

UCSB Physics Department Diversity, Equity, and Inclusion Strategic Action Plan

This plan has been developed by the UCSB physics department's Climate Committee, composed of faculty, staff, graduate students, and undergraduates. It considers aspects of the department across six domains: undergraduate students; graduate students; postdocs and research associates; faculty; staff; and the department as a whole. The purpose of the plan is to articulate concrete steps that the department can take to fulfill its commitment to improving the diversity of its faculty and students, in the belief that a rich plurality of outlooks and backgrounds is vital to our growth as physicists and to our participation in an increasingly diverse society.

In each domain, the plan begins with an assessment of the current status of the department, including data on admissions, recruiting, enrollment, retention, and outcomes. This current assessment informs subsequent proposals for enhancing diversity, equity, and inclusion. Action items are enumerated in each domain, and a summary of all action items is provided at the end of the document. The plan is informed by a variety of input from the department, university, and external sources, including the department's 2017-18 Program Review Panel (PRP) report; results of climate surveys completed by the departmental community in Summer 2020; data on undergraduate enrollment from UCSB's Office of Budget & Planning; departmental data on graduate recruitment and retention; and guidance from the American Institute of Physics (AIP) TEAM-UP Report [1], DEI strategic action plans from other physics departments in the state of California [2,3], and various studies evaluating strategies for improving diversity in STEM fields. Where available, comparisons are made to national statistics collected by the American Physical Society (APS) and AIP, which highlight aspects of the department in particular need of attention. However, to the extent that these statistics reflect the endemic nature of underrepresentation in physics departments throughout the country, even points of consistency between the department and national trends are taken as a call to action.

This plan is intended as a living document. The first iteration of the plan is primarily centered around recommendations for enhancing diversity, equity, and inclusion, accompanied by the identification of specific targets and a prioritization of action items based on the availability of departmental resources. Once adopted by the department, a second iteration will focus on implementation, identifying the faculty committees responsible for implementing recommendations; timelines for implementation; and metrics for assessment.

We emphasize that understaffing significantly constrains the department's ability to implement aspects of the plan. Since 2012, department support staffing has remained flat while undergraduate enrollment has more than doubled and graduate enrollment has grown by 25%. Undergraduate and graduate advising, critical to meeting the needs of the student population, is correspondingly limited; understaffing in payroll and personnel administration has further

compromised the availability of advising by requiring advising staff to cover payroll responsibilities; and temporary hires essential to address critical needs in the department have been covered by departmental gift funds that could otherwise be used to support DEI initiatives. Implementation of aspects of the strategic action plan necessarily involves staff activity at a level that is unsustainable under current circumstances. Action items that are expected to be strongly impacted by staffing limitations are explicitly noted throughout the document.

In addition to staffing considerations, many of the department's ongoing and proposed initiatives relevant to the strategic action plan are sensitive to, or constrained by, broader funding availability. For example, departmental gift funds that could be used to support research fellowships for students from under-represented groups are currently required to compensate for shortcomings in the department's temporary budget. For example, the undergraduate Learning Assistant program (see Undergraduate Curriculum and Pedagogy below), a key component of ongoing efforts to increase the department's instructional cross-section and improve outcomes for minoritized students, is funded at the discretion of the dean of the Division of Mathematical, Life, and Physical Sciences (MLPS). Continuation of salary support for undergraduate Learning Assistants is crucial to ensuring accessibility to Learning Assistant positions and viability of the program in general. The department looks forward to working with the university to broaden funding support for initiatives outlined in this plan.

The committee would like to thank Laurel Wilder of the UCSB Office of Budget and Planning for invaluable support with data on undergraduate outcomes; Physics Department staff for data on graduate students, postdocs, faculty, and staff; and numerous members of the Physics Department community for their suggestions and input.

Undergraduate students

Demographics¹

As of Fall 2020, 791 undergraduates were enrolled in the physics major through the College of Letters & Sciences, of whom 252 (32%) were international students. We note that the number of international students has grown tremendously -- international students comprised only 1% of those enrolling in Fall 2010. Of the 539 domestic students, 24.9% were from under-represented minorities (URMs): 2.2% Black, 21.1% Hispanic/Latine, and 1.5% Native American. Between 2018 and 2020, the percentage of degrees conferred among domestic students to URMs rose from 20% to 26%, primarily through an increase in the percentage of degrees granted to Hispanic/Latine students, which rose from 17% to 23%. The percentage of degrees granted to Black students rose from 2.2% to 2.6% in the same period, while the percentage granted to Native American students fell from 1.5% to 0%, but the small size of these populations (no more than three graduates in any year) leads to sizable fluctuations. Nationally, the percentage of degrees awarded in physics to Black students stood at 3% in 2018 (the most recent year for which information is available, from APS), and 11% for Hispanic or Latine students. At 17.8%, the percentage of female-identifying students enrolled in the UCSB physics department as of Fall 2020 is somewhat below the national average, with 18% (22%) of bachelor's degrees in physics awarded to women nationwide in 2017 (2018), the most recent years for which APS data is available.

Admissions & Enrollment

Although the department does not have control over undergraduate admissions, a demographic breakdown is useful for understanding the composition of the major. Here we focus on admissions in 2020, but note that results are generally comparable in preceding years. We begin with admissions and enrollment by ethnicity. In 2020, URM students comprised 25% of the freshman domestic applicants and 15% of the total applicants to the physics department. The overall 66% admit rate for URM students was comparable to the 64% overall rate, but significantly below that of domestic students identifying as White (77%) or Asian (80%). These rates include admissions of students to the physics department who originally applied to other

¹ Here and throughout this document, we largely adopt the specific terminology used by the UCSB Office of Budget and Planning in classifying demographic categories. In particular, Under-Represented Minority (URM) refers specifically to domestic students identifying as Black, Hispanic/Latine, Native American, or Pacific Islander. We use Hispanic/Latine as an umbrella for various categories (e.g. Chicano/Latino, Latinx, Hispanic) used by the Office of Budget and Planning, Graduate Division, and other university institutions. We include women as an under-represented population in Physics. We use nonbinary to refer to transgender, genderqueer, and gender non-conforming gender identities reported by the Office of Budget and Planning. We note that UCSB began reporting nonbinary gender identities in Fall 2016, which is reflected in the absence of some data pertaining to outcomes for nonbinary students. In general, the committee did not possess sufficiently fine-grained data to explore outcomes for populations at the intersection of multiple groups, but recognizes the compounding effects of such intersections. "Under-represented groups" is used as a term of collective reference involving multiple populations.

majors, including those outside MLPS; among original physics applicants, the 46% admit rate for URM students lagged behind the 53% overall rate, the 64% rate among White students, and the 66% rate among Asian students. However, owing to a much higher acceptance rate among URM students, the yield (percentage of students accepting their offer of admission) among URM students stood at 20%, higher than the overall yield of 16% and on par with the 19% yield of URM students throughout MLPS. Among transfers, URM students comprised 36% of domestic applicants and 30% of total applicants, on par with MLPS as a whole; admit rates for URM students again fall behind those of non-URM domestic students, while yields are generally lower compared to freshman applicants: 16% among URM transfers compared to 27% among all transfers, largely driven by low yield (14%) among Hispanic/Latine transfers.

Turning to admissions and enrollment by gender identity, in 2020 women comprised 25% of freshman applicants, while 0.9% of freshman applicants were nonbinary. The admit rate for both women and nonbinary freshman applicants was 64%, consistent with the overall rate. The yield among women was only 12% and the yield among nonbinary students was 45%, compared to the overall yield of 16%. Among transfers, women comprised 18% of applicants, while nonbinary students comprised 4% of applicants. The yields among women and nonbinary students were 15% and 37%, respectively, compared to 27% among all transfers.

Retention & Outcomes

Although enrollment and graduation in the major tracks or exceeds national trends, retention and graduation data suggests that there are obstacles facing majors from under-represented groups. Among URMs, one-year retention rates are lower for URM students compared to non-URM students (78% vs. 91% for the 2019 freshman cohort, 70% vs. 86% for the 2019 transfer cohort), a gap which is not apparent in MLPS as a whole for which the same comparisons are 88% vs. 92% and 87% vs. 90%, respectively. One-year probation rates are correspondingly much higher, at 22% vs. 6% for the 2019 freshman cohort and 40% vs. 26% for 2019 transfers. The 4-year graduation rate for URM physics majors lags behind their non-URM counterparts; the rates for students enrolling in 2016 were 59% for URMs against 69% for non-URMs, with comparable or slightly larger gaps in preceding years. Although the overall 4-year graduation rate for URMs is somewhat higher across all of MLPS (64% for the 2016 cohort), the discrepancy between URMs and non-URMs throughout MLPS is comparable to that observed in the physics department; the non-URM graduation rate across MLPS was 76% in the 2016 cohort.

Tracking changes in the major is also illuminating, and is illustrated in Figure 1. Among the physics freshman cohorts enrolling between 2012 and 2016, 23% of URM students have graduated with a physics major vs. 39% of non-URM students. 50% of the URM students graduated in a different department (26% in another MLPS department, 24% in another division), compared to 40% among non-URM students (24% in another MLPS department, 16% in another division). 27% of the URM students do not yet hold a UCSB degree, compared to 21% among non-URM students. The discrepancy is apparent by the end of the second year: although the percentages of URM and non-URM students in the major are comparable at 74% and 77%, respectively, at the beginning of their second year, only 45% of URM students remained in the

major at the beginning of their third year, compared to 52% of non-URM students. By the beginning of their fourth year, only 31% of URM students remained in the major vs. 42% of non-URM students, with relatively larger attrition after their fourth year.

Flow from Enrollment to Degree by Ethnicity

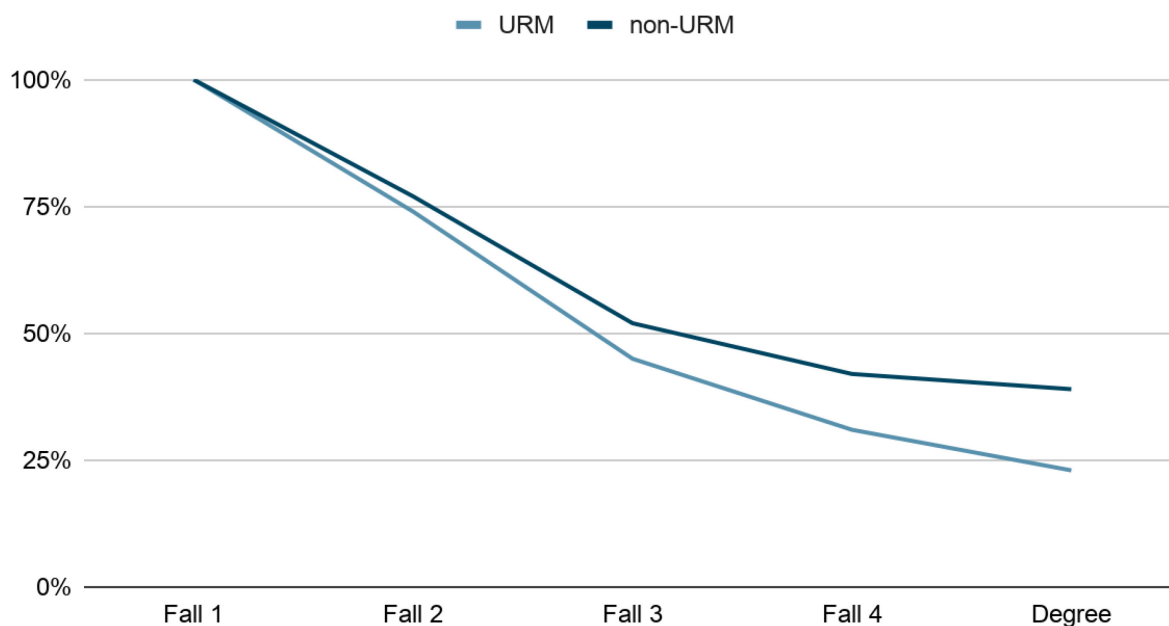


Figure 1: Percentage of students remaining in the physics major from enrollment to degree by ethnicity among freshman cohorts enrolling in the Physics Department between Fall 2012 and Fall 2016.

The persistence gap between URM and non-URM students is consistent with national trends. Documented factors contributing to this gap include challenges in transitioning to college among first-generation college students, unequal access to adequate high school preparation in physics and calculus, availability of support systems, freshman academic performance and the role of “gatekeeper” courses, the degree of racial isolation, and availability of personal contact with faculty [4]. Although the department is not well positioned to address disparities arising from high school preparation and does not have designated gatekeeper courses, it is taking steps to reduce the persistence gap through e.g. enacting curriculum reform aimed at accommodating a wider range of preparation levels, implementing peer learning strategies, providing undergraduate research experiences, and improving undergraduates’ sense of connectedness to the department.

Retention and graduation data by gender identity is currently only available for men and women. One-year retention rates are comparable for women and men (87% and 90%, respectively). One-year probation rates are historically higher for women at 26% vs. 18% for

men among the 2018 freshman cohort² and 43% vs. 30% for 2018 transfers. The 4-year graduation rates are comparable for women and men; the rates for students enrolling in 2016 were 63% for women against 67% for men.

Changes in the major for women and men are illustrated in Figure 2. Among the physics freshman cohorts enrolling between 2012 and 2016, 23% of women have graduated with a physics major vs. 37% of men. 50% of women graduated in a different department (32% in another MLPS department, 18% in another division), compared to 41% among men (23% in another MLPS department, 18% in another division). 27% of women do not yet hold a UCSB degree, compared to 22% among men. The discrepancy is apparent by the end of the second year: although the percentages of women and men in the major are comparable at 72% and 77%, respectively, at the beginning of their second year, only 39% of women remained in the major at the beginning of their third year, compared to 52% of men. By the beginning of their fourth year, only 26% of women remained in the major vs. 42% of men.

Flow from Enrollment to Degree by Gender

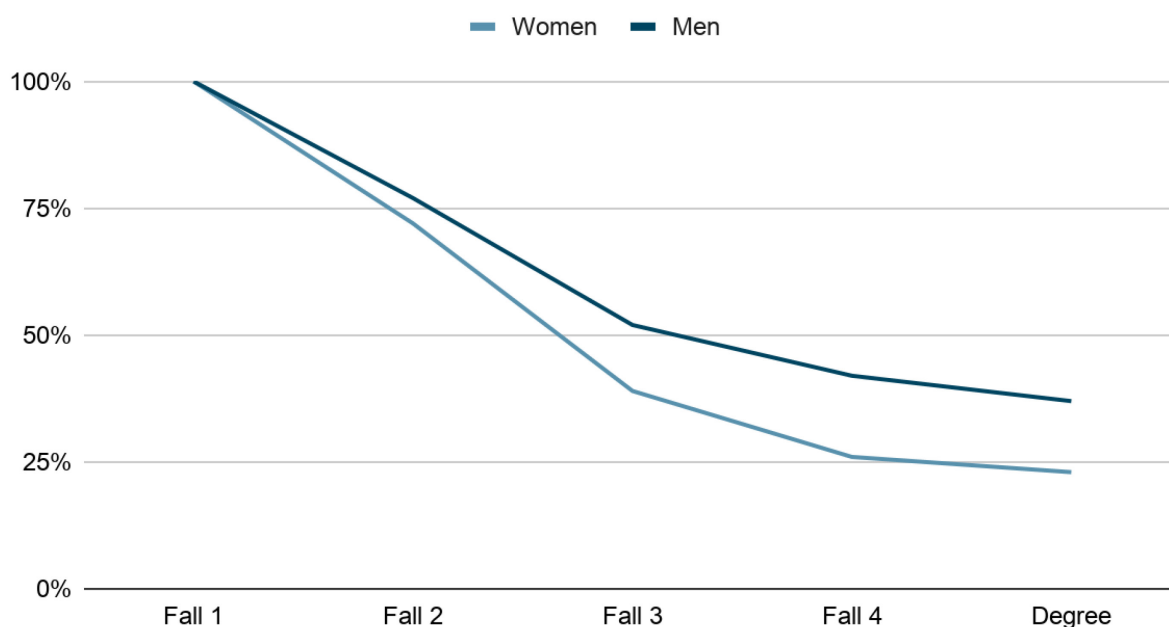


Figure 2: Percentage of students remaining in the physics major from enrollment to degree by gender among freshman cohorts enrolling in the Physics Department between Fall 2012 and Fall 2016.

² Among the 2019 cohort the stated rates are 2% vs 10%, respectively, but this is either a typo or non-representative, as probation rates among women are otherwise above 20% in every freshman cohort from 2012 onwards. We quote data for the 2018 cohort as a representative example. The 5-year average probation rate among freshman cohorts between 2015-2019 (inclusive) is 21% for women and 16% for men. The committee does not have access to raw data on probation rates.

Similar to the persistence gap between URM and non-URM students, there are many documented factors that contribute to the persistence gap of graduation rates between men and women; however, the effects of pre-college preparation and early undergraduate performance as cause for women leaving the physics major are more debated than they are for URM students [5]. More consistently, studies have shown that climate surrounding physics has an impact on the women pursuing the field. In addition to dealing with the gendered culture surrounding physics and the effects that has on forming connections, women in the field have reported dealing with judgment for appearing “too feminine,” stereotype threat, and microaggressions such as not being fully included in the workplace and sexist language [6,7]. Although much work remains to be done, the department has begun to make steps toward improving the culture, including shifting toward one-on-one or small-group office hours, rather than in the Physics Study Room (PSR), so students feel more comfortable asking questions; implementing bystander intervention training into graduate student TA training; and implementing a code of conduct for students in the PSR.

Undergraduate Curriculum and Pedagogy

Prompted by its last external review, the Physics Department has been engaged in a comprehensive reform of its undergraduate curriculum for majors, and has submitted a full proposal to the relevant Academic Senate Committees as of the end of Fall quarter 2020. The reform is aimed at changing a Bachelor of Science degree that was designed with PhD program-bound undergraduates in mind to a degree program that serves a broader set of students well. It takes into account both the wide range of high school and community college preparation of incoming students and the diversity of their post-graduation career goals. By serving a broader set of students, it is our hope that this reform will help us attract and retain a more diverse population of physics majors. Some highlights of the reform relevant to DEI are

- A staggered set of lower division course requirements, including a new course designed to help students who have little or no preparation in high school calculus.
- A strengthened lower division lab sequence, designed to better prepare majors for upper division experimental courses.
- A new, required lower division computer programming class for all majors.
- A revised upper division classical mechanics class designed to help bridge the gap between lower and upper division coursework, particularly relevant to junior transfer students.
- The introduction of upper division concentrations for students with a variety of goals and interests. In addition to traditional “Core Physics”, there will be three new concentrations in Astrophysics, Physics Education, and the Physics of Soft and Living Matter. With this structure in place, we hope to also develop and offer additional concentrations in future.

If approved by the Senate, the lower division changes will become effective next year (Fall 2021), and the upper division changes the year after that (Fall 2022). Key to the success of this reform will be careful advising, assessment of student program learning outcomes, and

monitoring of student success rates across diverse ethnicities, genders and family educational backgrounds.

In addition to curricular reform, enhancing successful student diversity will also entail embracing non-traditional pedagogy. The Physics Department has already been incorporating undergraduate peer Learning Assistants (LAs) in active learning environments led by graduate teaching assistants as a replacement for more traditional discussion sections. The introduction of the LA program was motivated by the desire to improve both the overall instructional cross-section in light of growing undergraduate enrollment and the educational outcomes for students from minoritized groups. LAs have now been incorporated into both lower-division and upper-division courses, and LAs undergo training in pedagogy concurrent with their first assignment. Learning Assistants are currently paid through funding from the MLPS dean. Among other benefits, this makes assistantships feasible for students who would otherwise need to work. Continuation of support from MLPS is crucial to the viability of the LA program.

The new Physics Education concentration will incorporate a new required course on “Teaching and Learning Physics” which will engage both the faculty (and graduate teaching assistants) who teach it and the students who take it in modern pedagogical methods that have been shown to be successful by Physics Education researchers. Moreover, three of the courses in the Physics Education concentration will be taught in UCSB’s Education Department within the Gevirtz Graduate School of Education. It is hoped that this new collaborative effort between the two Departments will foster further advances in pedagogy that will help our DEI efforts within the undergraduate student body.

Undergraduate Research

Research plays a significant role in the career trajectories of undergraduates in the department, particularly for students interested in attending graduate school. The large number of undergraduate majors relative to the size of the faculty means that research opportunities are only available to a small fraction of majors. Research funding is also quite limited; physics majors in the College of Creative Studies (CCS) have access to at least one summer of research funding through the CCS Summer Undergraduate Fellowship Program, but there is no reliable source of funding for the majority of majors enrolled via the College of Letters & Sciences. As such, many of the existing research opportunities are unpaid, putting students with financial need at a significant disadvantage. This has an outsize impact on first generation, low-income, and URM students.

The department does not collect data on undergraduate research; collecting annual data on the number and demographics of undergraduate researchers, the prevalence of paid vs. unpaid positions, and the distribution of research opportunities among L&S and CCS would improve the department’s ability to assess the equity of undergraduate research opportunities.

Compelling PIs to fund undergraduate research is unlikely to have the desired effect of increasing opportunities; in the absence of additional resources this will simply reduce the

number of undergraduate research positions. Rather, the department can take steps to both increase the pool of funds available to URM students and make more systematic use of existing university resources. Existing resources include the Faculty Research Assistance Program (<https://urca.ucsb.edu/frap>), which provides funding for project expenses in exchange for advertising to, and involving, undergraduate majors from Letters & Sciences in research; the Undergraduate Research & Creative Activities Grant (<https://urca.ucsb.edu/urca-grant>), which directly funds independent undergraduate research under the supervision of a faculty member; the Transfer Student Research Activities Grant (<https://urca.ucsb.edu/tsra-grant>), an analogous grant aimed specifically at transfer students; and the Edison STEM scholars program (<https://mcnair.ucsb.edu/edison>), a program for low-income, first-generation, and/or under-represented students whose opportunities include academic-term research scholarships, summer research support, and GRE preparation. Another possibility for leveraging existing funding is to facilitate research activities for students on federal work study, for whom research in the physics department could count as paid work.

The department currently supports some undergraduate summer research through the Worster Summer Research Fellowship, made possible by the generosity of Bruce & Susan Worster. In order to improve access to research opportunities, the department could seek donations that would go towards supporting research fellowships for low-income, first-generation, or URM students.

Undergraduate Survey

In Summer 2020 the department separately surveyed undergraduate majors in the College of Letters & Sciences and the College of Creative Studies. The 21% response rate for L&S students fell below the 40% threshold considered necessary for representative results, but we nonetheless summarize salient features in the absence of a representative survey with demographic information. Within Letters & Sciences, 11 of 159 respondents reported personally experiencing exclusionary or harassment behavior on campus or within the physics department; 13 reported witnessing such behavior; and 37 reported hearing of such behavior. While 10% of respondents identified as Hispanic or Latine, this group comprised 36% of the respondents who reported experiencing exclusionary or harassment behavior. Hispanic/Latine students were more than twice as likely to indicate a sense of unwelcomeness and unequal treatment in the UCSB physics community compared to their White counterparts. Although statistics are poor for students identifying as Black or Native American, respondents from these groups did not report experiencing exclusionary or harassment behavior, and their responses relating to feelings of welcomeness, connectedness, and equal treatment were positive. We do not have separate data for international students. This is something that we will address in future surveys.

In terms of gender identity, 31% of respondents identifying as nonbinary reported experiencing exclusionary or harassment behavior on campus or within the physics department, compared to 17% of women and 3% of men. Students identifying as nonbinary or women were far more likely to report feeling unwelcome in the UCSB physics community compared to students

identifying as men (31% and 22%, respectively, compared to 3% for students identifying as men), with similar percentages indicating a feeling of unequal treatment by faculty, staff, or other students.

In written comments, respondents note inaccessibility of faculty; difficulty in finding research experiences; a toxic or unwelcoming atmosphere in the PSR created by some students; a lack of support for under-represented populations; sexism; and unsupportive advising.

Among 36 respondents to the CCS survey, no students reported experiencing exclusionary or harassment behavior, and responses relating to feelings of welcomeness, connectedness, and equal treatment were positive.

Action Items

(* denotes activities whose implementation requires additional staff resources)

Retention & Outcomes

- Work with the university Office of Budget & Planning to collect and maintain fine-grained data on students to track academic progress differentiated by race, ethnicity, and gender. Make this data regularly available to academic advisors.*
- Maintain and expand connections between the department and campus-wide STEM or non-STEM associations for students from under-represented groups. Make information about these groups readily accessible to interested students.
- Collect, publish, and regularly update information about emergency grant programs that are available for students facing financial difficulties.*
- Encourage the departmental newsletter/social media team to highlight the induction of McNair Scholars and the involvement of faculty as mentors to McNair Scholars.
- Encourage faculty to discuss guidelines for an inclusive and respectful climate both in their undergraduate physics courses and research groups.
- Implement the proposed curriculum reform and continue curriculum reform efforts.

Mentorship

- Make use of the APS National Mentoring Community (which supports mentoring relationships for URM physics undergraduates, <https://www.aps.org/programs/minorities/nmc/>) by encouraging faculty participation and advertising to students.
- Encourage faculty involvement in mentoring and supporting minoritized students by emphasizing these activities in merit reviews.
- Support a system of peer mentorship, whether organized by the department or student groups.*
- Work with the MLPS Dean to ensure continued and expanded support for the undergraduate Learning Assistant program.

Undergraduate Research

- Collect data on undergraduate research in the department on an annual basis by surveying department faculty to determine the number and demographics of undergraduate researchers, the prevalence of paid and unpaid positions, and the use of university-wide resources to support undergraduate research.*
- Identify students on federal work study, for whom physics research could count as paid work, and educate faculty about how to use federal work study for research employment.*
- Make full use of university-wide resources such as URCA and the Edison STEM Scholars Program by advertising to faculty and students.
- A core of highly successful and visible URM students who engage in research, are visible/active in seminars/group meetings, and go on to greater successes after graduation can provide a 'seed' for fellow students to follow in their footsteps. Encourage faculty to identify promising students early and engage them in research.

Climate

- Reform the PSR. Possibilities include renaming the room (e.g. Physics Help Room or Physics Learning Room) to decrease its use as a social space; taking steps to migrate social activities to lobbies on the second, fourth, and fifth floors of Broida Hall; holding separate lower-division and upper-division PSRs; tailoring PSR help to lower-division courses only, plus the classes with the TAs who are staffing the PSR at any given time; asking the lower-division classes to stagger homework due dates; implementing a take-a-number system like in the CLAS room to reduce the barrier of students needing to summon the courage to approach a TA for help; supporting office hours in place of PSR hours for some courses; and holding virtual office hours or virtual drop-in sessions to create additional spaces for interaction with TAs and LAs.

Graduate students

Demographics

As of Fall 2020, there are 134 graduate students enrolled in the department's Ph.D program, not including the incoming class of Fall 2020. Of these, 34% are international students. URM students comprise 13.6% of the domestic students and 9% of the total graduate population (2 Native American, 1 Black, 9 Hispanic or Latine), which. Nationally, URM students comprised 6.7% (0.4% Native American, 1.3% Black, 5.1% Hispanic/Latine) of domestic Ph.D recipients in 2018, the most recent year for which APS data is available. Women constitute 18.7% of the graduate student population, below the 22% of women awarded Ph.Ds in physics in 2018.

Admissions & Enrollment

The physics department directly controls admission and recruitment to the graduate program. The program is advertised on the department's website and by the reputation of the department's research programs. The graduate admissions chair solicits applications to the graduate program from students participating in UC diversity-oriented programs such as McNair Scholars, UC LEADS, UC STARS, and the UCLA REU. As of Winter 2021, the department has applied to become a Partnership Institution of the APS Bridge program and is undergoing evaluation.

Applicants are selected for admission by a committee of faculty that includes representatives from each major sub-discipline in the department. The graduate admissions committee takes a holistic approach to selecting students for admission, weighing recommendation letters, research experience, curriculum, and personal statements as well as GPA, general GRE, and Physics subject GRE scores (although no GRE scores will be required for the Fall 2021 applicant pool, and the subject GRE score is not required of applicants in astrophysics). Applicants' research interests are taken into consideration in selecting the applicant pool, with an eye towards ensuring that matriculating students in every cohort will find research opportunities in their areas of interest in the department. Admits are generally offered a uniform package guaranteeing five years of support, including three quarters as a teaching assistant (TA) in their first year. Recruitment of highly competitive candidates is facilitated by a number of special fellowships that reduce teaching responsibilities, including university-wide central fellowships and departmental fellowships sourced from named endowments. Allocation of these fellowships is generally at the discretion of the committee, but some endowed fellowships have specific entailments (e.g. the Fithian Graduate Fellowship is awarded to female applicants facing financial hardship).

To characterize recent trends, we focus on admissions data for the Fall 2018 and Fall 2019 cohorts. There were 754 applicants in Fall 2018 and 902 applicants in Fall 2019, with an overall admission rate of 16.3% and an acceptance rate of 25.2%. Black applicants comprised 1.7% of the total applicant pool in this period, and accounted for 1.5% of the total students (2.0% of the

domestic students) enrolling in the program. Hispanic/Latine applicants comprised 5.1% of the total applicant pool, and accounted for 7.4% of the total students (10.2% of the domestic students) enrolling in the program. Female applicants comprised 16.7% of the total applicant pool, and accounted for 23.5% of the students enrolling in the program. The relatively higher fraction of women enrolling in F18-19 compared to their representation in the current graduate population reflects a lower rate of enrollment in previous years, e.g. they constituted 18.3% of the students enrolling in the 5-year period between F14-19.

Retention & Outcomes

The department maintains records of student trajectories upon leaving the program, with data going back to 1992. Over that period, 7% of students have left the program with no degree and 6% with a Master's degree. The recorded reasons for leaving commonly include following advisors who move to other institutions or deciding to pursue other personal interests. It is rare (<1%) for students to leave due to failure to find a research advisor. This is helped by the advising programs described above and by the department's financial support. Admitted students have been offered a five-year guarantee of stipend during the academic year, health insurance, and payment of tuition and fees, contingent on maintaining continuous enrollment, good academic standing, and employment eligibility. Among students matriculating between 2014-2019, 100% of the 14 URM students have remained in the program or graduated with a Ph.D, compared to 89% of the non-URM students.

TA Training

The majority of students are supported by TAs during their first year in the Ph.D program, and many students continue to be partially supported by TAs throughout the duration of their Ph.D. The department requires TA training for all incoming graduate students. This has been taught the same way for many years, with mixed reviews from the graduate students. Areas of potential improvement include training to sustain a constructive atmosphere among undergraduates in the Physics Study Room and improved preparation in leading mastery question-based sections incorporating undergraduate Learning Assistants.

Graduate Survey

80 graduate students submitted responses to the Summer 2020 climate survey, and results were analyzed both in total and via cross-tabs of gender, ethnicity, international student status, and cohort. Where possible, results can be compared to analogous results from the Fall 2019 survey.

We look first to the quantitative questions, for which students were asked to rank their agreement to a provided statement on a scale of "strongly agree" to "strongly disagree." Defining a non-positive response as one of the three options "neither agree nor disagree,"

“disagree,” or “strongly disagree,” we identify two questions that a significantly high percentage of students had non-positive responses to:

1. “I feel connected to other graduate students in the physics department.” (43.75%)
2. “I know the resources available to me from the physics department.” (50%)

In comparison to the 2019 survey results, which had a pool of 70 respondents, these percentages increased significantly (from 20% and 32%, respectively). This suggests that the recent switch to remote coursework and research, and the coinciding decrease in departmental social events, played a role. However, it is worth noting that the 2019 results leave much room for improvement on their own. Along these lines, in 2020, 12.5% of students had non-positive responses to feeling welcome in the physics community, 20% to feeling comfortable approaching professors, and 18.75% to feeling that they were not treated the same as their peers. While these numbers are much lower than the two areas highlighted above, the department should ideally be working toward decreasing them to zero.

Overall, women were less likely to feel comfortable approaching physics professors and feel connected to other graduate students in the department. They were also less likely to feel that they were treated the same as their peers by other members of the department — 21% of women had non-positive responses to this question versus 11% of men. Finally, women were more likely than men to rate interactions among physics graduate students as “neutral” rather than “collaborative.”

Turning toward the cross-tab analysis of these results, South Asian, Hispanic, and Latine students were far more likely than their peers to be neutral or disagree with the statement “I am confident in my ability to do physics.” Other questions had similar breakdowns of answers for each ethnicity, and results for international students did not show any significant deviations.

On the subject of harassment, 11.25% of students said that they had personally been subjected to harassment or exclusion on campus or within the physics department in the past year. 10% of students said that they had definitively witnessed such behavior, while 53.75% said that they had definitively heard of such behavior. Further investigating sources of harassment/exclusion and working toward eliminating it should be a primary goal for the department going forward. The high percentage of students who had heard of harassment/exclusion behavior also shows that these incidents can have a large impact on the overall department climate.

Among written comments, when asked to describe their current impressions of the department, 10% of respondents wrote that the graduate student community is either cliquey or exclusionary, with one student writing “there is a lot of gossip and exclusion that happens behind the scenes.” A few more students reflected on the department as being disconnected, highlighting a lack of interaction between graduate students in different years as well as between graduate students and faculty. When asked about the transition to the physics

department, 10% of respondents cited this disconnect as a reason for a more difficult transition, describing it as “a nightmare” and “extremely lonely.”

When students were asked to reflect on factors contributing negatively to life in the physics department, a few common themes emerged: an overall apathy of faculty toward graduate students (low faculty attendance at department events, overworking students, not getting to know students either as people or potential collaborators, no interface with visiting academics), women being harassed for dates by other graduate students and isolated upon rejection, and feeling like the department does not take the concerns of graduate students seriously. Many respondents also brought up the PSR as an overall negative environment, both for undergraduate and graduate students.

As for events that contributed positively to life in the physics department, commonly cited answers included Astro Tea, several journal clubs, as well as specific students and professors that created a welcoming environment. The latter, a focus on individuals instead of the community as a whole, points to a disconnected department that could be alleviated with more graduate student and faculty participation.

Action Plan

Admissions & Recruitment

- Expand the pool of applicants by having members of the graduate admissions committee encourage applications from under-represented students participating in UC-wide programs, expanding and formalizing the current practice.
- Continue to review and implement holistic admissions practices. Provide training for graduate admissions committee members in implicit bias and holistic evaluation.
- Strengthen recruitment efforts for under-represented applicants through personal communications from multiple faculty members in the department.
- Develop an endowed fellowship for the recruitment of students from under-represented groups.
- Encourage faculty to develop connections with colleagues at institutions with higher fractions of undergraduates from under-represented minorities, including MSIs and HBCUs. Support faculty involvement in the UC-HBCU program.

Training

- Provide Equity & Inclusion training to incoming graduate students. Reform TA training to specifically address the environment in the PSR with a combination of observation and discussion by the graduate students, especially focused on the experiences of women and underrepresented minorities. Train TAs to effectively lead mastery question-based sections with undergraduate Learning Assistants.

- Continue supporting career mentoring and connections to post-degree placement services by e.g. advertising university-wide career resources and maintaining an annual colloquium talk by UCSB graduates employed outside of academia.
- Expand the first-year research seminar to include exposure to climate-related issues.

Climate

- Support a system of cross-cohort peer mentorship, whether organized by the department or student groups. (Note that a mentorship program was established by Grad Life this year, but the extent to which this is being utilized is unclear).
- Encourage students to develop a network of mentors including other faculty, postdocs, and staff.
- Reform the trailer community for the incoming graduate class by emphasizing its role as an academic space and providing venues for social activities elsewhere in the department. Although respondents overall had positive things to say about the trailer and its role in establishing an informal space for first years to get to know their peers, some women respondents in particular had highly negative experiences with this environment.

Postdoctoral Associates & Specialists/Project Scientists

Demographics

As of Winter 2021, there were 42 postdoctoral associates within the department, of whom 26% were women; the department does not currently maintain data on nonbinary gender identities. Two of the postdoctoral associates (1 Black and 1 Hispanic/Latine) were from under-represented minorities, comprising 5% of the total. Of the 11 non-postdoc specialists and project scientists employed within the department, 18% were women; data on ethnicity is unavailable for this group. The department would benefit from greater accessibility to gender and ethnicity data for postdocs, specialists, and project scientists maintained by the university.

Hiring, Retention, & Outcomes

Hiring of postdocs is necessarily de-centralized in the department, with considerable variation in the timeline, hiring process, and position duration from field to field. Postdoctoral positions are advertised on the department website and through field-specific venues.

The department does not currently provide uniform guidance for postdoctoral hiring practices. The department has not regularly included postdocs in annual climate surveys and does not uniformly collect exit information that could be used to track outcomes of postdoctoral alumni, although this is done by some groups within the department

Postdocs and their faculty mentors are required to fill out annual evaluations assessing the postdoc's progress to date, identifying both strengths and opportunities for improvement, and describing future training, research activities, and expectations. These evaluations are sent to Academic Personnel but are not centrally reviewed in the department.

A significant opportunity for improving the representation of women and URM within the postdoctoral community is provided by the UC President's Postdoctoral Fellowship Program (PPFP). The program provides salary, benefits, and research expenses as well as a faculty hiring incentive for PPFP recipients. The deadline for applications is typically November 1, with recipients notified by March 31. Although groups in the department have made use of the PPFP, there is currently no systematic approach to recruiting applicants for the program, such as meeting within groups on an annual basis to identify and solicit applicants. One obstacle to the use of the PPFP is the application and notification dates that do not align with the hiring timeline of some fields within the department. Nonetheless, PPFP applicants may be recruited among postdocs at other institutions; this practice has been successfully employed by other physics departments in the UC system.

Postdoc Survey

The 34% response rate in the Summer 2020 postdoc climate survey falls below the target 40% response rate, but we include the results here because there is no other recent survey of postdocs in the department. In general, survey responses indicate that postdocs feel positively about the opportunities for scientific and professional development that they have been afforded within the department. However, they highlight a lack of social connections both within the postdoctoral community and in relation to the department as a whole. Specific issues that were raised in the survey include depressing office space; under-staffed purchasing office; and a missing sense of community. One respondent reported being personally subjected to exclusionary or harassing behavior, while 2 have witnessed such behavior and 3 have heard of such behaviors.

Action Items

- Survey faculty about their advertising and hiring practices and use the results of this survey to develop guidance for best practices. Provide a document on the departmental website offering clear guidance for inclusive advertising and recruitment.*
- Encourage groups within the department to identify and recruit applicants for the UC President's Postdoctoral Fellowship Program on an annual basis.
- Create and maintain a list of postdoc resources (at both departmental and university levels) on the department website.*
- Create an exit survey for postdocs that solicits feedback about their experience at UCSB and future career plans.*
- Use exit surveys and faculty input to maintain a list of postdoc alumni and their current positions in order to improve networking opportunities and recruitment.*
- Involve postdocs in departmental committees where appropriate, e.g. the climate committee, outreach/special events/social media
- Organize or support the organization of quarterly postdoc events (lunch, coffee, etc.) and improve efforts to include postdocs in departmental social events.

Faculty

Demographics

The Department currently has one Hispanic faculty member, corresponding to 1.7% of the 58 faculty members in the Department (1.9% of the 52.2 FTE) and no Black or Native American faculty. This contrasts with e.g. the AIP's 2012 national average of 2.1% Black faculty and 3.2% Hispanic/Latine faculty. There are 8 female faculty members (6.2 FTE), corresponding to about 13.8% of the Department (11.8% by FTE), compared to the AIP's 2018 national average of 16% among Ph.D-granting physics departments.

Hiring & Recruitment

Faculty searches are earmarked by subfield according to the department's FTE Plan. Faculty searches are advertised centrally by the university and through relevant physics publications and websites. Job descriptions encourage applications from candidates that contribute to the diversity of the academic community through research, teaching, and service, and include a statement articulating the University of California's status as an Equal Opportunity Employer. Some searches invite applicants to submit a statement of contributions to diversity.

Hiring committees comprised of departmental faculty undergo training by the university's Equal Opportunity & Discrimination Prevention (EODP) Office to address compliance and best practice issues related to equal opportunity and improving diversity in Academic and Staff search processes.

Recruitment and retention of faculty is complicated by the lack of a robust and transparent spousal hiring program. Women are more likely than men to have academic partners, and the lack of suitable employment for their academic partner is cited by women as the primary reason for declining an outside offer [8]. The relative isolation of the UCSB campus from other universities and major cities makes a robust spousal hiring program essential to recruiting and retaining women on the faculty.

Training

On-boarding of new faculty hires into the department is handled informally, through meetings with the department chair and informal mentoring by one or more current faculty members. The chair has recently put together a FAQ to familiarize new faculty with standard teaching practices in the department.

Faculty Survey

The 42 faculty responses to the Summer 2020 climate survey have not been broken down by demographics due to the relatively small number of faculty, for whom demographic data would render some individual responses identifiable. Faculty generally report positive experiences in the department, with few respondents providing negative responses to questions about welcomeness and comfort approaching other members of the department. There are some indications of disconnectedness among department faculty, with 24% providing non-positive responses when asked about feeling connected to other faculty in the department. 14% provide non-positive responses to questions pertaining to awareness of resources available in the physics department and requirements for professional advancement. Three respondents (7%) indicate that they have been personally subjected to exclusionary or harassment behavior on campus or in the department during the past year, while one respondent reports witnessing such behavior and 50% of faculty report having heard of such behavior.

Comments indicate that the faculty community is largely seen as congenial. Some note a lack of department-wide coordination and action on climate-related issues. Many comments point to fragmentation of faculty by subfield with attendant difficulty in maintaining collegiality, which is particularly manifest in the FTE allocation process. When asked about impressions of how welcoming the department is to newcomers, respondents gave generally positive responses regarding welcoming sentiments, but many noted that the department is inconsistent with mentorship and could be better in helping newcomers get up to speed: new faculty receive little guidance, and the department would benefit from a formal process to orient incoming assistant professors.

Action Items

Hiring

- Identify and engage potential early-career candidates from under-represented populations, including UC President's & Chancellor's Postdoctoral Fellows and recommended candidates from external colleagues. Proactively invite such candidates for colloquia and/or seminars.
- Continuously and actively look for Exception to Open Recruitment hires outside of normally approved searches.
- Discuss with the Dean and EVC strategies for increasing diversity in recruitments, including PFP hires, cluster hires, joint appointments, and targets of opportunity.

Training

- Implement a formal faculty mentoring plan, including assigning one or more senior faculty members to each incoming faculty member.

- Encourage all incoming faculty members to attend the New Faculty Workshop hosted by the American Association of Physics Teachers. Much of this material is now available online. Alternatively, they can attend a campus workshop on teaching and mentoring.
- Develop an information packet outlining essential information for new faculty, including graduate student advising, administrative procedures, and instructional development opportunities.*
- Devote at least one faculty meeting a year to diversity and inclusion, and ensure all faculty members are aware of stereotype threat and implicit bias.
- Ensure formal diversity training for faculty advisors and faculty mentors.

Staff

Demographics

The Department has 19 permanent and five temporary administrative and teaching support staff. These include 14 women and 10 men with two self-identified underrepresented minorities (one Hispanic/Latine and one Black/African American). Staff also include self-identified Japanese Americans, Chinese Americans, and Indian Americans.

Hiring & Recruitment

The Department has not received new FTE with which to hire additional staff since the early 2000s so hiring and recruitment practice only replaces staff who have retired or resigned. Job descriptions are updated on a regular basis and again prior to recruitment. Staff recruitments are advertised centrally on the University job board and on local online and print newspapers. Jobs requiring a very specialized skill set (e.g. machine shop engineers, IT systems administrators) are advertised more broadly, targeting nearby counties and national job boards. Job descriptions include a statement articulating the University of California's status as an Equal Opportunity Employer.

Retention

The Department has a relatively low staff turnover rate. Of the current 19 permanently funded staff, eight have been in the department between 12-33 years; five have been with the department for over four years, and six have been with the department between one-two years. Of these six, three replaced retirements or internal promotions and three replaced resignations from the department. According to internal exit interviews, staff resigning from the Physics Department over the past five years have stated 1) higher salary and promotional opportunity; 2) lateral position with comparable salary but less workload/stress; 3) difficult supervisor.

Training

Funds are budgeted within the department, as well as some matching funds from the College, to support professional development courses for staff. Some managers and student affairs staff participated in early safe zone training (~2018). This training has since been updated with a new name (QTies) and additional/updated course material.

Staff Survey

The 19 staff responses to the Summer 2020 climate survey have not been broken down by demographics due to the relatively small number of staff, for whom demographic data would render some individual responses identifiable. Respondents feel generally positive about the department in general, with no non-positive responses to questions about feelings of welcomeness and connectedness in the department, interactions with students, and interactions with staff. Three respondents (16%) do not feel informed of requirements for professional advancement or well-supported by supervisors and senior staff regarding career advice. One respondent indicates interactions with faculty and researchers is generally very negative. Three respondents (16%) indicate being personally subjected to exclusionary or harassment behavior in the past year, while two respondents indicate witnessing such behavior and 7 respondents (37%) indicate hearing of such behavior. Comments are generally positive, but indicate that staff are feeling overwhelmed by a growing workload and point to a specific personnel issue about which department leadership is aware.

Action Items

- Unit Managers participate in the UC Managing Implicit Bias Series for Staff Managers
- Support participation in university-wide career development workshops.
- Ensure that faculty are regularly apprised of workload issues among staff.
- Maintain good communication between department administration and staff on issues that influence morale, including budgets, salary, and management.
- Ensure adequate funding for morale-building staff events.
- Maintain staff involvement in equity and inclusion matters within the department, including participation in the climate committee.
- Support training for management and staff on inclusive management and advising practices, including guidance on career development.

Department

The department has historically held a number of events aimed at building connections between faculty, students, and staff. These include the departmental colloquium, department tea, holiday events, and an annual picnic.

Since Summer 2020, the department has taken a number of steps aimed at increasing equity & inclusion. These include

- Submitting an application to become a partnership institution of the APS Bridge program. Becoming a partnership institution would allow the department to enroll graduates from the Bridge program into its Ph.D program with a commitment to dedicated mentorship. The department application is currently under evaluation.
- Circulating an updated climate survey with demographic information to better understand the climate for different groups in the department and exploring the results in the climate committee, with the goal of making summaries of the survey results public where appropriate and circulating a stable climate survey on an annual basis.
- Creating a web form for anonymous comments that is permanently posted on the department web page and monitored by the department chair and the chair of the climate committee.
- Updating the departmental diversity page to include information about recent climate-related activities in the department.
- Involving undergraduate and graduate students in the climate committee, beginning in Fall 2020 with the addition of representatives from Undergraduate Diversity in Physics (UDIP), Women in Physics (WIP), and the Equity & Inclusion Reading Group, and continuing in Winter 2021 with the addition of a representative from GradLife.
- Reading and discussing the entirety of the AIP TEAM-UP report in the climate committee and completing the corresponding departmental self-assessment. This report looks at long-term systemic issues within the physics and astronomy communities that contribute to the underrepresentation of African Americans in these fields and makes important, actionable recommendations for community wide efforts to reverse this trend.

The department is in the process of modernizing and updating its website.

Action Items

- Continue to conduct annual surveys of all departmental populations, including demographic information. Publish the results where appropriate and compare performance over time.
- Continue to hold departmental town halls on an annual or semiannual basis.
- Maintain a strong and visible Climate Committee including faculty, staff, and student representatives.

- Ensure a diverse representation of department colloquium speakers. Take input from students for at least one colloquium each academic year. Periodically invite speakers to speak about outreach or equity & inclusion issues.
- Organize several annual social events for students, staff, postdocs, and faculty.
- Ensure that the departmental website and communications remain up to date and reflect the current diversity of the department. *
- Update the departmental tea, possibly modeled after the Astro Tea event, or adopt a proper social hour prior to colloquia.

Summary of Action Items

Undergraduates

- Work with the university Office of Budget & Planning to collect and maintain fine-grained data on students to track academic progress differentiated by race, ethnicity, and gender. Make this data regularly available to academic advisors.*
- Maintain and expand connections between the department and campus-wide STEM or non-STEM associations for students from under-represented groups. Make information about these groups readily accessible to interested students.
- Collect, publish, and regularly update information about emergency grant programs that are available for students facing financial difficulties.*
- Encourage the departmental newsletter/social media team to highlight the induction of McNair Scholars and the involvement of faculty as mentors to McNair Scholars.
- Encourage faculty to discuss guidelines for an inclusive and respectful climate both in their undergraduate physics courses and research groups.
- Implement the proposed curriculum reform and continue curriculum reform efforts.
- Make use of the APS National Mentoring Community (which supports mentoring relationships for URM physics undergraduates, <https://www.aps.org/programs/minorities/nmc/>) by encouraging faculty participation and advertising to students.
- Encourage faculty involvement in mentoring and supporting minoritized students by emphasizing these activities in merit reviews.
- Support a system of peer mentorship, whether organized by the department or student groups.*
- Work with the MLPS Dean to ensure continued and expanded support for the undergraduate Learning Assistant program.
- Collect data on undergraduate research in the department on an annual basis by surveying department faculty to determine the number and demographics of undergraduate researchers, the prevalence of paid and unpaid positions, and the use of university-wide resources to support undergraduate research.*
- Identify students on federal work study, for whom physics research could count as paid work, and educate faculty about how to use federal work study for research employment.*
- Make full use of university-wide resources such as URCA and the Edison STEM Scholars Program by advertising to faculty and students.
- A core of highly successful and visible URM students who engage in research, are visible/active in seminars/group meetings, and go on to greater successes after graduation can provide a 'seed' for fellow students to follow in their footsteps. Encourage faculty to identify promising students early and engage them in research.
- Reform the PSR. Possibilities include renaming the room (e.g. Physics Help Room or Physics Learning Room) to decrease its use as a social space; taking steps to migrate

social activities to lobbies on the second, fourth, and fifth floors of Broida Hall; holding separate lower-division and upper-division PSRs; tailoring PSR help to lower-division courses only, plus the classes with the TAs who are staffing the PSR at any given time; asking the lower-division classes to stagger homework due dates; implementing a take-a-number system like in the CLAS room to reduce the barrier of students needing to summon the courage to approach a TA for help; supporting office hours in place of PSR hours for some courses; and holding virtual office hours or virtual drop-in sessions to create additional spaces for interaction with TAs and LAs.

Graduate students

- Expand the pool of applicants by having members of the graduate admissions committee encourage applications from under-represented students participating in UC-wide programs, expanding and formalizing the current practice.
- Continue to review and implement holistic admissions practices. Provide training for graduate admissions committee members in implicit bias and holistic evaluation.
- Strengthen recruitment efforts for under-represented applicants through personal communications from multiple faculty members in the department.
- Develop an endowed fellowship for the recruitment of students from under-represented groups.
- Encourage faculty to develop connections with colleagues at institutions with higher fractions of undergraduates from under-represented minorities, including MSIs and HBCUs. Support faculty involvement in the UC-HBCU program.
- Provide Equity & Inclusion training to incoming graduate students. Reform TA training to specifically address the environment in the PSR with a combination of observation and discussion by the graduate students, especially focused on the experiences of women and underrepresented minorities. Train TAs to effectively lead mastery question-based sections with undergraduate Learning Assistants.
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Resources and references

- [1] AIP TEAM-UP Report <https://www.aip.org/diversity-initiatives/team-up-task-force>
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