The units and programs of the College of Natural Sciences (CNS) underwent program review Oct. 4-6, 2021, in a virtual format. We would like to thank the review team for the time and energy dedicated to the review process, and for their thought-provoking and constructive comments.

CNS is a large and successful college that provides critically needed undergraduate and graduate degree programs for the State of Hawai‘i in core STEM disciplines, while strengthening its role as a major research hub for the University of Hawai‘i at Mānoa (UHM). Over the last several years the College has improved dramatically in terms of its research standing, as well as academically.

CNS is one of the largest colleges at UHM, and consists of five academic departments or schools (Chemistry, Information & Computer Sciences, Life Sciences, Mathematics, and Physics & Astronomy) and one research unit (the Pacific Cooperative Studies Unit). These units deliver undergraduate and graduate degrees and certificates across the spectrum of natural science disciplines, as outlined in the report we prepared for the external review team, and collectively generated approximately $40 million in extramural funding in 2020.

Below, we provide responses to recommendations for CNS-wide issues (which are further categorized based on whether additional resources are needed to put into action, and whether they need to be addressed at the campus or University level). Following those are the responses to recommendations from each of the academic units included in the review. In order to implement many of the recommendations to the departments and the college additional resources will be needed. For each of the last five years the college has had to cut both operating expenses and personnel to remain within its allocated budget and thus there are no college resources to implement many of the improvements recommended by the review committee.

CNS-WIDE ISSUES:

1. Recommendations requiring additional resources for CNS to put them into action:

   **Recommendation:** The current CNS Teaching Assistant salaries are unrealistically low. The college needs to find a way to raise these salaries in order to maintain competitiveness with peer institutions in recruiting the best graduate students.

   **Response:** This recommendation was also listed as a suggestion to be addressed at the campus level. It is clear that low TA salaries are one of the most significant issues impacting research and instruction in CNS, and that the current salary step which can be supported by the CNS budget does not provide an adequate salary for graduate students given the high cost of living in Hawaii. Moreover, this issue results in competition among STEM programs at UHM, with many of our best TAs accepting positions in colleges able to offer much more competitive salaries, last-minute resignations from TA positions to assume better-paying RA positions, and promising potential graduate students opting to attend programs at other institutions with higher levels of graduate support. While we recognize the critical nature of this, CNS cannot address this issue without a significant augmentation of its operating budget. To be competitive, CNS needs to raise TA salaries to at least Step 13 ($23,028 for 9-mo); for our 186 TAs in the College, this would mean an allocation of an additional $819,884, annually in salary and fringe. Reducing the number of TA lines is not a viable option as TAs are used to support our teaching
mission and critical mass of graduate students is needed for programing. In fact, additional TA lines are 
needed in many programs with high enrollments.

**Recommendation:** The college should seek to increase development funding efforts with the advice of a 
dedicated, full-time expert who is familiar with the local community and who has access to information 
on potential commercial, philanthropic, and alumni donors.

**Response:** For the last year, CNS has been working with a 0.5 FTE development officer from the 
UH Foundation. Despite only having part-time assistance with fundraising, in just the past six months, we 
have been successful in raising over twice the amount we raise on average for a typical full year. 
Although more dedicated staff for this purpose (APT or S faculty) would be welcome and would certainly 
help with fundraising efforts, we have many staffing needs across the College and have to prioritize some 
of our more urgent needs first. Nonetheless, CNS has a very large alumni base, and we recognize the 
strong potential for success with increased effort toward fundraising activities.

**Recommendation:** The current advising load of SASC is about 1 advisor to 750 students. The college 
should continue to press for resources to bring the number of academic advisors closer to the national 
norm of 1 advisor per 300 students in order to make the current level of excellence sustainable.

**Response:** Academic Advising staffing in CNS is at a critically low level, which was presented 
and discussed in detail during the Program Review. This staffing issue has resulted from a number of 
factors, including burgeoning undergraduate enrollment, advisor retirements, and advisor resignations to 
accept positions elsewhere or relocating for personal reasons. We have annually requested additional 
advising positions for the last several years to address this problem. Two positions, for which we were 
routing active searches, were swept during the pandemic hiring freeze in 2020. A request for two APT 
advisor positions was just approved, which will bring our ratio closer to 1:470. We will continue to build 
and strengthen CNS Advising as resources become available.

**Recommendation:** The Dean may want to consider convening a blue ribbon faculty committee to 
investigate where new staff priorities and/or modified administrative procedures would have the most 
impact on advising, faculty research support, and administrative efficiency and morale.

**Response:** It is certainly true that we are understaffed in CNS, and we agree that identifying new 
advising priorities and modified procedures are a good direction to head in. To address these issues, we 
plan to draw from recommendations of both the Faculty Steering Committee and the Climate Surveys that 
we will be conducting at the College and Departmental levels.

**2. Recommendations to which CNS can respond without additional resources:**

**Recommendation:** The College should form an elected Faculty Steering Committee to better realize the 
goal of shared governance, and to foster two-way communications between faculty and the college 
leadership in areas of college policy, administration, diversity, equity, and strategic planning.

**Response:** We acknowledge and agree with the importance of shared governance and strong 
communication between CNS faculty and leadership. In spring 2021 we organized a representative group 
of faculty to begin the process of developing the charter for a CNS Faculty Senate, which will be brought 
to the larger CNS faculty for consideration. Once established, the elected executive committee of the CNS
Faculty Senate will fill this role, which is an appropriate mechanism for communication and shared governance at UHM.

**Recommendation:** Consider establishing an External Advisory Board to improve fundraising efforts, foster more connections to the local community, and serve in an advisory role for alumni outreach.

**Response:** Dean Helminck worked to establish such a Board (in conjunction with the UH Foundation representative for the College at the time) in the first years of his appointment, with very limited success due to a lack of engagement by alumni and the community in CNS affairs. We have begun to address the issue of engagement through activities such as the monthly CNS “Pilina Ao” webinar series, and with our new UH Foundation representative we will revisit the establishment of the External Advisory Board by reaching out to people with appropriate community stature for such a Board.

**Recommendation:** The Dean should direct the departments to prepare long-term (at least five year) strategic Plans that document the existing strengths of the department, identify potential opportunities, and propose a numerical plan that balances these priorities.

**Response:** We have already engaged with department chairs to discuss the need for 5-year strategic plans for each department to guide hiring requests, curriculum modification, and research opportunities. The School of Life Sciences is underway with this exercise in the current (Spring 2022) semester, and are sharing their approach and strategies with other CNS departments. Department Chairs are meeting during Spring 2022 to discuss these plans and plan the development of these exercises within their units. These departmental plans will then be used to inform the development of a College-level strategic plan, focused on interdisciplinary opportunities, and aligning with the recently released UHM Strategic Plan.

**Recommendation:** Simplify and clarify opaque and confusing startup and grant accounting practices, and provide research account balances to faculty on a regularly-scheduled basis.

**Response:** Start-up accounts at UHM are often funded from multiple sources, and can include commitments from several different university offices (e.g., CNS Dean’s Office, OVPR, etc). For this reason, we are unfortunately unable to amalgamate these into a single account for faculty. However, to address the resulting confusion, CNS HR has been holding one-on-one meetings with new faculty to explain how the accounts work and how they should be managed. Research account balances are available to PIs through the RCUH financial forecasting tool, and CNS is also able to provide account summaries to faculty upon request. However, the primary responsibility for providing these reports lies with the departmental fiscal staff. Departmental fiscal staff have more in-depth knowledge of the expenditures made on the accounts than College fiscal staff, who have access only to summary information. The Dean’s Office staff has provided regular training for the departmental fiscal staff about forecasting and managing of grants and will continue to provide training on this.

**Recommendation:** The college should immediately plan and execute a climate survey that would clarify potential problems in CNS workplace environment so they can be addressed. Individual units should also be directed to either participate or conduct their own survey as soon as possible, with guidance from the college on methodology and content.

**Response:** We agree that climate surveys at the College and Department levels are a priority. We have begun discussions with OVPAE and units on campus that have conducted climate surveys recently
to identify the survey logistics that will be used, and we plan to conduct the surveys after the full return to campus, allowing for sufficient time for faculty, staff, and students to re-adjust to in-person work and learning (to ensure the focus of the survey is not shifted mostly to COVID-related issues).

3. **Recommendations and suggestions about critical issues impacting CNS which require resolution at the campus level:**

**Recommendation:** If not already in place, establish a rank-ordered multi-year plan to address major maintenance needs with the aid of faculty and staff.

**Response:** We regularly bring major maintenance issues to the attention of Facilities and the UHM Space Committee. Unfortunately, there is an enormous backlog of competing needs on campus. CNS will continue to work closely with these groups (especially the Space Committee) to elevate the CNS needs on the campus priority list. As such, the path forward on this recommendation will need to involve a collaboration between the UHM campus and CNS.

**Suggestion for UHM:** The campus should consider phasing in a program of a direct charge to research grants of student tuition, and using the funds generated to raise the salaries of TAs.

**Response:** Graduate teaching assistants are a critical and underpaid work force in CNS, and we strongly agree that they need to be paid at a higher level. To bring our TA stipends to a competitive level with other STEM units on campus, a raise to at least Step 13 ($23,028 for 9-mo) is needed. This was identified as one of the most pressing concerns for the College, and we would be happy to work with UHM on this issue.

**Suggestion for UHM:** (Re)-establish a campus-wide partner accommodation policy. We consider this essential particularly for universities in small employment markets. This action may also broaden the applicant pool and thus increase the opportunity to hire more diverse faculty.

**Response:** We agree that a campus-wide partner accommodation policy is critical for attracting and retaining faculty talent in CNS, as well as all units on campus. Partner accommodation is an issue for many of our hires, and in some cases, our faculty decide to leave UHM because of the lack of employment opportunities for their spouses. Moreover, we welcome the opportunity to hire a more diverse faculty in CNS, and such a policy may help. Considering the isolation of Hawai‘i from the continental USA and the limited opportunities for academic employment in the state, a campus-wide partner accommodation policy will help to strengthen UHM.

Responses from individual academic programs are listed below.

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**DEPARTMENT OF CHEMISTRY**

The Chemistry Department would like to thank the reviewers for their thoughtful and constructive feedback. Our successes have been acknowledged, and the Department's challenges are summarized nicely.
Many of the recommendations below will require responses from administrative levels above the Department as these focus on policies established outside of the Department's control. These include the graduate student stipend, improving the efficiency of the hiring process, facilities improvements. Furthermore, the continued strong support for those levels will be necessary to accomplish many of the other recommendations concerning faculty and staff hiring or improving the diversity of the Department through hires.

UNDERGRADUATE EDUCATION

Recommendation: As part of a comprehensive faculty hiring plan (also discussed below), take into consideration the range of courses that need to be taught in the different degree requirements and evaluate hires that can teach in a range of courses.

Response: The Department is revising its long-term hiring plan considering recent and pending retirements with these factors in mind. Any meaningful plan will require consultation and support from the Dean and Provost, as outlined below, given how they view the role of the Department within the University.

Recommendation: Work with MIRO to understand the cause for attrition from Chemistry degree programs and where these students matriculate.

Response: For 2020, MIRO data indicates an attrition rate of 19.8% for CHEM. Regarding where those students went, that data breaks down as follows.

- 3.3% changed their major to another degree within the CHEM department,
- 4.3% switched to another degree program within CNS,
- 4.3% changed to another degree program outside of CNS,
- 7.9% Left UH.

The causes of student attrition remain to be assessed.

RESEARCH AND GRADUATE EDUCATION

Recommendation: Develop a comprehensive FTE growth strategy that is supported by the Department, Dean and Provost. The faculty has been effective and efficient at meeting its core teaching mission despite the small size, however with larger enrollments and new demands, it is not sustainable and there is a risk of the Department losing American Chemical Society (ACS) accreditation.

Response: The Department is revising its long-term hiring plan considering recent and pending retirements with these factors in mind. In particular, the use of "temporary" lectures in 200- and 300-level classes needs to be addressed given our accreditation requirements.

Recommendation: Develop a teaching workload policy that takes into account highly active and funded research programs.

Response: The Department's current workload policy was established in 2014. It allows for reduced teaching loads for faculty heading high active and well-funded research programs, and these reductions have been routinely granted. In the late fall of 2021, several changes were debated but
ultimately not adopted. The tenured and tenure-track faculty consensus was that the current policy was the best option. That decision is always open for further debate, though, and we will revisit the issue.

**Recommendation:** Improve the efficiency of the faculty hiring process. The process for making formal offers leaves the Department at a competitive disadvantage to other schools that move forward on offers more quickly. This is particularly true for DEI hires.

**Response:** This issue is particularly important as it negatively impacts our ability to hire. It includes the time to secure an agreement on start-up packages, approvals of salary levels, and then the time required to navigate the bureaucratic process of generating an official offer letter. To reduce the time needed for off-scale salary approvals, the Department will seek designation as a high-demand area. This issue is but one facet of the problem. A meaningful solution will require thoughtful analysis of the factors involved at the different steps and action at administrative levels above the Department to streamline or move some of the requirements earlier in the process.

**Recommendation:** As addressed throughout the document, the level of the graduate student stipends needs to be addressed.

**Response:** We agree with the reviewers that the level of the graduate student stipend is a significant impediment to the growth of the program. There are numerous examples to support this assertion. This problem will require action from levels above the Department to ameliorate the situation.

**FACILITIES**

**Recommendation:** There is a clear need for a new building or a major renovation of Bilger Hall. There need to be short-term solutions to support instrumentation in close proximity to Bilger Hall.

**Response:** We appreciate the reviewers recognizing the challenges caused by an aging building and how that impacts our teaching and research mission. This recommendation will require the combined action of the Department, senior administration, and facilities to come up with a comprehensive plan.

**SUPPORT STAFF**

**Recommendation:** Development of a long-term strategy for committed staff support of research infrastructure. Some positions, such as IT support, could be centralized within CNS.

**Response:** The Department has begun creating a long-term hiring plan for APTs. Any meaningful plan will require consultations and support from the Dean, Vice-Provost for Research and Scholarship, and Provost regarding the role of the Department’s facilities within UH and the State.

**DIVERSITY**

**Comment:** The Department has made some strides in increasing faculty diversity, with the hire of two female tenure-track positions since the last review, however more work in this area is needed.

**Response:** The Department continues to be committed to improving the diversity of its community. Absent either a series of new faculty recruitments at the Assistant-, Associate- and full Professor-levels, this issue will remain a problem for the foreseeable future. In the meantime, we will
continue our internal conversations about DEI and how these can best be fostered in the Chemistry Department.

DEPARTMENT OF INFORMATION & COMPUTER SCIENCES
The ICS faculty would like to thank the external review team, and the ICS reviewer in particular, for their efforts and report. We greatly appreciate the following positive observations from the report:

“*In general, the department has responded positively to the recommendations [of the previous external review] to improve the undergraduate program, especially with a goal to produce students adept at project software development.*”

“The department has made some excellent hires lately, and research funding is on the uptick.”

“The department has made strides in increasing the number of women students as well as faculty. Representation of women in ICS is just over 20% among undergraduate as well as graduate students. Over 80% of the undergraduates are from the state of Hawai‘i.”

The ICS Department is committed to continuing on this path in order to improve undergraduate and graduate education and increase research productivity.

The external review contained several recommendations, which are addressed below.

**Recommendation:** The department should make sure that the changes to the undergraduate program are completed, and have a process by which feedback from the student body and the external advisory board is taken into account to further improve the quality and employability of the graduating students.

**Response:** A new “Undergraduate Committee” has been formed to address all matters relevant to undergraduate experience and education. The committee has a mandate to develop assessment procedures and criteria, outside of course evaluations, for undergraduate learning objectives. A meeting between this committee and the External Advisory Board will be organized and a liaison from the committee to the Advisory Board will be identified.

**Recommendation:** Faculty evaluations, in terms of contributions to research, science and service should be done on an annual basis, and meaningful incentives should be given to high performing faculty members.

**Response:** Annual reviews of all faculty members are now conducted by the ICS Department Chair. The departmental annual review was redesigned to emphasize evaluation of productivity instead of justification of work time; however, the university recently implemented a new required program emphasizing time reporting. This year, the department annual evaluation will combine both productivity and time reporting. With respect to incentives, high performing faculty members may reduce their teaching load, and faculty with active labs receive more lab space. The department will explore other possibilities for incentives.
Recommendation: Urgency should be shown in the hiring of new faculty in selected areas of excellence. The byproduct should be an increase in research funding and more inter-disciplinary research with other departments...Hiring high-quality junior faculty is of the utmost importance.

Response: The ICS Department has requested new hires in many emerging areas of computer science over the last several years and will continue to do so. The department was granted three exceptions to the current hiring freeze this year, which we see as a positive step from university administration. The hiring committee prioritized demonstrated and potential research funding and interdisciplinarity in the selection process. In the last several years, including this year, the administration has carefully controlled the areas in which ICS may hire. While these areas are consistent with “selected areas of excellence” that the department favors, we hope to expand into broader areas in the future and gain greater autonomy in the hiring process. Since the size of our program has grown so dramatically while the size of the faculty has not, we hope that the administration will continue to allow our program to hire new faculty members.

Recommendation: The department needs to increase the quantity and quality of GTA support. It should be ensured that the GTAs know the course material well.

Response: The ICS Department appreciates this observation from the review committee. We have requested increased stipend amounts for graduate teaching assistants in the past to no avail. We regularly lose prospective graduate students to other institutions because of uncompetitive stipend amounts and, as the report indicates, many of our graduate students work full time while pursuing their degrees. This is not appropriate for a Research 1 institution where graduate students are expected to make contributions to their scientific discipline. We will continue to ask for approval of competitive funding for teaching assistants. Increasing the size of the graduate program will allow us to assign students more selectively to courses that they are assisting.

Recommendation: Graduate students indicated that they felt isolated and “on their own” during their studies...The department should take steps to increase well-being and a community feeling among students, for example, by having a department funded weekly tea/snack gathering where graduate students as well as faculty participate.

Response: The lack of a sense of community among graduate students was also recently identified by a comprehensive “Data Buddies” report from the Computing Research Association. One reason for this might be the independent lab model that the ICS Department uses where Graduate Research Assistants work in separate lab spaces and seldom intermingle. The Graduate Seminar was redesigned to better facilitate interaction, but the COVID crisis interfered with the goals of the redesign. The ICS Department also allocated space for a graduate student social area, but again its effectiveness in fostering a sense of community will only be measured after the COVID crisis ends. Finally, a weekly faculty/grad-student breakfast was a success for a time, and will be implemented again when COVID restrictions end.

Recommendation: A dedicated faculty specialist/advisor should ensure that courses are planned and sequenced in advance, and course prerequisites are clearly specified to the students, especially in the new concentration areas of data science and security...Students should be advised about internship opportunities, career fairs, and be exposed to research opportunities.
Response: Again, the ICS Department appreciates this observation. We have in the past requested faculty specialists or other non-instructional positions for the purpose of student advising, undergraduate curriculum management, internship monitoring and career preparation, external relations with employers, and other non-teaching, non-research related duties. We will continue to do so with the hope that such positions can be approved and filled.

With regard to research opportunities: The new capstone requirement will expose all undergraduates to a software development project, many of which will be research oriented. We encourage faculty to participate in the UROP (Undergraduate Research Opportunities Program) and to include an REU (Research Opportunities for Undergraduates) application in all NSF grant proposals. While some faculty members do involve undergraduates in their research programs, the ICS Department recognizes that opportunities remain limited. The ICS Department will explore an annual undergraduate research showcase with accompanying awards as an incentive.

Recommendation: Since the differences with the B.S. degree have disappeared over the years, either the B.A. program should be removed, or changes should be made to the B.A. degree by working backwards from the desired student outcomes but without “watering” down its quality.

Response: The Undergraduate Committee and Curriculum Committee will be given this charge.

Recommendation: The department should also increase the size of its Ph.D. and M.S. programs. To fund this increase, more research funding should be brought in by more of the faculty. The department should provide administrative support for grant preparation and management.

Response: The ICS Department recognizes the coupling between research funding and the graduate program, especially the Ph.D. program. Faculty members are encouraged to always include funding for graduate students in their grant and contract proposals, and the university facilitates this by waiving tuition for research assistants. An increase in graduate student enrollment will naturally follow the increased funding activity of new faculty members.

Many faculty members have asked for grant-related administrative support. Once again, this is a hiring request for a non-instructional position that the department will make in the future. But, the ICS Chair recognizes that the more likely source of funds for such a position will come from administrative support costs included in grant proposals, or from indirect costs generated by research-active faculty. The Chair therefore encourages faculty seeking large research grants to include administrative support costs so that the department might generate funding for this purpose on its own.

Recommendation: To spur research, professors should be freed up to teach more advanced graduate research-oriented courses; this could be done by hiring more instructional faculty to teach the service courses, possibly by tapping into the local industry.

Response: As faculty size has shrunk, the department has needed to utilize more faculty time on the required introductory and core courses. Both faculty and graduate students are frustrated with the resulting inability to schedule more research seminars and graduate courses in advanced topics. The department will make funding requests for instructors to handle the introductory undergraduate courses. As the size of the department faculty grows, the problem may resolve.
**Recommendation:** The teaching labs have aging desktop PCs which should be removed. Since most students bring their own devices, it might be better to replace the PCs with monitors and docking stations.

**Response:** The ICS department used to receive enough funding to equip the teaching labs, but this funding has dropped to zero. We have instituted lab fees for the first time to cover the cost of the teaching labs. However, we do recognize that the “room full of PCs” model for teaching labs is outdated. This summer (2022), the department will be refitting one lab to be an “active learning lab” which depends on the “bring your own device” model and provides a networked infrastructure that allows for group work on large shared monitors. The department intends to do the same with its other lab as funding permits (we are seeking outside funding from local industry for this purpose). In addition, we would like to build some special-purpose teaching and research labs for areas such as visualization, simulation/modeling, tangible computing, networking, and other purposes.

**Recommendation:** A more welcoming social space should be made available for students to mingle and interact with each other and with faculty.

**Response:** Prior to COVID, the relatively large “ICSpace” social space was heavily utilized by undergraduates. It has just been reopened after two years. Unfortunately, it is windowless, but it has large display monitors on the walls and, frankly, this is more desirable than windows to undergraduate computer science students.

**Recommendation:** The ICS department should continue its work on outreach to local high schools, and making scholarships available to native Hawaiian and women students in their activities, for example, their summer boot camp.

**Response:** The ICS Department is proud of the strides it has made in the area of outreach to schools. We will strive to do more. In the current hiring cycle, we have identified candidates who have some record of working with high school and intermediate-level students in the area of computer science.

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**DEPARTMENT OF MATHEMATICS**

The Mathematics Department is grateful to the review team for a thorough process and careful write-up. We appreciate that the review team recognizes our efforts in education, research productivity, funding, outreach, and diversity. Some highlights include our “enviable” level of student success in general education service teaching, and “impressive” numbers of externally funded faculty.

We generally agree with the recommendation and suggestions for the Department, although several require support and resources from outside the Department and / or outside the College. In addition to these, there are some points of concern raised by the program review (but not forming specific recommendations) that are particularly important to us: these include increased support for graduate student teaching assistants and consistent support for our postdoctoral program.

**Recommendation:** Continue efforts to grow the number of majors. For example, continue to develop and market new concentrations in Actuarial Science, Computational Science, Data Science and Mathematics Education. Develop and advertise a capstone experience or upper division class(es) tailored for each new concentration.
Response: This academic year (2021-22) we formed a departmental committee specifically tasked with attracting more majors. Some of their recommendations, such as contacting students who do well in our service courses, are already going into effect. The Data Science Track is already on the books, and the Computational Science Track has been submitted for administrative approval; both are currently advertised on the department website. The curriculum committee is continuing to work on the design of an Actuarial Track (including a new Mathematical Finance course), an education BAP modeled on the recent program in Life Sciences, and a redesign of our capstone course.

Recommendation: Actuarial track: Seek to support students to take the initial professional exams during their undergraduate program. This is ideally accomplished by hiring an alumnus to run a weekly exam preparation seminar.

Response: We will be looking into this as part of the new track design.

Recommendation: Undergraduate research poses significant challenges in Mathematics, yet is an effective way of increasing student engagement and is widely considered to be a “best practice”. Consider how a small number of such opportunities might be developed and supported.

Response: While we agree this is challenging, we have had several faculty members successfully work with undergraduates during recent summers. We have advertised undergraduate research opportunities on our website. We will continue to encourage faculty to take part in research with undergraduates through the UROP program, and their grant applications.

Recommendation: Incentivize summer and distance course offerings for which there is a direct return of a percentage of revenue to the department.

Response: We advertise summer courses, but do not currently incentivize them (beyond the salary involved). We should note that the College is currently absorbing the revenue centrally due to straitened budget circumstances; the Department will not expect to see any of this revenue directly unless the College budget situation improves. We will look into distance course offerings (we currently have none); during the last two years we gained a great deal of expertise in remote learning, so this seems an opportune time to discuss this.

Recommendation: Seek to create a combined work / study space for junior graduate students to build a cohort. The pandemic which has challenged graduate student sense of community has highlighted the importance of peer learning.

Response: We strongly agree with this. However, it would require more space or other resources that we cannot provide ourselves. Unfortunately, the recent Keller Hall renovations applied only to the classrooms (not the office space) so our attempts to incorporate this into the new design failed.

Recommendation: Obtain permission to at hire at least one FTE. The ability to cross-train staff in order to mitigate the effect of a pending retirement has been limited by covid and current workload. It is therefore important to not only replace this position, but to be allowed to hire a replacement before the experienced staff member retires in order to allow for adequate training and transfer of institutional knowledge.

Response: We strongly agree with this, but it would require more resources from outside the Department. The chair is currently looking into how work is distributed amongst the current office staff.
and forming a plan for cross-training with our most experienced staff-member (subject to the restrictions imposed by this staff member's already very heavy workload), and putting together a request for an additional position.

**Suggestion:** An increasing reliance on instructors to deliver certain components of the curriculum need not be a negative development if the instructors are stable from one year to the next, committed to, and skilled in their craft, and where there is mutual respect and acknowledgment that both TTF and instructors are on the same team pursuing overlapping but different aspects of the same vision. Seeking the right balance is a challenge in the best of circumstances but it becomes unlikely if not impossible in the context of rapid turnover of NTTF and given examples of poor performance and student complaints. Late approval to hire and non-competitive working conditions and salary exacerbate any problems and friction. Similarly, a healthy postdoc program provides additional high quality teaching at a level beyond that available from instructors and GTAs, as well as supporting the research mission and the appropriate balance must be struck.

**Response:** We have made recent hires of long-term faculty (an S3 and an I2) with specific functions centered on our undergraduate teaching mission. We strongly agree that last minute hiring permissions and non-competitive conditions for purely instructional faculty (compared, for example, with conditions non-research-active faculty can get at the UH Community Colleges) seriously hamper our educational mission. We strongly agree that our postdoctoral program has provided high-quality teaching; it is very important to us that it continues to be supported, at least at the current level. Improving these issues requires support from outside the Department, and also from outside the College.

**Recommendation:** Establish a multi-year hiring plan acknowledging the need to create a critical mass in defined areas of both pure and applied mathematics, including tenure track faculty, postdocs and long term instructors. See discussion in Section 3.

**Response:** We agree strongly that maintaining critical mass in important areas is a central issue for us, and will work on this during the coming semester and over summer. However, pressure from the higher administration to hire in specific areas means faculty morale about such a process is low: faculty are worried the effort to create such a plan will be wasted without administrative support to follow it through.

**Suggestion:** Developing new strengths and including new specialties within a department necessarily causes stress and discomfort. This becomes even more acute when the faculty size is simultaneously shrinking as has occurred within the Mathematics department during the last review period. It is widely understood that there is a need to maintain a critical mass in essential areas in order to maintain and advance educational programs, stimulate research efforts and scholarship, and to populate seminar series. This argument applies equally whether the area in question lies within what are traditionally considered pure fields or those that are traditionally considered to lie within applied mathematics. Neither “pure” nor “applied” mathematics are monolithic entities. It is important to seek agreement among the faculty for which areas within each of these two larger, somewhat arbitrary groupings must be supported to meet the goals of the department, recognizing the inevitable limit on faculty numbers. That said, mathematicians must bring something new and unique when seeking to advance knowledge.

**Response:** The Department is working on changes necessitated by adding new strengths: in particular, this is reflected in the recent additions of more applied tracks to our undergraduate program; in
addition, we are currently discussing changes to the applied part of our graduate program. We strongly agree with this suggestion in general, and in particular about cross-fertilization between traditionally “pure” and “applied” areas. On a practical level, it is true that our shrinking faculty numbers are causing a problem maintaining critical mass in several areas. Remedying this needs support from outside the College, both in terms of permissions to hire, and freedom to hire in the areas the Department sees the most need.

**Recommendation:** As recognized in the self study, there is a desire to regularize and establish institution to institution relationships rather than relying on person to person interactions, and to construct ways of providing appropriate recognition. Seek to establish a regular source of funding as well as year-by-year or short term individual initiatives. Perhaps a target for alumni development.

**Response:** The chair will work on a draft document with the UH Foundation about Department asks from donors in this regard. With one of our most active faculty in this area likely on sabbatical next year, we will be working on trying to ensure the continuation of certain programs in that faculty member's absence; this will probably necessitate more formal interactions.

**Recommendation:** Institute an exit survey for Math majors to complement the capstone course as an assessment tool, particularly given the range of new degree tracks.

**Response:** This was independently recommended by our committee tasked with attracting more majors that was mentioned above. We intend to implement it this (Spring 2022) semester.

**Recommendation:** Develop a rank-ordered multi-year renovation plan for math department space.

**Response:** The department facilities committee has been asked to work on this. We have three clear priorities, and putting a ranking on them should not be difficult.

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**DEPARTMENT OF PHYSICS & ASTRONOMY**

The Department of Physics & Astronomy thanks the external review committee for their thorough and incisive study. We are gratified that the committee acknowledges the strength of our program on the national level, but also that our program is vulnerable to issues that the committee has identified. We respond to these specifically here:

**Recommendation:** The department should consider the hire a faculty member in the critical core area of advanced instrumentation and electronics as a top priority in order to maintain this nationally unique and highly-visible program. Not only is this important for the scientific life of the department, but it is an area that is in tune with the university-wide goal of expanding research into areas important to diversifying the Hawaiian economy.

**Response:** We are grateful that the committee agreed with our assessment of the urgency of replacing Instrumentation Physicist Prof. Kurtis Nishimura with a new hire in this area as soon as it is practical, and we will continue to press for this as our highest near term hiring priority.

**Recommendation:** The department should generate a formal Strategic Plan that articulates scientific goals, lays out a hiring road map, and relates the proposed plan to department, college, and university
priorities. This is especially important in a time of limited hiring and where there are multiple potential opportunities to pursue. The audience of the plan should be the college and university leadership.

Response: The department had begun the process of strategic planning for new hires during 2021, but the process was not completed in time to be reviewed by the external committee. We will make this a key project for the remainder of this academic year.

Recommendation: The department should prepare a quantitative analysis of why peer institutions can have a lower teaching load and suggest realistic actions to the college to improve the situation based on that analysis.

Response: The committee agreed with our assessment that our teaching workload is significantly higher than that of our peer institutions, and recommended we initiate a quantitative study on how our peer institutions achieve these workloads, since it is not practical to increase the faculty by 50%. We accept this recommendation and will start the planning process for this task as soon as possible.

Recommendation: The department should look into the current policy on buying out teaching and how that can be changed to make it more realistic. It is important that the buyout amount be sufficient to hire a well-qualified substitute instructor for faculty who are starting new programs, or are in periods of intense research activity.

Response: The committee found that current teaching buyout policy does not generate enough funding to reliably hire lecturers or instructors, and we concur with this finding. We believe that this issue must be solved at the college or university level with more attractive teaching compensation for part time instructors and lecturers. In practice, potential lecturers and instructors need an advanced degree in physics to be a competent teacher, but current compensation levels are not competitive with other employers.

Recommendation: The department should do a study of financial incentives being offered by peer institutions to determine if they are competitive at the current level. In addition, they should look at the correlation with GRE general and subject scores and consider if that is an effective tool to evaluate applicants in terms of their successful completion of the program.

Response: We support the proposal by the committee to perform studies of the financial incentives offered by the graduate programs of our peer institutions, and the correlation of Graduate Record Exams with student success in our graduate students.

Recommendation: The committee suggests that the department should consider whether the current annual exam schedule is slowing down time to degree significantly, and assess what it would take to give the exam twice a year. In addition, the department should review the goals and scope of the examination to make sure that there is faculty consensus on the target level of difficulty.

Response: We accept the committee’s proposal for us to review the PhD qualifying exam, and this process has already begun in the department.

Recommendation: The Department should seek ways to further expand existing connections to business and the local leaders in such a way as to become more visible to the local community and students. A departmental External Advisory Board may be a way to do this, with members drawn from prominent alumni, relevant government leaders, and local educators.
Response: The department is evaluating this recommendation by the committee.

SCHOOL OF LIFE SCIENCES (SoLS)
The School of Life Sciences thanks the reviewers for the recognition of its successful research programs and the key instruction that is being carried out for our majors and for the university, and for their thoughtful and constructive suggestions. SoLS has been and will continue to be in discussions related to their suggestions into the future. We have begun the process of taking action on several issues as noted below.

A number of recommendations to SoLS require responses by the College of Natural Sciences and UHM leadership. These include budget issues, staffing concerns (TAs, Instructors), college-level advocates, and faculty surveys as discussed below.

RESEARCH, POSTDOCTORAL SCHOLARS, AND GRADUATE EDUCATION

Recommendation: Raise the current pay level for TAs in SoLS to a liveable wage and resolve any problems with unpaid work.

Response: SoLS fully supports this action and we have requested higher salaries for TAs for many years. Occasionally there are students or postdoctoral scholars whose pay is delayed or who have issues with the onboarding, and we respond with corrective paperwork as quickly as possible and work with CNS HR to minimize these delays. That said, some of these onboarding problems arise from hiring TAs at the start of each semester as our instructor’s scramble to replace those that have declined our positions for more lucrative employment elsewhere. Low TA salaries have negative impacts on both teaching and research across CNS, as they hamper our ability to compete with other institutions for top graduate applicants and with other UH Manoa units that can offer substantially larger TA salaries.

Recommendation: Hire more TAs with deliberate planning based on anticipated demand for courses as the number of majors increases and moves through both lower and upper-level courses. This will allow better planning for not only instructors but also graduate students who need to plan both research and finances. Continue to address the ongoing curriculum modifications needed to reduce redundancies and the number of required courses that result from the merger of the three departments into the SoLS.

Response: We have been fortunate recently to receive permission to hire additional TAs when new sections of laboratories were opened due to surging enrollments. We would also like to hire more TAs to help with several of our high enrollment courses (those with greater than 100 students enrolled) to assist instructors with class management. This has not been possible as our allocation of TAs has been sufficient to cover only the laboratory sections. One of our most popular majors, the BS in Marine Biology, has steadily increased in the number of majors and is experiencing an accumulating backlog of students that cannot register for required gateway courses because we cannot staff a sufficient number of lab sections with TAs.

Recommendation: Develop a grad student/postdoc handbook that is available online for standard procedures.
Response: Models for this exist within existing SoLS graduate programs and efforts through strategic planning to make these uniform across the graduate programs are in progress. The SoLS website is now up and available, and materials such as this handbook will be made available there. We have been working hard to eliminate course redundancies and courses that are no longer being taught, both at the undergraduate and graduate level.

Recommendation: Appoint a person within the CNS for SoLS and other units who can interface with higher administrative levels and bring together information and responsibilities for postdoc administrative issues and who can work with and advocate for postdocs and their mentors.

Response: Such an appointment would be welcomed by SoLS to help us with these issues.

Recommendation: Continue to encourage both social and intellectual activities that foster more interaction within SoLS and related units for researchers at different levels of their careers.

Response: SoLS has planned for and is now offering a seminar series that begins in the Spring 2022 semester with speakers from campus, Hawaii and internationally. Presently these are presented in hybrid format, but when university restrictions are lifted they will be in person with socials to follow. We will also be starting a once per semester activity (“Pau Hana”) to introduce undergraduate and graduate students to agency researchers and conservation managers. This will 1) introduce students to the diversity of work possibilities, 2) provide opportunities to learn of possible research and funding opportunities, 3) network with professionals throughout Hawaii. As a part of SoLS strategic planning activities, we will be looking for other means to interact with agency professionals in Hawaii.

Recommendation: Continue discussions of field safety issues.

Response: Safety concerns in laboratories have been a major concern and extensive training programs for them have been made. However, safety when carrying out field work has been neglected. We will be working toward promoting field-related SOPs to train our graduate students in best practices when in remote areas and using equipment in such settings. The Environmental Health and Safety Office is working to develop guidelines for field research, and we will liaise with them to adopt best practices for SoLS.

FACULTY

Recommendation: Continue work on a shared short-term and long-term strategic plan and vision for the School.

Response: Strategic planning was scheduled in Fall 2021 and is now underway by SoLS faculty. The SoLS has begun a strategic planning exercise to focus first on general procedures and guidelines to follow in future activities. This will focus on identifying SoLS strengths and related gaps, curriculum directions, the graduate programs, association with other life science related departments, and DEI relations. This will be followed with preparation of detailed plans for future hires, curriculum changes, modifications to the graduate programs, etc.

Recommendation: Standardize and clarify procedures with better communications within CNS and within SoLS including development of a faculty handbook. (See also Section 3.2 Communications.)
Response: SoLS will work closely with CNS staff to develop a Climate Survey for our faculty. This will then be used to target areas of deficiencies in leadership and staff responsiveness to the extent that we can control them. A faculty handbook will be developed to assist junior faculty and new hires in familiarizing them with the campus and Oahu community, commonly accessed resources for faculty, procedures for establishing or modifying courses (UHM forms, focus designations, etc), submitting grant proposals and use of MyGrants, and choosing housing and neighborhoods on Oahu, etc.

Recommendation: Complete the new SoLS website and continue to pursue additional external funds for the School.

Response: The SoLS Website had a soft rollout in September 2021 and was fully implemented in November 2021. A website committee makes regular updates to the website and continues to add new features. Several SoLS faculty are actively pursuing external funds to support our programs. In recent years, these have included two funded NSF REU Site awards that support diverse undergraduates in gaining research experience, as well as an NSF IUSE proposal that is under consideration now and which would fund several improvements to the undergraduate curriculum. A working group is currently planning for an upcoming NSF RAMP proposal that would fund a post-baccalaureate program and provide a bridge for students into research focused careers. We intend to continue pursuing such funding opportunities as they arise.

Recommendation: Establish an external advisory board for SoLS.

Response: We have included this recommendation as one of our strategic planning priorities. A working group of SoLS faculty will discuss the composition and operations of such an advisory board and make a recommendation for assembling it to the Director.

UNDERGRADUATE EDUCATION

Recommendation: The review committee strongly recommends longer term contracts for current non-tenure-track instructors who have been employed for years on year-to-year contracts, recognizing the essential role they play in support of undergraduate education.

Response: SoLS fully supports this, but we are constrained by university policies and budgetary concerns.

Recommendation: Continued updating of assessment of courses across SoLS is necessary and should help point out how to improve courses and curriculum.

Response: SoLS uses a yearly assessment process that results in periodic assessment of all program level SLOs. We are working to further expand and unify our procedures across the nine undergraduate majors and four graduate programs.

STAFF

Recommendation: Use existing data to help design and implement interventions to improve learning and retain students in the majors.

Response: Finding ways to help our students through the curriculum is a concern we share. Curriculum within SoLS majors will be reviewed to determine how retention and completion of degrees
can be improved. As part of our strategic planning and through NSF funding that is being sought (see #9 above), we will make a thorough evaluation of this.