

Report of the **Committee on** **Student Admissions and Recruitment**

APRIL 2021

SUBMITTED BY

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Overview

The charge of this committee was to examine graduate recruitment and admissions with the aim of identifying actions that will enable Caltech to achieve a more diverse student body, particularly among racially minoritized populations. Under this charge, the committee has developed recommendations that are practical to implement, leverage the Institute's strengths, and accommodate the needs of its academic options.

The committee solicited advice from a variety of Institute personnel with expertise in diversity, equity, and inclusion (DEI), undergraduate and graduate admissions, and institutional research/information technology. We also spoke with faculty, option managers, and, to a more limited extent, colleagues from peer institutions. Our conversations allowed us to learn which practices have helped enhance diversity and where opportunities for further advancement exist.

For graduate recruitment and admissions, a constraint on realizing institutional goals and implementing improvements is that initiatives must be carried out in a decentralized system. Each of the 31 graduate options at Caltech is responsible for establishing admissions requirements, recruiting students, reviewing applications, arranging financial aid, and, subject to approval by the dean of graduate studies, admitting students, with all of these activities facilitated by the Graduate Studies Office (GSO). The committee feels that it is essential that options maintain a high level of autonomy in order to preserve the standards of scholarship in their different disciplines and to respond to size considerations and other current needs. While this places challenges on instituting top-down change, it also provides a considerable opportunity to learn from each option's innovations. Already, there are a variety of DEI-related initiatives taking place from the bottom up. These initiatives are valuable and should be encouraged. However, the committee also feels that the Institute would benefit from centralized structures dedicated to promoting the goal of improving DEI in graduate admissions at Caltech. What is essential is that the Institute foster productive partnerships and clear paths for communicating priorities and best practices on the one hand, and needs, successes, and failures on the other.

Our overarching conclusion is that improving diversity in recruitment and admissions must be viewed as a continual, evolving process. Best practices need to be informed by the ongoing experience of admissions personnel and by systematic, continual, and data-driven analysis. Our 11 principal recommendations focus on the adoption of (i) administrative structures and priorities that will facilitate this endeavor and provide accountability for results, and (ii) broader cultural shifts that encourage and reward actions by individual faculty to improve DEI. The recommendations incorporate both actions that could be taken relatively quickly and with minimal expense, and changes that will require longer-term investment and effort.

Appendix A gives the full committee charge from President Rosenbaum. Appendix B provides minutes of our meetings. Appendix C describes our understanding of the procedures that are currently used by each option for graduate recruitment and admissions. Appendix D provides a list of resources that the committee found useful. This includes a list of outreach/DEI activities presently being undertaken at the Institute that are or can be leveraged for graduate recruitment and admissions as well as a list of external resources.

I. Discussion and Recommendations

A. RECRUITMENT AND OUTREACH

Achieving a more diverse graduate student population, particularly among students from minoritized communities, will require a substantial and sustained Institute-wide commitment to outreach and recruitment. While Caltech enjoys substantial and productive pipelines for matriculating talented graduate students through our alumni network and through our worldwide visibility in research communities, these pipelines implicitly reinforce our past demographics. Left unattended, they will at best limit our success in attracting diverse students to those demographics that constitute undergraduate programs at peer universities. Furthermore, we presently admit students identifying as female and/or as underrepresented minorities (URM) at modestly higher rates than our general application pool. This suggests that enhancing the pipeline and yield of these groups will be required to achieve our diversity goals.

Recommendation 1: To diversify the graduate student body, the Institute must critically evaluate the present administrative structure, budget, staffing levels, and information technology around graduate recruitment, and significantly expand recruiting with clear goals and defined metrics of success.

Presently, there is only one staff member exclusively devoted to graduate recruiting: the recruitment, outreach and admissions coordinator within the Graduate Studies Office. However, this effort requires expertise and cooperation from the graduate options, the Caltech Center for Inclusion and Diversity (CCID), and Student-Faculty Programs (SFP). Our committee was unsure whether this recruitment effort should remain within the Graduate Studies Office or be reorganized to better leverage the various partners mentioned above as well as staff and resources utilized in undergraduate recruitment. Regardless of the administrative structure adopted, the level of activity must be significantly increased, and the process should have clear goals and defined metrics of success: Students should be extensively tracked and constantly supported through the process, and the adopted structure should coordinate existing expertise from the aforementioned groups as well as undergraduate admissions and recruiting functions.

It is important that our amplified recruitment efforts involve both actions: making contact with students from minoritized populations and coordinating recruitment activities with the options, as well as deep study and reflection on best recruitment practices. The graduate recruiting office should be staffed by professionals who have the necessary background and training to continually study our past and present applicant pools, measure how demographics are shifting, and determine which messages resonate with students and which activities provide maximum impact and cost effectiveness.

Information technology will prove crucial to such endeavors, and should be budgeted and selected based on long-range planning and the ability to link to admissions and other student-oriented databases. One currently missing component of an overall IT system for recruitment and admissions is a comprehensive web-based system often referred to as customer relationship management (CRM) technology. It is critical that the software include features such as event management, tracking, historical data and reporting, and a seamless

and flexible online application review process. It should facilitate collection of data such as (i) graduation rates and job outcomes for different options and demographic groups, (ii) detailed longitudinal data on student well-being and satisfaction on various issues, and (iii) outcomes of students who were either admitted but not matriculated or denied admission. The CRM system must manage the entire “funnel” process for candidates: from early tracking of candidates, from WAVE and contact through recruiting conferences aimed at underrepresented students, right through to enrollment commitment and integration with post-enrollment data streams. The system must be accessible to individual faculty within the different divisions so that their own contacts, including DEI outreach contacts, can be entered in the portal. Ultimately, the ability to track students and manage the communications for diverse students and their interests, as well as track the events they attend while more easily reviewing their credentials, will give staff the data necessary to better predict, control, and leverage enrollment outcomes.

When selecting this software, Caltech should undertake a systematic review of all student-centric IT on campus with an eye toward integration among offices, expansion of data collected, automation of data streams, and easy access to decision makers across both administrative and academic units. Caltech presently relies on a patchwork of software products and manual data streams; this lack of coordination adversely impacts admissions and recruitment, including the ability to identify and maintain relationships with URM candidates and to coordinate across Institute programs. This limits our ability to develop long-term, sustained relationships with URM students who may participate in research as high schoolers or undergraduates or who participate in specific outreach programs that are often run at the division level rather than being Institute-coordinated.

While it is envisioned that the recruiting activity described above will be aimed primarily at baccalaureate students, the committee felt that Caltech also needs to do more to introduce itself to younger students, many of whom may not be competitive as undergraduate applicants to Caltech but who may reach Caltech at a later stage of their career.

Recommendation 2: Caltech should enhance STEM outreach activities to include messaging about Caltech graduate degrees and research opportunities.

The committee noted that current general STEM outreach activities undertaken by the Center for Teaching, Learning, and Outreach (CTLO) could be expanded to have a graduate recruitment component. For example, while making contact with high school and community college students, we could send the message that if prospective students build up their STEM coursework and focus on getting involved in research (including but not limited to research at Caltech through SURF/WAVE), they will be well prepared for graduate studies and that Caltech will be ready to welcome them into our community. This would have the added benefit of introducing students to the process of building a scientific/engineering resume and career.

The committee felt that Caltech can do much more to encourage our faculty, postdocs, and graduate students to participate in outreach activities at all levels, but especially those activities aimed at reaching young, female, first-generation, minoritized, low-income, and

other underrepresented students. One particular idea that generated much enthusiasm in the committee was that of a corps of graduate students who would be paid the equivalent of a TA-ship to perform such targeted outreach efforts. These “Graduate Outreach Assistantships” could be launched with a modest investment and focus on building connections with teachers at high schools, community colleges, and minority-serving institutions (MSI). STEM teachers serving minoritized and otherwise underrepresented communities within the greater L.A. area should be prioritized.

Enhancing the pipeline is a high priority, but, concurrently, the committee recommends that the Institute’s options, supported by the administration, also be more strategic in the pre- and post-application recruitment periods and in related events.

Recommendation 3: Visit days should be primarily focused on recruitment, and a campus-wide post-admission yield event should be developed.

While there may still be circumstances that favor in-person interviews, the committee feels that increased use of video conferencing to screen applicants prior to acceptance would allow in-person visit days to be focused on recruitment, particularly for top-rated applicants, including students from diverse backgrounds. Whether in conjunction with or subsequent to such visits, the campus-wide yield event would be centered around giving students a better view of the campus community as a whole, and would provide an opportunity to break down into affinity groups to address issues of concern to specific communities including women, Black, Latinx, LGBTQ, first-generation students, and other communities. Ideally held late in the admissions cycle, the campus-wide yield event would also offer a final chance to “seal the deal” with prospective students and to remind them, many of whom will have visited many other universities after their initial visit (whether virtual or in person), of our vibrant and welcoming community before they make a final decision. A potential model for such an activity is the Caltech Shines event held in early April 2021 by the divisions of Biology and Biological Engineering and Chemistry and Chemical Engineering.

In addition, the committee noted that while Caltech has many effective web pages with information regarding graduate studies and application processes, the form and content of these pages is highly variable from option to option and largely excludes information about DEI.

Recommendation 4: Each option should maintain on their websites option-specific graduate application guides and DEI information. The Institute should provide resources and mechanisms for maintaining and ensuring the consistency and accuracy of these pages.

Each option should provide a full description of its current graduate admissions process, including descriptions of expectations for application documents with examples and descriptive rubrics for the committees’ processes on admitting students. This information should be easily accessible from multiple places and informational links should be aggregated on the GSO website to maintain consistency. Good examples of current websites with robust admissions and DEI information are the [Physics](#), and [Mechanical and Civil Engineering](#), and [Computing and Mathematical Science](#) sites, respectively.

Finally, the committee recognized the recruitment benefits of the new Presidential Graduate Fellowships, which are allocated specifically to support diverse candidates, but we would take this program further.

Recommendation 5: The Institute should expand the Presidential Graduate Fellowships and offer multiyear support for the most outstanding applicants.

These fellowships are consistent with programs at our peer institutions, and the rationale for investing in them is obvious. However, apart from the prestige of earning a named fellowship in an Institute-wide competition, the existing program provides financial resources and terms that are not appreciably more attractive than the other fellowships that most first-year students receive. The committee felt that, assuming success in the enhanced outreach and recruiting activities outlined above, we would need to offer roughly 20 such fellowships each year in order for most options (or groups of small options) to benefit. In addition, the program should have the flexibility to extend some of these offers into multiyear fellowships to entice top candidates, many of whom are intensively recruited by our competitors with similar offers. Providing these fellowships on a multiyear basis to candidates is appealing because it affords candidates some research autonomy as they seek to identify the group that best fits their interests. Increasing the number of Presidential Fellowships would represent an ambitious and appealing fundraising goal in dual service of Caltech's aims to endow more graduate fellowships and to increase graduate student diversity.

The committee strongly recommends continuing the procedure undertaken in the present academic year in which the graduate dean selected the fellows based on a transparent, competitive process. Despite the desire for balance in awarding fellows to the different options, which we expect to happen naturally when averaged over many years, the overarching criteria should be the quality of the applications and the potential for the candidate to contribute to the diversity of our campus.

B. ADMISSIONS PROCEDURES

Graduate admissions is a decentralized activity that is primarily carried out by the options (or by groups of options). This decentralization is hardly unique to Caltech, and differences in procedures between different options are a function of the culture, history, and evolution of different academic disciplines; the size and current needs of the option; and the demographics of the students and faculty.

The committee did not see uniformity as a goal for its own sake, and, indeed, anecdotal evidence gathered through interviews with colleagues suggests that Caltech is no more decentralized in our approach to recruitment and admissions than are our peer institutions. However, it is essential that options discuss and set diversity goals, are aware of best practices, are systematic in their approach to implementing those practices, and are responsible to the Institute for documenting and justifying practices as they exist.

Recommendation 6: The Graduate Studies Office, together with a newly constituted Institute-wide Graduate Admissions Committee (distinct from the existing Graduate Studies Committee) should develop a written set of recommended policies and procedures (best practices) that each option should implement to evaluate applicants. Options would be required to submit an annual report describing their goals, admissions outcomes, PhD completion rates, and justifications for deviations from the recommended procedures, and should report on any other DEI efforts to the graduate dean and chief diversity officer (CDO).

The faculty members of the proposed Graduate Admissions Committee (GAC) should hold at least five-year terms to provide continuity as changes are made. The precise composition and mechanism for membership would need to be determined through consultation with the Graduate Studies Office and the Faculty Board. Our committee felt that the GAC should be staffed by faculty intimately involved in graduate admissions, such as chairs of admissions committees (and/or option reps) within the options and that seats should be representative of the graduate population at large with no fewer than one member per division. The proposed GAC could also include graduate student representatives and option managers, who the committee recognized as doing much of the hard work in each admissions cycle and whose talents and innovations should be shared among the options. The dean of graduate studies would likely serve as chair of the GAC, with the assistant dean serving *ex officio*.

The current business of the Graduate Studies Committee (GSC) would be divided between functions associated with admissions, which would be spun off to the new committee, and functions associated with matriculated students, which would continue to be handled by the option reps as representatives to the GSC.

Best practices in recruitment and admissions are centered around the primary objective of identifying excellent candidates *fairly* and *inclusively*. Some practices may casually exclude individuals because they “fall through the cracks.” Others may systematically exclude individuals from underrepresented populations because they “don’t fit the profile.”

The committee identified the following list of best practices that address these issues as a starting point only; many of these items are already being implemented on an ad hoc basis within the options.

- Options should provide written rubrics for evaluating both cognitive and noncognitive admissions criteria, and make them publicly available. The Undergraduate Admissions Office has used such rubrics in previous admissions cycles and could be a useful resource for the options as they are developing their own.
- Each applicant should be reviewed by two or more faculty members. For applicants identifying as female, URM, or first-generation students, a third “backstop” reviewer should be used to ensure that these applicants do not fall through the cracks. The option manager could serve in this role.
- Options should develop essay prompts that are specific and short, and which elicit, in an obvious way, the pertinent information we seek, i.e., questions about the attributes/qualities that are important for an individual to be able to thrive as a Caltech graduate student. In formulating these prompts and evaluating the responses, it will be important to recognize that students from economically disadvantaged backgrounds will not have had the same resources and “grooming” that often provide clear “cookie-cutter” answers to essays; as such, reviewers should be open to diverse responses. It is likewise important that we not push away applicants by having onerous application questions.
- Options should add directions and specific questions for letter writers instead of soliciting a generic statement. In the same way that some applicants may not be familiar with the implicit expectations of the graduate admissions process, some recommenders may also be unfamiliar with what reviewers are looking for in letters. Revising the current letter prompt could be a useful starting point to ensure that letter writers understand what information they are expected to include.
- Options should increase the use of online interviews for candidates who may not have had access to research opportunities. Rubrics and guided questions should be prepared to streamline and homogenize interview processes, and all interviews should be documented with comments available to the admissions committees. Postdoctoral scholars and graduate students can have roles in interview processes provided they receive training and guidance on procedures.
- Bases for decisions, whether admitting or declining a student, should be documented in all cases.
- All individuals participating on admissions committees should complete implicit/unconscious bias training.

Best practices are, by definition, subject to revision and innovation based on changing data, priorities, and societal expectations. A static list from 2021 will be of little lasting value to the Institute, and the committee therefore felt strongly that in lieu of simply recommending that options adopt them, we instead adopt on a mechanism by which a focus on best practices can be built into the system.

The committee understands that options may (thoughtfully) deviate from the recommended best practices. There is a benefit to leaving the ultimate responsibility to the options so that the practices best reflect factors such as the specific field of study, the size and scope of the option, and so on. In their yearly report, options should be prepared, however, to justify practices that differ from the recommended standards.

The graduate dean and CDO should should periodically audit the annual reports on recruitment and admissions provided by the options, and should meet with the president, provost, and division chairs to offer guidance on the efficacy of diversification efforts and the ways in which they can be improved. The graduate dean and CDO's oversight of the admissions process should draw from data on demographics and other metrics such as completion rates, job placement, student satisfaction, and publication rates.

The members of the newly formed GAC, both as a group and individually, would seek counsel from professionals within Caltech's CCID, SFP, and CTLO, and from experts and consultants from outside Caltech. The committee's vision is of a *partnership* among the options, the Graduate Studies Office, and the various offices within the administration that facilitate graduate admissions.

The committee also discussed the status of the Graduate Record Examination (GRE) in Caltech admissions. Many studies have highlighted the lack of correlation between GRE performance and a variety of metrics of student success. Data also clearly supports the conclusion that the GRE is biased against minoritized, first-generation, and low-income students. While this is not debatable, some options feel that the GRE provides a useful metric to compare students from atypical backgrounds. This does not consider the financial burden of taking the GRE, which affects students very differently. Prior to the formation of this committee, all but two options elected to suspend acceptance of GRE scores from applicants for two years, with the GRE optional in the remaining two. While many on the committee felt that the GRE should be abolished in Caltech admissions for more holistic practices, the committee ultimately supported leaving the decision about the GRE to the individual options. With the current experiment underway, forced by the COVID-19 pandemic, we recommend that data and anecdotal experiences from the present admissions cycle be scrutinized to determine any impacts on the experience or outcome of the admissions process, and that decisionmaking around the GRE should become part of the GAC's role.

C. CALTECH CULTURE AND STUDENT QUALITY OF LIFE

The success and diversification of our recruitment efforts is predicated on Caltech being a desirable community for diverse young scholars, both in terms of opportunities for professional growth and in terms of overall quality of life, standard of living, and DEI. For example, decisions on a range of issues from housing to health care to childcare can have significant effects on student satisfaction and recruitment. These issues can be particularly important for women, parents, and for students coming from disadvantaged backgrounds. While this is a broad area requiring continued reflection and action throughout the community, the committee identified several items that we believe merit immediate attention.

Efforts to improve the student experience call on faculty, students, and staff members to commit their time and energy, sometimes at the expense of other activities, including research and teaching. It is essential that the Institute, primarily through the division chairs and executive officers, strive to engage all personnel and to reward those individuals who make sacrifices on behalf of the Caltech community.

Recommendation 7: During the promotion and tenure process, candidates should have the option to provide information on work benefiting DEI at Caltech, particularly in the context of supporting students through recruitment and mentoring. This information should be considered during the promotion and tenure review.

This change to our existing tenure process would emphasize that diversity and inclusion are core values of the Institute. It would provide a mechanism whereby contributions in these areas would be rewarded alongside traditional metrics such as excellence in research and teaching. The committee recognizes that any changes to the tenure process require careful study by the Academic Freedom and Tenure Committee and by the divisions. We encourage a broad discussion on how to best include and evaluate such information in the course of making a tenure decision.

Recommendation 8: The Institute should establish presidential/provostial mentoring awards to recognize at least two faculty each year who are doing excellent work mentoring students, with an emphasis on individuals engaged in promoting DEI through these efforts.

These awards should contain a financial incentive, preferably in the form of discretionary funds, and should be promoted at the same level as the Feynman Teaching Prize. The awards would thus serve to further emphasize Caltech's institutional commitment to student success and diversity, and recognize individuals who contribute to that goal.

Recommendation 9: Each option (or group of smaller options) should nominate faculty—and optionally staff, postdocs, and graduate students—as DEI liaisons.

The DEI liaisons would serve as focal points for students, faculty, and staff to raise and discuss issues impacting their educational/work climate (and, for students, off-campus climate). The Institute should offer training and support for these liaisons and, likewise, the liaisons should coordinate with the undergraduate and graduate deans and the Institute CDO in order to address climate issues within their options. The DEI liaisons would also serve as option-specific contacts for the CDO, the CCID, and other offices on campus seeking to improve the culture. Some options have DEI committees for this purpose, and such committees may serve as a model for the liaison role.

Many graduate students lack relationships with faculty beyond their immediate thesis adviser, and this deprives them of an important resource for professional growth and a needed outlet to discuss and address issues relating to academic progress and their relationship with the primary adviser.

Recommendation 10: Options should evaluate their existing advising structure and formalize mentoring relationships beyond the primary adviser.

One possibility is the assignment of a secondary adviser who would meet regularly with their advisees to discuss coursework, research progress, and professional growth. The secondary adviser could be the chair of the thesis committee or another faculty member. Some options designate an academic adviser separate from the thesis adviser. Options should feel free to come up with a structure that best suits their field or department and to share ideas and initiatives with their colleagues.

A final area of investigation and discussion for our committee was the cohesion of the cohort of first-year graduate students (“G1s”). There are many models for introducing students to the different academic programs at Caltech. These range, at two extremes, from options that admit students directly into research groups and options that admit a pool of “free agents” who rotate through different groups in the first year and select a permanent adviser typically in the spring of that year. Most options use some blend of these two approaches. The former structure can be deleterious to diversity, as it requires that students pre-identify specific research interests and this, in turn, typically requires students to be plumbed into the traditional pipelines. On the other hand, some options see admitting generally talented students without regard to their ultimate distribution into groups as risky and likely to lead to shortages of students in some areas and surpluses in others. *The committee did not formalize these concerns into a specific recommendation, but we encourage options to be aware that there can be a competition between achieving a diverse student body and efficiently distributing students to groups. We also encourage options to consider how their current practices affect DEI efforts in their programs.*

Similarly, some options at Caltech are at a disadvantage compared to our peers because we (mostly) lack terminal MS programs that can serve as in-house recruiting pools for PhD

students. With a large MS program, some hypothesize that it would be easier to enhance diversity and thus provide a new pipeline for the PhD programs. This indeed may be tractable in certain options where the MS degree is associated with professional practice and not solely as a path to a PhD. However, the committee also believes that Caltech can and will succeed at attracting diverse PhD students without imposing such a radical change. (The committee is also aware that the graduate student body has trended larger in the past decade and that further growth would present logistical and potentially significant financial impacts on the Institute as a whole). Alternatives such as bridge or post-baccalaureate programs could also be considered as tools for preparing students to come to Caltech.

In addition to encouraging options to evaluate the culture around their first-year cohorts, the committee saw value in creating Institute-wide cohort-building courses such as a “Graduate School Skills” course for G1 students. It has been shown that URM and women students deal disproportionately with imposter syndrome and a feeling of not belonging, and students from disadvantaged or nontraditional backgrounds may lack understanding of the implicit expectations of graduate schools. Courses and mentoring could be organized around the Graduate Summer Research Institute (GSRI) model, where a variety of skills relevant to being in graduate school— including technical writing, presenting, how to apply to and network at conferences, and psychological coping mechanisms—are taught. This would also create a collective feeling of support and excitement among students that would extend beyond the classroom and follow them throughout their time at Caltech. This would result in cohorts that intrinsically have a broader sense of community.

D. COMMUNICATIONS

Caltech has a strong brand centered around excellence in research and education. Our visibility within the international scientific research community is outstanding, but within the broader culture, we are not as visible as key peer institutions like Harvard and Stanford, and are still less so within minoritized, immigrant, and poorer communities. Not only does this narrow our applicant pool, but it can also influence the decisionmaking of students who are selecting from multiple admissions offers.

From the point of view of recruiting graduate students, we need to better train individual faculty and options to home in on messages that resonate with prospective students and avoid tropes that can be misinterpreted. The admissions/DEI websites (recommendation 4) and DEI liaisons (recommendation 9) would provide two important mechanisms for options to become better informed about how to communicate with students from diverse communities.

When viewed through the lens of recruitment, we must be certain that Institute documents—including the catalog, websites, and memos—be vetted (critiqued/edited) by individuals with expertise in communicating with diverse audiences. In many cases, Institute documents have evolved over many years and may contain fragments and code words that are not reflective of the current climate or the one to which we aspire.

Recommendation 11: The Institute should undertake a systematic review of all important documents and websites for inclusive language, and all official Institute communications to the community should be reviewed by the CDO.

While the review of existing documents and websites would be an extensive task, we suggest that it can be streamlined by performing an analysis to prioritize those pages and documents most likely to be encountered by prospective students. The committee wants to emphasize, however, that this work is worthwhile. Taking the time to change official language will allow the Institute to communicate with the public in a way that better reflects its commitment to diversity, equity, and inclusion.

Appendices

Appendix A

Committee Formation and Charge

From: Thomas F. Rosenbaum
Subject: Advisory Committee on Student Admissions and Recruitment
Date: September 4, 2020 at 4:16:39 PM PDT

Dear All:

Thank you for agreeing to serve on the Advisory Committee on Student Admissions and Recruitment, with a special thanks to Prof. Tim Colonius for agreeing to chair the effort and Jennifer Torres (Office of Strategy Implementation) for agreeing to staff the committee. This is an area to which each of you has given considerable thought. I believe that we have a timely opportunity to examine how we can amplify Caltech's efforts to identify and then attract the best and brightest candidates from every background and perspective.

The focus of the committee should be on graduate admissions with its special challenges of decentralized processes across the options. Having said that, I hope that lessons learned both can be drawn from and applied to undergraduate admissions and faculty recruitment. Among the questions I should appreciate you addressing are:

1. What are best practices in student admissions both at Caltech and at other institutions?
2. What is the appropriate balance between prerogatives vested in the options and expectations set centrally?
3. How can we leverage Institute strengths to be more successful in recruitment, especially among racially minoritized populations?

The committee should, of course, feel free to identify and address other issues that it feels are meaningful to the discussion.

I should like to receive a report from the committee by February 2021. The report need not be lengthy; bullet points are perfectly acceptable. I will plan to meet with the committee in person to discuss the report and believe it would be useful for committee members to present their conclusions to the IACC and the Faculty Board.

The members of the Committee include faculty members representing each division, Institute staff, and students:

Prof. Michael Alvarez (HSS)

Jennifer Blankenship (Options Manager, Applied Physics & Materials Science)

Prof. David Chan (at-large)
Prof. Bil Clemons (CCE)
Prof. Tim Colonius (EAS, Chair)
Prof. Bethany Ehlmann (GPS)
Prof. Kata Fejes-Toth (BBE)
Natalie Gilmore (Asst. Dean of Graduate Studies)
Prof. Matilde Marcolli (PMA)
Daniel Mukasa (graduate student)
Newton Nguyen (graduate student)
Diego Olaya (undergraduate student)
Jarrid Whitney (Asst. VP for Student Affairs, Enrollment and Career Services)

I look forward to working with you.

With only the best,

Tom

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Thomas F. Rosenbaum
President
Sonja and William Davidow Presidential Chair and Professor of Physics
California Institute of Technology

Appendix B

Existing Processes and Resources

To understand current recruitment and admissions processes and practices across divisions and options, committee member Jennifer Blankenship, options manager for applied physics and materials science, conducted a series of interviews with option managers. As expected, processes vary widely, and broad conclusions proved difficult to draw. Nonetheless, interviews yielded insights in six key areas: soliciting applications/candidate identification; review of applications; rotations: CollegeNET; women and underrepresented applicants; and post-admit contact.

Soliciting Applications/Candidate Identification: This is a universal weak spot and perhaps an area of opportunity for Caltech to become more broadly known as a graduate school destination, especially for URM applicants. A few departments send representatives to specific conferences related to their research fields and a few ask faculty to contact colleagues at other schools, but there is no centralized (or even decentralized effort). One option, neurobiology, reported some use of ads and social media. FUTURE (for women in physics) and FUTURE Ignited (for URM) were cited as making a difference in applications and admits this year, so campus-wide expansion of these programs should be considered.

Review of Applications: About 70% of departments ensure every application is reviewed by at least two readers. The majority of departments are admitting a cohort of students rather than allowing faculty to hand select admits, which is in line with DEI best practices. Most departments are interviewing students ahead of admission, again a DEI best practice. Most departments and options use scoring and ranking systems to evaluate applicants; however, criteria vary and are often at the discretion of individual reviewers/faculty members. Only one department reported using a rubric for scoring.

Rotations: No consensus. Some departments require rotations; others have no program at all. Funding a summer rotation ahead of fall courses could help URM students acclimate.

CollegeNET: There is some frustration with CollegeNET among faculty and administrators. Among the concerns raised were: speed with which data is refreshed on the screen; the need for many clicks to generate simple outputs such as a PDF of the application; complicated report-building; issues with using the rating system with limited scoring; difficulty with seeing who has reviewed or even been assigned to an application. CollegeNET training is offered every year. Additionally, perhaps a small group of faculty/administrators could work with the Graduate Office to improve and refine CollegeNET systems.

URM/Women Applicants: Only some departments have completed unconscious bias training, but all who did found it useful. All departments report ensuring that women and URM applicants receive adequate review, including through additional readers and discussion at admissions meetings. Two divisions reported using “sign-on” bonuses in limited instances as recruiting tools for women and underrepresented applicants.

Post-admit Contact: Varying amounts of tracking exist for this process, but most departments do continue to recruit after visiting days. Some departments have formalized this process and assign faculty to contact each admitted student. In some departments, current graduate students also are involved in yield efforts. For example, in BBE, a big sib/little sib program pairs new students with continuing graduate students to assist in recruiting and answering questions, and, eventually, to help new students transition into the graduate program.

Final Thoughts: The organized sharing of admissions practices may help generate ideas and formulate best practices, especially with regard to URM applicants. In many cases, individual options are not aware of how other options/divisions approach the process.

Appendix C

Committee Meetings

Detailed minutes and presentation materials from the committee's meetings are available upon request to the committee chair. This section summarizes the process and meetings undertaken by the committee.

Following four informal agenda-setting meetings, the Advisory Committee on Student Admissions and Recruitment convened for nine formal meetings between November 2020 and February 2021.

Five initial meetings represented an information-gathering stage in which the committee examined individual facets of admissions and recruitment that had been identified in the agenda-setting process. During 90-minute sessions, invited presenters (two of whom were members of the committee) offered perspectives on challenges and potential opportunities while also providing an overview of existing processes and relevant data and metrics. Open discussion among the full committee followed. Sessions focused on:

- Existing diversity, equity, and inclusion efforts at Caltech and their leadership. Presenter: Bil Clemons, member of the committee and chair of the President's Diversity Council.
- Data, including graduate student demographics and Institute efforts around data collection and dissemination. Presenter: Lindsey Malcom-Piqueux, assistant vice president for diversity, equity, inclusion, and assessment. (At the time of her presentation, Dr. Malcom-Piqueux's title was chief institutional research officer.)
- Undergraduate admissions process and successful strategies for improving diversity in admissions. Presenter: Jarrid Whitney, member of the committee and assistant vice president for student affairs, enrollment, and career services.
- Graduate admissions process, including reflection on opportunities for improvement. Presenter: Doug Rees, former dean of graduate studies.
- Effective messaging and outreach to prospective graduate students from underrepresented communities. Presenter: Hanna Song, senior director for inclusion and diversity (Dr. Song has since left the Institute).

As part of the information-gathering stage, we also spoke with a variety of Caltech faculty, students, and staff, as well as colleagues at peer institutions. We examined and collected reports and documents that included demographic data on graduate student applicants and matriculants; information on the graduate admissions process and how it varies across divisions and options; examples of best or promising practices currently implemented by individual divisions or options; and tools used to support diversity and inclusion in undergraduate admissions.

Based on discussions and data presented at the information-gathering stage, the committee chair identified and outlined a preliminary list of recommendations. Over the course of four 90-minute meetings, the committee refined, elaborated on, and prioritized the action items on that list to arrive at a final set of recommendations.

Appendix D

Resources

1. Recruiting. Activities of the Graduate Studies Office include:

- a. Recruitment at DEI STEM student conferences and through partnership programs including: AISES, SHPE, Tapia, NOBCCHE, SACNAS, SWE, Grace Hopper, California Diversity Conference, McNair, etc.
- b. Utilizing the NNE (National Name Exchange) to encourage students to apply to Caltech
- c. Fee waivers for all students who we meet at conferences and partner programs
- d. Coordinating nomination, selection, and notification processes for the Presidential Graduate Fellowships
- e. Providing graduate admissions info sessions and hosting lab tours for various organizations/groups
- f. California Alliance for the Graduate Education and the Professoriate (AGEP; Doug Rees was PI)

2. CTLO Educational Outreach Initiatives. The Caltech Center for Teaching, Learning, and Outreach (CTLO) runs a wide variety of programs that connect our graduate students with local K–12 teachers and students in schools serving populations largely underrepresented in STEM fields. Educational outreach opportunities specifically for Caltech graduate students include:

- a. *Visiting Scientists*: Grad students teach hands-on science lessons weekly or biweekly at a local elementary school
- b. *Classroom Presentations*: Grad students engage with K–12 students at local schools on current research and cutting-edge science
- c. *Teacher Professional Development*: Grad students work with local STEM teachers on curriculum development
- d. *Science Nights*: Grad students lead active demonstrations at local school science nights and community events
- e. *Solar Energy Activity Lab (SEAL)*: Grad students mentor high school clubs developing techniques to convert sunlight to consumable energy
- f. *Summer Research Connection*: Grad students mentor high school students and teachers working on summer research projects in labs and research groups campuswide

In addition to these efforts, Caltech offers several open online courses or MOOCs that could reach current undergraduates with potential interest in graduate studies at Caltech, providing exposure to Caltech faculty and areas of specialization. These noncredit courses are listed at online.caltech.edu and include:

- a. Getting Started with Cryo-EM, Grant Jensen, Coursera platform
- b. Science of the Solar System, Mike Brown, Coursera platform
- c. The Evolving Universe, George Djorgovski, Coursera platform
- d. Pricing Options with Mathematical Models, Jaks Cvitanic, edX platform
- e. Quantum Cryptography, Thomas Vidick, edX platform
- f. Principles of Economics with Calculus, Antonio Rangel, edX platform
- g. Vibrations and Waves, Frank Porter, Caltech-hosted
- h. Learning from Data, Yaser Abu-Mostafa, Caltech-hosted
- i. Circuits and Systems, Ali Hajimiri, Caltech-hosted
- j. Analog Circuit Design, Ali Hajimiri, Caltech-hosted

3. DEI programs at Caltech

- a. **Freshman Summer Research Institute (FSRI)**: a comprehensive program of orientation and academic support designed to ease the transition from high school to college while building a strong research foundation.
- b. **FUTURE Ignited** and **FUTURE Ignited CCE**: a conference designed to boost the number of students of color who pursue graduate studies in science and engineering.
- c. **Graduate Summer Research Institute (GSRI)**: a comprehensive program of orientation, academic support, and professional development designed to ease the transition into Caltech's graduate programs.
- d. **Research University Alliance (RUA)**: a program, formerly the California Alliance for Graduate Education and the Professoriate (AGEP), designed to increase diversity in academic fields with the greatest national underrepresentation of minorities: mathematical, physical, and computer sciences and engineering.
- e. Scholarships and Fellowships
 - i. **Curated list of external scholarships from Caltech Financial Aid**
 - ii. **External fellowships for underrepresented groups from the Caltech Graduate Studies Office**
 - iii. **Amgen Scholars**: a national program aimed at increasing research opportunities for students committed to pursuing careers in the sciences. Caltech is committed to providing research opportunities to students traditionally underrepresented in STEM fields and to those who attend schools where undergraduate research is limited.

- iv. **Base 11 Program**: a program that connects high-achieving, underrepresented students from community colleges throughout the country with top research institutions like Caltech.
 - v. **Mellon Mays Undergraduate Fellowship (MMUF)**: a prestigious national program focused on increasing the number of underrepresented students who will pursue doctoral degrees in core fields in the arts and sciences. Fellowships include mentoring, research stipends, and travel support.
 - vi. **Questbridge**: a national nonprofit that offers scholarships for first-generation and low-income students.
 - vii. **WAVE Fellows**: a Caltech program that aims to foster diversity by increasing the participation of underrepresented students in science and engineering PhD programs and making Caltech's programs more visible and accessible to students not typically exposed to Caltech.
- f. **Awards**
- i. Dr. James King Jr. Award: recognizes individuals who stand out as strong supporters of diversity within the Caltech student body
 - ii. Dr. Fred Shair Award for Programming: recognizes individuals who stand out as strong supporters of programs that increase the diversity and pluralism in practice at Caltech
 - iii. Women Mentoring Women Candace Rypisi Outstanding Mentor Award
 - iv. Women Mentoring Women Helen McBride Outstanding Mentee Award
 - v. **Chen Institute Diversity and Inclusion Award**: recognizes graduate students and postdoctoral scholars in neuroscience at Caltech for the uncompensated time and effort they are dedicating to achieve diversity and inclusion at Caltech and/or the wider community and in STEM education
 - vi. **Kavli Nanoscience Institute (KNI) Catalyst Awards**: recognizes and highlights researchers in the KNI community who demonstrate efforts to support and promote diversity, equity, and inclusion at Caltech or within the broader scientific community
 - g. Other funding: The **Moore-Hufstedler Fund** supports large-scale student-related projects that have not been sufficiently funded by other sources.

4. Other influential information

- a. Julie Posselt's two books: *Inside Graduate Admissions: Merit, Diversity, and Faculty Gatekeeping*, Harvard University Press (2016), and *Equity in Science: Representation, Culture, and the Dynamics of Change in Graduate Education*, Stanford University Press, 2020

- b. Interview with Lee Brown: <http://oralhistories.library.caltech.edu/171/1/Browne%2CL.OHO.pdf>
- c. *The Diversity Bonus: How Great Teams Pay Off in the Knowledge Economy* by Scott E. Page, Princeton University Press (2018)
- d. *Measuring Non-Cognitive Variables: Improving Admissions, Success, and Retention for Underrepresented Students* by William E. Sedlacek, Stylus Publishing (2017)
- e. *Holistic Admissions: Predicting the Likelihood for Student Success* by Michele Sandlin and William Sedlacek, American Association of Collegiate Registrars and Admissions Officers (2020)
- f. *Structure and belonging: Pathways to success for underrepresented minority and women PhD students in STEM fields* by Aaron J. Fisher, Rodolfo Mendoza-Denton, Colette Patt, Ira Young, Andrew Eppig, Robin L. Garrell, Douglas C. Rees, Tenea W. Nelson, and Mark A. Richards. PLoS ONE, 2019
- g. *Typical physics PhD admissions criteria limit access to underrepresented groups but fail to predict doctoral completion* by Miller, CW; Zwickl, BM; Posselt, JR; Silvestrini, RT; and Hodapp, T. Science Advances, 2019
- h. Why Caltech Astro should remove the PGRE as an admissions requirement by Mia de los Reyes
- i. *Multi-institutional study of GRE scores as predictors of STEM PhD degree completion: GRE gets a low mark* by Petersen, SL; Erenrich, ES; Levine, DL; and Vigoreaux, J; Gile, K. PLoS ONE, 2018
- j. *A test that fails: A standard test for admission to graduate school misses potential winners* by Miller, C. and Stassun, K. Nature, 2014