the University for NSF MRI level instrumentation proposals.

Recommendations

- Examine external models for a true career ladder for research personnel at the University level.
- Re-examine priorities for central allocation of matching funds.

Criterion 7: Peer Comparisons

Overall Findings: Met (M)

The faculty chose three departments at the University of Arizona, Arizona State University, and the University of Wyoming for peer comparisons. All three have very strong Geoscience/Geophysics/Planetary Science programs and are Carnegie Research institutions.

Strengths

- The choice of peers for comparison was ambitious and appropriate.
- The analysis in the self-study demonstrates that EPS department compares favorably with its peers for the criteria evaluated in this report.

Shortcomings

None.

Recommendations

None.

Criterion 8: Resources and Planning

Overall Findings: Met (M)

The department has a history of carefully planning for and managing a complex budget comprised of several different sources of income, and a diversity of expenses. Notable sources of income above and beyond the University I&G budget include multiple research grants and contracts, F&A return from the VPR’s office, fees for services from the operating accounts of the analytical labs, and a substantial endowment. One endowment, in the form of the Caswell Silver Foundation, has an advisory board.

Strengths

- The I&G funding for staff that support multiuser analytical laboratories that serve the department and the university. The department contributes to staff member salaries by partially supporting many on laboratory revenue and research grants and contracts.
- High level of funding from grants and contracts for research. Much of what the department accomplishes with respect to research and student support could not take place were it not for these and associated F&A returned from the VPR's office.
- A substantial endowment (\$8.5 M) that helps support many activities including undergraduate research and scholarships as well as graduate fellowships.

Shortcomings

- Lack of computational research support for the Geophysics group in particular and the scientific computing capabilities of the department as a whole is a major issue. Administrative support has been promised several times in recent years but has not been forthcoming. The scarcity and unreliability of this support is severely impacting research productivity and student success. Nationally, departments of this size and caliber have dedicated IT staff.
- Lack of clear plans and resources to replace expertise in surficial processes and climate science will have significant on environmental programs both within and beyond the department at UNM.

Recommendations

- Allocate funds for a staff FTE to support research computing.
- Allocate funds to replace faculty expertise in surficial processes and climate science.

Criterion 9: Facilities

Overall Findings: Exceeds (E)

Current space and needs, planning efforts and potential funding sources

The department has devoted considerable attention over many years to optimizing and expanding the quality and footprint of its facilities. Since the last academic program review, it has expanded its footprint beyond Northrop Hall with 1) several multi-user analytical labs moving to the Physics, Astronomy and Interdisciplinary Science (PAIS) building, 2) classroom and teaching laboratory space in UNM's Science and Math Learning Center (SMLC), and 3) forthcoming space in the Natural History Science Center (NHSC) under construction that will house vertebrate and invertebrate fossil collections, and serve as a research and teaching space for paleobiology. The department has been proactive in seeking funding sources for new and renovated space from the state and other sources.

Strengths

- The department oversees a large number of outstanding state-of-the-art research laboratory facilities. Notable is the fact that many of these laboratories are run as multi-user facilities, in some cases acting effectively as central core analytical facilities for the UNM as a whole.

- The department's associations with the Institute of Meteoritics, museums, the Harding Pegmatite mine and associate collections are distinctive assets that significantly enhance teaching and research activities.

Shortcomings

- Northrop Hall is nearly 70 years old and needs upgrades. Surveys of constituents indicate significant concerns around dust levels and the quality of cooling, heating, and ventilation, to say nothing of the outdated appearance of the interior (e.g., paint, flooring, tiles, furniture etc.).
- Northrop Hall is also becoming short on classroom and collaborative space for undergraduate majors and graduate students in part because so much classroom space has been reallocated to analytical facilities in recent years. This situation is degrading the learning and enculturation experience for students.

Recommendations

- Continue to work with the University to manage issues around aging infrastructure in Northrop Hall.
- Commence study to figure out what student space is really needed in Northrop Hall – might be something a donor would be interested in engaging in?

Conclusion and Strategic Planning

Overall Findings: Exceeds (E)

The self-study's account of planning efforts shows that the members of the department are well-aware of their strengths and weaknesses in all areas of responsibility and that they are continually working to sustain or address these. Despite the challenges noted in this report in areas of teaching and learning, as well as resources and infrastructure, the department has unique strengths that advance its research and education mission. Noteworthy is the way that the department performs as a strong university citizen in terms of planning and supporting collaborative facilities, research, and education initiatives that benefit colleagues in many other areas at UNM.