External Review Report

Department of Geology and Review

This review is based on information gleaned from the self-study report of the Geology Department and the Dean's Review of the Department in addition to (virtual) conversations with the Dean, AOL, faculty and staff and a few students. The perception of the Department and its role in the institution are somewhat limited by not actually visiting the campus.

The Department has not had a formal review in several years- since 2003 (complete) and 2006 (partial). The Department has a critical faculty vacancy in a key area and is on verge of significant changes stemming from possible near-future retirements and evolving connections to related programs (CSAV and HVO) in the broader context of uncertain Covid-19 recovery and global financial instability. Thus, this review is especially timely and significant for the future of the Department. Given the current situation, communications between the administration and faculty are essential in optimizing the role of the Department. The virtual interviews and materials provided demonstrate that these lines are open and that there is a shared understanding of the opportunities and challenges currently facing the Department.

The Department's self-study document is excellent in breadth and depth, following WASC guidelines. It is complete and comprehensive and provides an honest evaluation of the current state of the Geology Department. It also offers prioritized objectives for the near future. The report is especially impressive given the small faculty and limited support resources available. The Department and especially the Chair, Professor Michaud, should be commended for their efforts in preparing this very helpful document.

Dean Wissman's evaluation acknowledges the key points raised by the Department and touches on several key issues that can potentially be resolved through the cooperation of the Department and the administration. My comments below follow the main topics considered in the Dean's report and Department's responses.

The Geology Department is situated in CNHSA instead of Arts and Sciences. This configuration may result in the Department being somewhat isolated from other science departments and with limited political influence in broader curricular issues. From the available materials, it is clear, that despite its small size, the Geology Department is doing a great job in offering a traditional geology curriculum in a nearly unique natural setting that it uses to its advantage. For a department of its size (4-an absolute minimum for the great breath of the field it seeks to cover) the curriculum covers all the basics. Additional instruction relies on links to other programs (some in other colleges) that help bring additional breadth and flexibility to the program. Learning and research opportunities for students are possible through collaborations with CSAV and HVO, though connections with these groups is not entirely clear. The Department does great job of teaching and advising with personal attention to students and providing exciting learning opportunities outside the classroom. Assessment efforts are underway and already showing signs of being effective in tweaking the curriculum to optimize student success. These efforts are especially challenging at this time of changing student

demographics, Covid-19 recovery, and curricular changes in the university beyond the control of the Department.

Faculty Resources

The Department is at a critical juncture with an undersized and aging faculty. All parties appear to be aware of the acute need to fill the current faculty vacancy and to plan for additional future faculty development. It was encouraging to hear the Dean's enthusiasm and commitment to restoring the size of the Department and thinking strategically about how to best meet its goals in contributing to the mission of the college and university. It is recognized that the Department is extraordinarily well-positioned to capitalize on the things that make it unique and that can excite and attract students, especially in Hawaii and the Pacific region. Being on an active volcano in itself is an attraction and includes field and related classroom connections. The 2019 Kilauea eruption, illustrated these opportunities with faculty, staff and students contributing to monitoring and data collection and benefiting from first-hand experience. This fall's Mauna Loa eruption is just the latest eruption. It will never be a question of *if* but rather *when* the next eruption occurs. These events are invaluable, continual advertising and opportunities for a department with its focus on volcanic activity.

The small size of the Department and breadth of the curriculum that it covers requires that the faculty have significant breadth of perspective in order to cover diverse courses and to provide flexibility in how they are offered. Thus, the specific background of new faculty needs to be carefully considered. Collaboration with affiliated faculty and associated programs (CSAV and HVO) can help broaden the overall program and provide educational resources. Based on the available information, these connections are not very clearly defined. Both Ganseki and Hazlett have taken the lead in research and publications that engage other faculty members. These are very important connections. The role of CSAV is less clear. It appears to function as a center within the Department but with an independent administration. Overall, the Department has the potential to "punch above its weight" by leveraging its natural environment and related research-oriented resources.

Specific Comments

The Dean's summary comments on the Department's self-study document are a succinct statement of the current state of the Department and a clear recognition of the issues it currently faces. It is encouraging that the Department and the administration agree on the key issues and are focusing on how to address them.

• As clearly acknowledged by the Department and the Dean, it is urgent that the current faculty vacancy be filled by a volcanologist. The administration should approve starting the search process without delay. Given the geological setting, local resources, and potential collaborations, the Department should be able to attract an outstanding new faculty member. Given the Department's demographics, a junior faculty member who can contribute fresh ideas and connect with students should be a priority. Bringing the faculty back to its full size will help with workload distribution (teaching and advising) and the flexibility that is important for

offering key classes annually (instead of alternate years), sabbatical leaves, course buy-out from grants, collaborative research, recruiting efforts, timely opportunities (eruptions), etc.

• Given the age distribution of the faculty, this is an important time for strategic planning for future faculty development. Hiring a volcanologist is clearly the top priority, but that person's specialization with the field will influence the next hire/replacement. The Department and the university will have the opportunity to develop collaborative research and teaching that will maximize its goals. For example, if a volcanologist focusing on physical processes is hired, the next hiring opportunity- in addition to covering other essential needs- could seek expertise in allied fields that can be applied to volcanology, for example remote sensing, numerical modeling, geodetics, geochemistry, etc. As emphasized by the Department, breath will be essential. The faculty and administration should engage in strategic planning to optimize impact of the future hires.

• As noted by the Department, the distinction between the BS and BA degree paths permit flexibility for students entering the program. This flexibility is essential to encouraging students with limited quantitative backgrounds to become geology majors and to be able to navigate their program even if key classes are not offered annually. This is especially relevant to students who "discover" geology relatively late in their college years. If they choose career paths that require more quantitative skills, there are options for filling these gaps to earn a BS. One of the consequences of university responses to Covid-19 has been an expansion of online classes in nearly all areas. Adding approved online classes could allow students to "catch up" if necessary. Especially as there are a relatively small number of geology and natural science majors, it would be advantageous to make it possible for as many students as possible to take classes as offered together as a cohort.

• For better or worse, the shift away from calculus-based cognate classes in STEM curriculums is now widespread. No doubt this is a reaction to students being put off by the demands of the "more difficult" quantitative classes and possibly weak secondary school preparation. Accepting algebra-based classes will lower the bar for some students but not severely handicap more quantitatively advanced students. Again, there are opportunities to enhance math skills online or in summer programs for students who wish to continue in research paths. Depending upon specializations, some graduate programs now accept statistics classes in lieu of calculus requirements. Some graduate programs reason that students will learn quantitative skills when they need them, and this may not be apparent to them until they are fully engaged in research. Required quantitative skills are commonly covered by classes in the first semester of graduate programs. So, relaxing calculus requirements is probably not a bad option.

• Cross listing or inclusion of classes from different departments as electives has the undeniable benefit of broadening the subject matter available to students. This is especially important for a small department in a very broad field like the geology. Many of the classes listed for potential cross listing are offered by larger geology departments in other institutions. Inevitably, issues arise when it comes to FTE "bean-counting, "and assigning credit for students enrolled and expectations for class sizes. If U of HI functions like many other institutions, these issues are

likely to be complicated by the Geology Department being in a different academic unit from other departments with classes of interest (for example, Geography and Marine Science). Issues of pre-requisites, sequencing, and scheduling are all the more difficult when other units' interests are involved. Administrative leadership will be needed in sorting out these issues.

In any case, Geology students need to be able to take classes in GIS, remote sensing, UAS and other areas that provide transferable skills that employers are looking for and that are required for research paths. All parties need to understand the distinction between Environmental Science and Environmental Studies (geography) and that geology is the most appropriate entry point for the former.

Marine geology (not geological oceanography) including seafloor volcanic processes at mid-ocean ridges, subduction zones and ocean islands is an important and very attractive class that should be offered. It is possible that future hires in the Department could offer classes in this area.

• It is extremely important that all parties recognize the potential impacts of revising GE requirements. Large forces beyond the geology departments are at work in many institutions nationwide to weaken quantitative reasoning classes. The Department is clearly willing to make adjustments to help retain enrollments in light of these types of changes, but the impact of changing core curricular requirements is not always predictable and should not be underestimated. It would be grossly unfair for the Administration to permit GE curricular changes that result in drastic decreases in enrollments in classes taught by the Geology Department while expecting increased numbers of majors.

• The characteristics of a "typical student" are changing rapidly for many reasons that are articulated at length in many recent publications. Being prepared to accommodate transfer students (broadly defined) is a wise move. No department or college can create accommodation protocols for all possible situations, but it is important to recognize that students with extremely diverse backgrounds and living situations may be considering becoming a geology major. Offering a very flexible curriculum and close personal advising can make a significant difference. One of the students I spoke to had a number of problems in negotiating the major but was very appreciative of the guidance provided by the geology faculty. One of the impediments for students who enter the program out of sequence with respect to planned classes, is that key classes are not necessarily offered every year. Bringing the faculty back up to four, and possibly utilizing the expertise of CSAV and HVO connections, might allow for some classes to be offered more frequently. Again, approved online classes- though not ideal- might also allow students to fit into the sequence more smoothly. Students will not figure this out for themselves. The faculty must anticipate these needs and provide approved options as part of their advising (and advertising-?).

• Capstone classes are a great idea but a luxury for small programs and where students are scrambling just to take their required classes. In some places, geology field camp serves this function. Many programs have eliminated this as a requirement because of costs to students

and difficulties in providing required classes before the summer when they are offered. Would some sort of field experience, perhaps through CSAV (?) be an option for geology students? Communicating science also sounds like a good option that can be shared with other departments.

• In some ways it may still be too early to fully grasp the legacy of Covid-19 for academic institutions and particular disciplines. Changes in the interests, perceptions, adaptability and work ethics of early college students are obvious to anyone engaged in teaching the current generation of students. Adapting to the post-covid generation of students is going to be a work in progress for some time. As pointed out by the Department, the active learning and hands-on aspects of geology classes appeal to many students, but will the next generation of students prefer these? Many geology classes are just not adaptable to effective online presentations. At present, it is unclear how best to adjust to these complications. Geology programs also need to be aware that field work is not necessarily a preference - and in some cases not a possibility- for some students. Alternative paths to a geology major should be available for students with diverse interests and physical limitations.

• Asking about the "right size" for Department enrollment is an important question that is seldom asked. At some point, more is not better. For a small unit like the Geology Department, 50 majors sound like a lot. I suspect that 25-30 would be more manageable and not push the limits of available resources. At some point, space in vans for field trips and other limitations become real challenges. But for whatever goal is set, recruiting to help students "discover" geology is going to be important.

The Department appreciates its small size and the intimacy and shared values that come with it. Its traditional geology curriculum, for which students coming to a university have little prior exposure, requires active recruiting to enhance "discovery" of the field as an educational and possibly career option. Numbers can be expanded by advertising targeting HS and 2-yr. college STEM teachers who have some experience with volcanology and can help advise students elsewhere in the Islands, the mainland and internationally (e.g., Pacific Island nations). Changes in exposure because of revised GE requirements, for example, could be deadly in limiting critical advertising.

• It is difficult to assess the status of the facilities and space available for the Department remotely. From available documents and discussions, it appears that classrooms and labs are adequate at present but would benefit greatly from some modest upgrades. Selective upgrades to instructional resources for classrooms- e.g., a petrographic projection system, visualization software, UAS units, library resources would all be very useful contributions. Even though Hawaii is a fantastic natural laboratory for basaltic volcanic rocks and activity, geology students need to experience the diversity of geology that is probably only available by trips to the mainland. The costs for these experiences can be impediments for students with limited resources so the Department and university need to find ways to help. This type of assistance needs to be advertised so students do not perceive a geology major as "too expensive."

Although it may sound somewhat obvious, attention to the appearance of the Department and the building it occupies should not be ignored. Fresh, modern facilities can help attract students to classes and as majors and convey the sense that geology is a vibrant discipline with opportunities for exciting research and future employment. I note that this was a request in 2006 report, and it was not clear if any action was taken.

Some Additional Points

• There are tremendous opportunities for the Department through connections with established centers relevant to its missions. CSAV operates essentially as an extension of the Department, however, to take full advantage, it would be useful to re-evaluate this relationship and establish clear guidelines with CSAV. The Department should play a stronger role in administering this program and integrating it with its educational objectives. The potential for summer instruction, for which it was originally conceived, is significant and could access an international interest, as programs in Iceland have done. In addition, the move of HVO to Hilo can potentially open doors to new resources and potential collaborations for both faculty and students with its new proximity. These types of connections can be very important, especially for a small department.

• Assessment is an important topic discussed in the AOL report and the Department self-study. From experience in my own department, some of the issues raised are familiar: development of a suitable rubric, getting student participation in the process, running the program long enough to acquire statistically significant data, etc. In addition, the Geology Department is hampered by a small faculty without much administrative support to develop an appropriate rubric and acquire relevant data. The impact of Covid-19 on academic programs has also caused considerable confusion. In this case, it arrived amid program changes, raising uncertainties in the interpretation of the data.

Overall, I think the assessment program of the Department is appropriate at this stage. The Department has established a rubric and is trying to collect data and to think about how to modify its program to become more effective. It would be great to have a simple number for evaluation of effectiveness and to measure progress, but just like standardized educational tests, generalized approaches can fail to capture the essence of key elements. Personalized attention of a small faculty appears to be of critical importance for student success in the Department but trying to quantify it tends to take up time that could go into that attention.

Summary

The Department of Geology is a very good, but small academic unit in urgent need of adding a faculty member in its key area of emphasis- volcanology- as part of a longer-term, strategic plan for faculty development. The Department has excellent opportunities to leverage its high-visibility setting and institutional resources in offering a uniquely exciting program focusing on volcanoes and their products. The Department faces challenges that are typical of many other geoscience departments (even larger ones) including recruiting majors/class enrollments, class sequencing/scheduling, faculty development, and program assessment, all in the uncertain context of Covid-19 recovery. With the cooperation of the administration, the Department can

work toward strengthening its position with active recruitment of majors from general education classes and broader advertising, taking advantage of volcanic eruptions to attract students. Clarification of the role of CSAV as an extension of the Department and connections with HVO can greatly enhance its educational and research opportunities.

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