

Report of the
Joint Administrative/Senate Task Force
on the Academic Organization of UC Davis

Submitted to Provost and Executive Vice Chancellor Ralph Hexter
and Academic Senate Chair Bruno Nachtergaele

February 3, 2014

UCDAVIS

CONTENTS

Executive Summary	2
Background	3
Summary of MPS's Request, Problem Statement, Justification	4
Identification and Consideration of Matters of Concern in Various College Structure Scenarios	5
Research	5
Shared Governance	10
Undergraduate Experience	11
Undergraduate Advising	13
Communications and Development	14
Graduate Education	15
Conclusion	16
Appendices	18
o Appendix A: MPS Steering Committee discussion regarding the Academic Organization of UC Davis: Special Committee on MPS Positioning	
o Appendix B: Task Force Membership	
o Appendix C: Task Force Meeting Dates and Topics	
o Appendix D: SCENARIO: College of Natural Sciences	
o Appendix E: Organizational Options for HArCS and SS if MPS Becomes an Independent College	
o Appendix F: L&S Faculty Personnel Committee Structure	
o Appendix G: College of Letters and Science Subcommittees: Divisional Steering Committee	
o Appendix H: L&S Pathway Analysis	

EXECUTIVE SUMMARY

In 2012 the Division of Mathematics and Physical Sciences (MPS) recommended that MPS be established as a separate college, distinct from the College of Letter and Science (L&S), in order to improve the division's effectiveness, competitiveness, and synergy with other campus units. In May 2013 a joint Academic Senate/Provost Task Force on the Academic Organization of UC Davis was formed to review the recommendation. The task force considered a range of organizational scenarios including separating the L&S divisions into three colleges; reconfiguring the colleges into new college structures; and addressing problems within the existing structure. The potential impacts of these scenarios were considered on six major areas of concern: research, shared governance, undergraduate experience, undergraduate advising, communication and development, and graduate education.

This process began with the argument that changing the college structure of MPS would ameliorate problems within the division. By considering evidence from a number of angles, the task force has determined that the single change of moving to a separate college rather than a divisional structure will not in itself, without new resources and approaches, solve the problems that inspired MPS faculty to pursue college status. These problems face all three divisions in L&S, though some weigh more heavily on MPS.

The task force urges the provost and senate initially to seek solutions within L&S and the campus at large. This, however, is not to say that there is no value in considering alternative college structures for the divisions within or beyond L&S, especially if the current challenges cannot ultimately be solved within the college. Given the importance of academic configurations and the difficulty of changing them once established, imagining new college structures should consider large opportunities rather than focusing exclusively on current problems. This will enable us to establish college structures that add capacity to our faculty and our students and ultimately the public.

BACKGROUND

In May of 2013 the joint Academic Senate/Provost Task Force on the Academic Organization of UC Davis was formed to consider the recommendation by the Division of Mathematics and Physical Sciences (MPS) faculty to establish MPS as a separate college (See Appendix A). Currently, MPS is one of three divisions under the larger College of Letters and Sciences (L&S) along with the Divisions of Social Sciences (SS) and Humanities, Arts and Cultural Studies (HArCS).

A call for nominations for the task force was circulated to the entire university community. Members were selected jointly by the senate and the administration to ensure that the group would benefit from cross-campus knowledge and disciplinary diversity, have sufficient representation from within L&S, and include staff, students, and faculty. Carolyn de la Peña, Interim Vice Provost for Undergraduate Education and André Knoesen, Vice Chair of the Academic Senate co-chaired the task force. The task force membership list can be viewed in Appendix B.

The committee's charge was "*to consider the impact (positive and negative) of different scenarios of what might occur within the academic organization of UC Davis. These could include, but are not limited to, keeping things as they are now, having five separate undergraduate colleges at UC Davis (CBS, MPS, L&S, COE, CA&ES), having six separate undergraduate colleges (adding HArCS and SS), creating a new college of natural sciences (combining elements of CBS and MPS). The committee will identify different options, assess the impact on our students, and provide findings that will fuel an informed response to MPS's request. To restate: understanding full well that any formal proposal to evolve one or more divisions of L&S into self-standing colleges will require a formal process by and within the Academic Senate, the charge of the task force is to think broadly about the question and reflect on it above the level of a single division or college, delivering an analysis that enables the best decision to be made. This committee will not determine the fate of MPS or cause changes to be made to any of the current colleges or divisions of UC Davis.*" Therefore, the end goal was not to deliver an answer or recommendation as to whether MPS should leave or stay within L&S. Rather the task force sought to think through the benefits and costs of this option, especially to undergraduate students.

The task force's aim was to provide multiple road maps with data and analysis for academic configurations that faculty may want to pursue, so that whatever path is ultimately taken we can be assured that a careful decision has been made. We have been keenly aware throughout the process that the path the campus chooses will have significant and lasting impact. Our explorations showed that problems immediately visible may be more complex than they seem. Other problems and concerns may not as easily come into view. By analyzing MPS's request and its possible consequences from multiple angles, the task force hoped to provide foundational information so that whatever steps taken to enhance academic configuration at UC Davis truly solve problems and enhance capacities in a manner that is sustainable.

The task force met six times across fall quarter with a final meeting in January. Data were provided by several reports from MPS, presentations and data from the HArCS and SS steering committees, presentations from the three L&S deans, two associate deans, Budget and Institutional Analysis and the iAMSTEM Hub, as well as individual members of the committee who were charged with additional research tasks. Meeting topics and times can be found in Appendix C.

In the course of its discussions, the task force considered four scenarios.

1. Four-college model: SS and HArCS form separate colleges, resulting in four colleges serving SS, HArCS, MPS and CBS
2. Three-college model: SS and HArCS form a single college, and MPS and CBS exist separately
3. Two-college model: A College of Natural Science is established that would combine the CBS and MPS. For this exercise, it may be assumed that SS and HArCS form a single college
4. L&S model: Problems and deficiencies are addressed while the current L&S structure is retained.

To identify the main issues that should drive decisions to reorganize colleges, the task force explored possible configurations that might occur within L&S as well as between L&S and other colleges. Appendices are provided at the end of the report to consider more fully the College of Natural Science concept as well as HArCS and SS as combined, separate, and with a distinct College of Arts. It should be emphasized that these thought experiments were performed not to suggest that any of these options is more valid than others, or that there are sufficient data to effectively assess the real risks and advantages of such organizational structures. By keeping the emergent issues at the forefront of our analysis and exploring how they are impacted by different scenarios, the task force hopes to focus on solving the real challenges that exist in L&S.

SUMMARY OF MPS'S REQUEST, PROBLEM STATEMENT, JUSTIFICATION

On May 27, 2010, the Washington Advisory Group found, in its report on the effectiveness and potential of MPS, that “*departments in MPS have the know-how to rise, but not [the] resources. They are historically underfunded and held back—viewed as service to other units that have teaching and research agendas.*” MPS Dean Ko initiated an inter-division conversation on how to improve the MPS division during which alternative academic organization configurations were considered. According to one of the early reports, the initial inquiry into reorganization was driven by the desire to improve MPS in five areas:

1. the effectiveness of the division's delivery of core functions
2. the competitiveness of MPS programs for national prominence
3. the division's synergy with other campus units
4. the division's preparedness for dynamic change
5. the faculty's participation in a conversation about MPS's future

The final MPS report that served as the impetus for convening this task force identified four major problems that the authors felt would be improved by locating MPS outside of L&S and into a separate college. These include:

1. The MPS report's conclusion that the college's shared committee structure prevents MPS needs from being met quickly and with local knowledge. The MPS report specifically points out that “*there would be advantages in making MPS a separate college with its own committees, particularly its own Executive Committee*” and asserts that their personnel process and courses would be more appropriately and effectively overseen by an MPS college set of committees rather than the current L&S college committee structure;
2. Some MPS members believe the current college structure prevents MPS from realizing its research funding potential and its faculty from engaging in the most appropriate research

collaborations. MPS by its own estimate generates 65% of L&S's research dollars, and the dollar amount has increased 47% over the last five years. The MPS Special Committee on MPS Positioning's Additional Recommendations to Dean Ko dated February 13, 2012 asserts that as in the College of Biological Sciences and College of Engineering, resources could be identified to help faculty compete for large extramural grants and training grants more effectively within a separate college structure. The MPS report also argues that cross-college research collaborations would be more easily facilitated by MPS faculty were they not organized as a division within L&S with a high teaching and administrative load as a "service" division;

3. Some MPS members think that the current system of shared advising prevents MPS students from receiving information specific to their needs; and
4. Some believe the current shared development staff does not spend sufficient energy targeting potential MPS donors.

It is important to note that L&S has historically provided a large number of shared services within its Academic Senate and administrative functions. These include the college's executive committee and division-specific Committee on Academic Personnel (CAP) sub-committees for promotion and tenure, courses, college computing, undergraduate advising, and college/relations and development. In considering the efficacy of a separate MPS college, it is crucial to examine simultaneously whether current shared services are meeting one (or perhaps more) of the divisions' needs, and the relationship between this discrete set of concerns and the overall request for divisional independence. Without this, steps might be taken to disaggregate a college without first attempting to fix what is broken within it.

IDENTIFICATION AND CONSIDERATION OF MATTERS OF CONCERN

Our goal in the task force process was to take MPS's concerns as a starting point, and to work outwards ensuring that we were looking at the issues from the broadest possible perspective. This led us to identify the following matters of concern for exploration:

- Research
- Shared Governance
- Undergraduate Experience
- Undergraduate Advising
- Communication and Development
- Graduate Education

Research

Possible concerns related to MPS research can be placed into three categories: collaboration, infrastructure and instructional teaching load of ladder rank faculty.

Collaboration. The last two decades have shown that grand challenge research problems evolve dynamically and require diverse and ever changing intellectual disciplinary expertise. Fortunately, UC Davis is inherently well suited to respond to this challenge since it has the capability and reputation for delivering excellent interdisciplinary education programs through the large number of active graduate groups on our campus. The federal research budget shows significant funding opportunities

at the interfaces between physical sciences and biological sciences, physical sciences and engineering, and physical sciences with other disciplines such as medicine and environmental science. Therefore encouraging and supporting interdisciplinary research engagements between MPS faculty and these disciplines clearly has the potential to advance and support research fields on our campus which are important to the nation.

There appear to be no active barriers to interdisciplinary collaboration among faculty. Graduate groups and organized research units (ORUs) help foster such collaboration. The MPS faculty view the interactions between their five departments as highly interdisciplinary and collaborative, with current collaborations spanning, it appears, all UC Davis colleges and schools. More broadly within the task force the question was raised whether college structures position UC Davis to lead very large centers and program projects such as those funded by federal agencies. The questions that must be answered are: to what extent do college structures impact, either positively or negatively, the intellectual connection and collaborative potential across different disciplines? Is the current L&S divisional arrangement of SS, HArCS and MPS optimal from this perspective? Will a change in college organization provide the opportunity to improve matters?

Infrastructure. Some faculty raise concerns that the MPS division may not be receiving sufficient infrastructural support to enable it to reach its Top-20 departmental ranking aspirations. The division draws in well over half (MPS estimate is 67%) of L&S's research funds.

It is clear that currently the MPS division has significantly fewer senior administrative positions (e.g. associate or assistant deans) compared to 'standalone' colleges such as CBS or College of Engineering (CoE). Does the current structure provide appropriate levels of support for MPS faculty to develop competitive research partnerships and proposals? It is clear that the campus as a whole, and MPS specifically, has an urgent need for significant investment in research infrastructure: buildings, laboratories, and equipment. The question here is, if MPS were to separate from the rest of L&S, would these issues be better addressed (or addressed more rapidly and completely)? Given the rapid and proactive changes that are being implemented by the Office of Research to improve research support on the campus as a whole, it was not possible for the task force to reach a definitive conclusion on the relative level of research support that exists in MPS in comparison, for example, to CBS or CoE. However, if the current approach results in an inferior level of support for faculty in MPS disciplines, then rectifying this approach is a high priority.

Instructional teaching load of ladder rank faculty. The MPS report states that MPS has a student credit hour load equivalent to 19% of the campus total, and it is certainly correct that

- MPS has higher Student Credit Hours (SCH)/FTE numbers than other colleges/divisions
- Chemistry has the highest SCH/FTE within MPS
- Chemistry as a department teaches about 7% of total SCH (28,648/388,029) on the campus.

The task force's concern was to determine whether there are uneven instructional teaching assignments among colleges and divisions that adversely impact ladder rank faculty's ability to fund and conduct their research. In other words, is there a disproportional instructional teaching load on MPS ladder rank faculty? If that is the case, then the root cause most likely correlates with the MPS faculty being situated within L&S. In order to answer this question, the task force performed a

limited study to determine how much effort is expended by ladder faculty in teaching in the classroom.

[Workload by Academic Rank](#) for the Academic Year 2012-2013 tabulates SCH,¹ Full-Time Equivalent Student (FTES)² and Instructional Full Time Equivalent (IFTE).³ It calculates FTES, IFTE and its ratios for ladder faculty by rank and other instructors by instructor type in each college/division and then also, specifically, for departments in L&S and CBS. From these data Table 1 summarizes, by college/division, the lower division/total undergraduate SCH, the graduate/total undergraduate SCH and the percent SCH taught by ladder faculty (which includes lecturers with security of employment). HARCS and MPS have the lowest percentage of total SCH that is ladder taught, because they rely heavily on non-ladder instructors to teach lower division courses.

Table 1: Academic Year 2012-2013: Instructional teaching workload distribution

	Lower division/ total undergrad SCH	Grad/ Total SCH	% Total SCH Ladder Taught:
Engineering	39%	26%	86%
Agricultural and Environmental Sciences	40%	16%	72%
Biological Sciences	37%	8%	73%
Humanities, Arts, Cultural Studies	58%	6%	46%
Mathematics and Physical Sciences	75%	8%	50%
Social Sciences	39%	7%	65%

¹The task force knows that the magnitude of SCH is a blunt instrument to quantify instructional teaching load. SCH fails to quantify variations in the intensity of instructional effort required across courses. For example, in some courses in the HARCS disciplines such as music theory, high-quality instruction requires time-intensive teacher-student interactions. Courses with such intensity of effort per assigned SCH is observed across the campus, such as advanced mathematics (MPS), undergraduate student theses (SS and elsewhere), and senior design classes (CoE). For the purposes of this study, however, SCH does quantify general instructional teaching load trends, and becomes more precise when like disciplines, such as MPS and CBS, are compared.

² Full-Time Equivalent Student (FTES): A measurement of instructional workload that is derived from the number of student credit hours (SCH) taught:

- A. Undergraduate FTES: the average number of SCH taught in undergraduate courses each quarter, divided by 15 units per full time undergraduate (or, alternatively, the total undergraduate course SCH taught in the year divided by 45 units per full time undergraduate) OR
- B. Graduate FTES: the average number of SCH taught in graduate level classes each quarter, divided by 12 units per full time graduate student (or, alternatively, the total graduate course SCH taught in the year divided by 36 units per full time graduate student).

³ Instructional Full Time Equivalent (IFTE): The three quarter average of full time equivalent instructors who are on the payroll and available to teach. Temporary instructors and "associate in" graduate students are included, but faculty on non-resident sabbatical leave, empty faculty positions, unpaid emeriti, and graduate students in teaching assistant classifications are excluded. Only Instruction and Research (I&R) appointments are counted; appointments in the Agricultural Experiment Station (AES) or in other Organized Research Units (ORUs), and academic administrator positions are excluded.

Table 2 breaks down the teaching load by college/division by tabulating the FTES to IFTE ratio of ladder rank faculty rounded to closest integer. By this measure the MPS instructional teaching load of ladder rank faculty is higher than that of HARCS, but lower than those of SS and CBS⁴. Considering the complication of AES FTE on calculating instructional workloads (see footnote 3), it seems fair to say that the MPS and CBS ladder rank faculty hold roughly comparable teaching loads.

Table 2: Academic Year 2012-2013: FTES/ IFTE ratios by college⁵

Academic Year 2012-2013:	FTES/IFTE for ladder rank faculty and SOE lecturers	FTES/IFTE for ladder rank faculty, excluding SOE lecturers	Total FTES/IFTE for all instructional titles
Engineering	16	16	18
Agricultural and Environmental Sciences	25	24	30
Biological Sciences	23	23	29
Humanities, Arts, Cultural Studies	13	13	16
Mathematics and Physical Sciences	20	20	32
Social Sciences	23	23	29

Table 3 further breaks down the teaching load of ladder rank faculty by departments in MPS and CBS. Within MPS the ladder faculty in Statistics have the largest teaching load (comparable to Plant Biology),⁶ second is Chemistry and Mathematics (comparable to Evolution & Ecology and Microbiology), and third is Physics and Earth & Planetary Sciences.

⁴The teaching load ratios for ladder faculty in the College of Biological Sciences and the College of Agricultural and Environmental Sciences are computed as required by the Office of the President and therefore do not count in the denominator the share of faculty FTE in Agricultural Experiment Station (AES) appointments.

Approximately half of the faculty members in the College of Biological Sciences (CBS) hold small Agricultural Experiment Station (AES) appointments (18%). The methodology employed here counts the instructional FTE of these faculty as 0.82 FTE. The College of Biological Sciences, however, advises that it would be more appropriate to count the CBS instructional FTE of its faculty as 1.0 FTE, because they are required to carry a full-time instructional load during the academic year (F, W, Sp quarters). If the teaching load ratios for the College of Biological Science were to be recomputed in this fashion, they would be less than the ratios shown in this document by a factor of about 10%.

College of Agricultural and Environmental Sciences faculty have a much larger AES appointment than CBS faculty. CA&ES faculty have a 48% AES appointment on average. The College of Agricultural and Environmental Sciences advises that a definite commitment to Agricultural Experiment Station mission oriented research is expected for that 48% AES FTE, all year long—and therefore, that only the I&R FTE should be used for teaching workload ratio calculations for CA&ES faculty.

⁵ There exists a relatively small number of FTES (83 out of a college-wide total of 1,935) in CBS courses that cannot be attributed by faculty pay status to a general campus I&R (instruction and research) unit. This relates to teaching performed by health sciences faculty (SOM and SVM—or faculty with split appointments in a general campus or health science department), faculty on sabbatical or without salary (not counted by the “faculty available to teach” algorithm), and faculty paid on an account that is not recognized as an I&R account. These FTES are credited by default to CBS college wide, but cannot be attributed to a particular department. If the CBS pay workload ratio was recomputed with these FTES withheld, it would be 22 instead of 23.

⁶ In the majority of colleges/divisions assistant professors’ instructional teaching load is comparable and in many cases kept intentionally lower than other professorial ranks. The data for Statistics indicates that in 2012-2013 the FTES/IFTE ratio of 26, 33 and 49 for professor, associate professor and assistant professor, and points to a

Table 3: Academic Year 2012-2013: FTES/ IFTE in MPS and CBS by departments

Academic Year 2012-2013		Total FTES: Ladder Titles & Lect SOE	Total FTES: for all instructional titles	FTES/IFTE for ladder rank faculty and SOE lecturers	FTES/IFTE for all instructional titles
MPS:	Chemistry	835	1958	23	23
	Earth & Planetary Sciences	252	342	15	12
	Mathematics	787	1573	22	22
	Physics	509	1071	15	14
	Statistics	451	661	32	32
CBS:	BioSci Graduate Grp Cluster*	43	61	Not applicable**	Not applicable
	Biological Sciences*	40	48	Not applicable**	Not applicable
	Evolution & Ecology	503	560	24	24
	Microbiology	263	355	22	22
	Molecular & Cellular Biology	418	551	19	19
	Neurobiology, Physiology & Behavior	386	731	20	20
	Plant Biology	322	380	32	32

* Pay Department = BioSci Graduate Group Cluster or Biological Sciences

** Not applicable since in this instance no I&R pay department could be identified and credit for the workload was assigned by default to the department of the course.

This information indicates that, based on 2012-2013 data, the instructional teaching load of MPS ladder rank faculty falls between Social Science and HARCS faculty and is comparable to the instructional teaching load of faculty in CBS. According to this analysis the instructional teaching load of MPS ladder rank should not negatively impact the ability of ladder rank faculty in MPS to fund and conduct their research. This investigation does not show that undergraduate instructional teaching differences on the Davis campus impacts research and graduate education, and even if such a problem did exist, it is not yet clear that an academic reorganization involving MPS would address such a problem.

possible disproportionately high teaching load for assistant professors in Statistics. While this issue falls outside of the scope of the task force, if substantiated as a consistent trend, it will need attention.

Impact of Different College Models on Research: In the four-college model, each college might be better able to have a focused research agenda, and research support might be enhanced in the College of MPS (and Colleges of HARCS, SS and CBS) where the deans can prioritize their budgets. Collaborations outside of the college might or might not be enhanced. While faculty on the task force commented that college boundaries have never stopped faculty from developing research proposals and carrying out research across colleges, it is difficult to determine, given the evidence we've had, whether college structures encourage collaborations. It would be just as easy to argue that grant proposals, centers, and interdisciplinary graduate groups encourage more collaboration than does a college structure.

A College of Natural Sciences would likely offer increased staffing support for a greater number of similar grant collaborations given the greater size of the college and CBS's current strength in research support within the college. Yet cross-disciplinary research projects would still be prioritized at the college level based on available resources and funding opportunities. Faculty within what is now MPS may still feel that support is inadequate. What would likely improve would be strategic research collaborations as these could be incentivized through proximity and administrative action within the college. Finally, a highly functional L&S in which resources were allocated to MPS faculty at a ratio equal to their potential to raise research dollars could also lead to enhanced research support. Actions could also be taken within the division to create cross-disciplinary research interactions, perhaps with the establishment of a faculty assistant for research or faculty liaison to the dean who looked to connect people inside and outside of the college. However, some faculty on the task force commented that such positions in other colleges have not been effective in achieving such an outcome.

Shared Governance

L&S faculty are active participants in the shared governance of the general campus. However, over the past few years it became evident that the current organization of shared governance in L&S does not adequately account for needs of the faculty. If left unchanged, L&S faculty will continue to suffer the shortcomings of an inefficient shared governance structure. This frustration surfaces in the MPS proposal where the faculty expressed a desire to establish its own Faculty Executive Committee including more expedient college committee structure as a benefit to becoming a separate college.

The faculty of the College of L&S is established by the Davis Divisional Representative Assembly as codified in [Davis Divisional Academic Senate Bylaw 133](#) and governed by the [L&S bylaws](#). In addition, Davis Divisional Bylaw 43 establishes the Faculty Personnel Committee for each Faculty Executive Committee. The L&S Faculty Personnel Committee structure is described in Appendix F.

An evolution improving the effectiveness of the shared governance structure in L&S faculty is under way. In Fall 2012 the L&S Faculty Executive Committee, reacting to a request of the MPS faculty, created an MPS Steering Committee which functions as a subcommittee of the L&S Faculty Executive Committee. In 2012, a HARCS Steering Committee was formed, again functioning as a subcommittee of the L&S Executive Committee. An illustration of the shared governance structure described above may be found in Appendix G.

The Academic Senate, and in some cases the campus administration, have begun to consult with the HARCS and MPS Steering Committees in a manner similar to college faculty executive committee. For

example, consistent with Academic Senate expectations the chair of the L&S Faculty Executive Committee and the MPS/HArCS steering committee (as appropriate) participated in the Spring 2013 budget discussions with the respective divisional dean and the provost.

The task force also consulted with the HArCS and MPS steering committees, and the formation of a steering committee for SS was initiated to enable consultation with SS faculty as well. As consultation with steering committees instead of the L&S FEC increases, it has become imperative to formalize the role and responsibility delegated to these subcommittees. The bylaws will also need to be amended to formally establish the steering committees.

In large part the creation of the MPS steering committee addresses one of the main concerns raised by the MPS proposal. A remaining issue is their desire to have more direct control over their undergraduate courses. However, as the formation of the steering committees illustrates, the L&S faculty is able to organize its college governance structure in a manner that best meets their needs and can always elect to do so provided that the changes are consistent with the Davis Division of the Academic Senate bylaws and regulations (see [Davis Divisional Academic Senate Bylaw 137](#)).

Undergraduate Experience

The undergraduate experience must remain at the forefront of any L&S change, especially given the high percentage of undergraduate teaching that occurs in the college. With this in mind, special attention should be given to changes in advising, requirements, and other policies that directly impact the ability of undergraduates to navigate their degree(s).

As long as the resources dedicated to advising do not diminish, and any changes in academic requirements/policies do not discourage non-MPS students from taking MPS classes (or vice versa) or complicate changes in major, the organizational structure of L&S and the divisions it houses are minimally relevant to the undergraduate experience. Undergraduate students most closely identify with their major department(s) and rarely interact with colleges other than to seek help with GE/college requirements and to change their major.

Currently, L&S has a large number of undeclared students, a common advising center for first and second year students, a single associate dean who is charged with ensuring sufficient seats in high-demand courses across divisions, and a common 110 unit ceiling on credits within all majors. All of these factors must also be taken into consideration as changes are contemplated. The task force explored the advising in CBS to see if the impact on students of its move from division to college could serve as an example. Because CBS was a division supported by two colleges with its own independent governance and budget for two decades prior to becoming a college, its experience reveals little about what would happen to students in the MPS scenario.

Having a single associate dean is particularly problematic for L&S in its current configuration. The other three undergraduate colleges each have an Associate Dean for Undergraduate Education responsible for a broad range of issues beyond student advising: accreditation, TA support, student recruitment and retention, diversity, enrollment planning, and coordinating curriculum changes with the senate. In each case, the college benefits from having a leader devoted to the undergraduate teaching mission and supporting the dean in integrating undergraduate teaching priorities with faculty recruitment, graduate education, research, and alumni development. In contrast, the associate

dean in L&S must support three deans with different disciplinary priorities, as well as oversee a student advising unit responsible for double or triple the number of undergraduate majors relative to the other colleges.

Specific concerns about undergraduate education (beyond advising) that were addressed in task force research, presentations, and discussions included the following:

- Many students move from MPS to SS and HArCS, so these divisions want to ensure that such moves remain viable. The task force commissioned a study (see Appendix H) that addresses the following questions: i) What are the pathways by which undergraduate students enter L&S? ii) Once in L&S, how do the students traverse through the three divisions to where they eventually graduate? iii) How long does it take a student to graduate? While any student can change majors within a college, a student must be in good standing to change colleges. Regardless of the eventual location of MPS, the task force recommends loosening this rule to allow a student not in good academic standing to change colleges, as long as the new college is willing to accept the student.
- What causes the large exodus of students from MPS majors? If a different organizational structure has any impact on MPS attrition, it will be through changes to advising (discussed below) rather than because switching majors becomes more difficult.
- There seems to be little discussion within MPS or L&S at large of how the college ensures we provide a cohesive liberal arts education for our undergraduates. Is there a core liberal arts philosophy within L&S or a message that students receive about how their foundational courses (or GE courses) combine to create something greater than the sum of their parts?
- Students earn the majority of their first two years of credits across this college. How would different scenarios strengthen or weaken that core experience? There was some discussion of this issue on the SS Steering Committee. While many members did think that a single college of L&S provides greater potential for a cohesive liberal arts curriculum, others were less sure whether this would be a real negative impact on students.
- How might college structures contribute or prohibit innovation in learning and enable students to persist in their fields?
- What college configuration would most effectively enable a foundational curriculum for the twenty-first century? The MPS proposal did not address how a separate MPS college will improve the offering of such an integrated curriculum to their students. The question arises whether a college incorporating all the natural sciences may provide the pathway towards a foundational and innovative curriculum in STEM. Similarly, could a combined college provide similar advantages for students majoring in HArCS and Social Science?
- What would be the impact on collaboration if MPS were to remain in L&S, or if it were to split off, or configured differently? There was some sense that it is easier for two college deans to agree to develop a course collaboratively than it would be with a college dean and a division dean.
- Some students talk of feeling little connection to a College of L&S from within MPS. Would that connectivity be enhanced by alternative configurations? What benefits would that offer?
- Some faculty expressed concerns that converting DBS into CBS eroded the liberal arts education focus within L&S. In fact, there was little or no tangible impact, considering that DBS had operated for the previous twenty years as a de facto college supported by both CA&ES and L&S. Undergraduate major programs, course offerings and advising all remained

in place, although certain majors were renamed to reflect disciplinary trends in fast-moving fields. Formation of DBS in the 1970s was accomplished in order to substantially improve undergraduate biology education by combining elements from the two colleges into a much broader, enriched program available to all students at UC Davis (including L&S students).

Undergraduate Advising

The L&S Deans' Office offers shared advising to students in the three divisions. There are some advantages to this arrangement: consistency in advice given regarding campus-wide requirements, the ability to learn about all the college majors available, and the relative ease of double-majoring within the college. There is a general belief that under this arrangement, L&S students have a greater potential to achieve a well-rounded liberal arts education. From an administrative perspective, there is efficiency in training a single large staff, and in administration by a single associate dean. Undergraduate Education & Advising (UEA) in the L&S Deans' Office is currently staffed with 18 staff advisors and 20 part-time peer advisors. UEA provides an important service to L&S – the largest college on campus – and because L&S is home to the majority of undeclared students, UEA advising is seen as a service to the campus as a whole.

When asked what the staff FTE impact would be if MPS were to leave L&S, Associate Dean McClain reported that 1.5 advisor FTE and 0 peer advisor FTE are designated to MPS. Due to the low advisor FTE that is allotted to MPS, there is concern whether UEA as a shared resource truly meets the needs of MPS as well as the other divisions within the college. It is possible that UEA is not able to consider the specific recruitment and retention needs of MPS as their staff time is dictated by the sheer number of students that need advising help, predominantly from SS. (It is likely that HARCS would have similar concerns as MPS due to the advising resources allocated for L&S as a whole.) MPS departments have reported that they feel under-resourced to assist the students most in need including underrepresented minorities and women. UEA recognizes that by the time they become aware that a student is in trouble academically, the student has often already decided to change to majors. A question that should be asked, regardless of the college structure pursued by MPS, is whether the MPS dean is effectively negotiating which resources should be put into UEA vs. departments in order to deliver a clear vision of student advising success.

There is concern that the college is too large, with insufficient resources to adequately address concerns for outreach, recruitment, and retention. MPS in particular may get less out of shared advising than the other divisions. Advisors mainly have training in SS and report only to the SS dean, leading to imbalanced advising. Moreover, since relatively few MPS students serve as peer advisors, students often receive advice from social science students instead. The lack of MPS-specific advisors may create or exacerbate a greater issue in MPS student retention. If MPS students are leaving in large numbers from the major, would a separate college or other structures improve retention? Further, are the advisors in UEA truly effective at working with MPS students? Perhaps the division and the head of this shared resource need to work together on the difficulties of removing obstacles from the student pathway between UEA and MPS.

Clearly, there is a gap in advising/resource support that is not being addressed. Not focusing on the needs of students in MPS is a disservice to the campus ability to address STEM education goals, a mandate for the good of the state and nation.

Even with these obstacles, students currently in L&S can double major outside of the college. The location of MPS within L&S creates no barrier for MPS students (or MPS students in other L&S divisions) to double majoring outside of the college. (See Appendix H for an analysis of multiple majors in L&S.)

The task force also considered whether shifting the college structure would impact a student's ability to major outside of the college. It was noted that students currently in L&S can double major outside of the college by going directly to the second major department for advising. There appears, then, to be little risk that shifting the structure would adversely impact double majors. One issue that should be addressed is the current inability of students to shift majors across colleges unless they are in good academic standing. There appears to be little logic in this across-the-board rule and the committee recommends changing this so that students can transfer to another major, outside their college, regardless of academic standing—as long as the accepting new major approves.

Impact of Different College Models on Undergraduate Advising

In response to the identified strengths and weaknesses of the current L&S situation, an optimized L&S might take the following steps:

1. Reorganize the current UEA into an “Advising Center” that could accommodate L&S students whether or not the current divisions are retained.
2. Improve coordination between UEA and departmental advising.
3. Allocate additional MPS trained advisors to assist with retention of MPS students.
4. Recruit MPS majors to serve as Peer Advisors within UEA.

The two- and four-college scenarios can offer more advisor specialization to division-specific issues, build a sense of membership and belonging for majors, and create a team advising environment with dean's office advisors collaborating with department advisors. However, in these models, students may not learn of programs in other colleges that match their interests, or be encouraged to pursue them. In the two-college model, the colleges would still be quite large, so there are similar concerns that advising resources would be spread too thin. In the four-college model, advising may become underfinanced if deans can shift money from advising to other uses such as startup costs, retention, matching funds, and development.

Communications and Development

During discussions in the task force about communication infrastructure on the Davis campus it became clear that communications are under-resourced across campus. UC Davis as a whole is challenged to resource communications optimally within the available budget, and each college and division also has distinctive needs that must be met. L&S faces a particular challenge in that it has only two communications staff shared across three divisions. In order to get out effectively messages that help to recruit undergraduates, share the stories of what happens in the colleges, and connect with alumni, specific messages must be crafted by the communicators. There are currently no formal plans within each division to define and meet communication needs.

Currently the development structure within L&S has one assistant dean for development that functionally reports to the HARCS dean. While the assistant dean does have a reporting relationship with the other deans, the position functionally reports to the HARCS dean. HARCS and MPS each have

one development officer assigned to serve their divisions. SS has two. The assistant dean and one other development officer serve the entire college.

Challenges emerge from this scenario. First, HArCS has an assistant dean for development who interacts directly with University Development. MPS and SS must also interact with the same assistant dean because they do not have one specifically assigned to them. As a result, there is a greater distance between the development officers in MPS and SS and University Development. One consequence is that MPS and SS are neither getting the support they need, nor are they cultivating the effective communication channels to ensure the highest degree of development success. The reality is that the L&S Development office currently does not have enough staff to support each division separately, so they assign administrative staff by function and essentially provide a shared service center for the three divisions. These issues were raised by the MPS faculty. Second, MPS claims that based on development staff FTE in proportion to donor opportunities, they have the lowest overall staffing level of any of the division. At the same time, the unit may have the largest potential to attract increased development support, given the depth of its prospect pool. MPS, in its own proposals, suggests that they would have greater development success with a Dean's Advisory Council to assist with development. They see the creation of a separate MPS college as an essential step towards the formation of such Dean's Advisory Council.

Again, the question should be asked whether separating into a different college would address these concerns or if the concerns could be addressed within the current or reconfigured college organization. It seems likely that the concerns expressed by MPS about their development efforts being stymied would be shared by others in the college given the general low level of staffing and the current L&S organizational structure of the development staff. It is the task force's recommendation that we should separate concerns about staffing and reporting lines, which appear to have merit, from the assertion that a separate college structure would be the only or best means of addressing these concerns.

Under a four-college model, each college's development office would need to have essential functions in addition to development officers. Separate deans could have a higher profile for fundraising, and would keep those funds within the respective college. However, separate development teams for each college would inevitably lead to an increase in administrative staff. The two-college scenario would enable the colleges to better track and solicit alumni support; and combining colleges may facilitate seeking support for interdisciplinary initiatives. However, it is possible that depending on the expertise of the dean of a two-college model (especially with SS and HArCS), particular areas could be disadvantaged or deemphasized. In both the four- and two-college scenarios, MPS would have the opportunity to build a sustainable development team with direct reporting to the Development Office, and to develop short- and long-term fundraising drives to address the potential that is currently not being realized. In the single L&S scenario, an optimized L&S would allocate additional development FTE to MPS; however, there is a risk that L&S will continue to operate "as is," ignoring fundraising potential.

Graduate Education

Graduate education was not mentioned as a concern motivating the original proposal from MPS. Discussions did not identify significant concerns associated with any of the models considered. Graduate advising takes place at the program level and is supported by the Office of Graduate Studies

for all graduate programs regardless of home college/school or whether a program is offered by a graduate group or a department.

Barriers regarding collaborative research could conceivably affect graduate education, particularly under the new model for allocating graduate tuition. We examined the extent to which graduate teaching and advising by L&S faculty is associated with programs in their divisions versus programs housed in other L&S divisions and other colleges and schools. The results suggested that MPS graduate students have opportunities to interact with faculty from other colleges and schools in the classroom and as advisors, and that MPS faculty have opportunities to teach and advise outside their home division. While it is important to consider potential effects on graduate education when considering reorganization, it is not apparent that there would be any substantive effects. This is consistent with the task force's conclusion regarding the effects on research.

CONCLUSION

By bringing specific problems to our attention as a campus, the MPS faculty has provided an important opportunity to make changes to improve the experience of students, faculty, and staff. The task force's deliberations, however, have revealed that while these problems are experienced within MPS, they are problems that face all three divisions in L&S, though some weigh more heavily on MPS now. Thus, the appropriate scale to address these problems is the campus as a whole.

Within L&S, short staffing in development and communication and inadequate resourcing and coordination within advising between UEA and the departments seem to be shared challenges across all three divisions. Inadequate research infrastructure, on the other hand, appears a particularly pressing problem for MPS. From the task force's vantage point, L&S is not functioning as a single coordinating unit with three component parts. With time and growth, the initial cooperative L&S structure has been stretched. Resources have grown increasingly scarce. Pooled services prevent divisional flexibility in reallocating resources to meet current needs. It is unclear how divisions can solve their own problems. Given this condition, it makes sense that MPS faculty would look to separate from the division as a first step to addressing their valid concerns.

The task force, however, urges the provost and senate to seek solutions to the problem within L&S as well as the campus at large, in particular involving CBS. In the absence of a reorganization, we urge the L&S faculty to work closely with leadership in the divisions to address the problems that exist comprehensively rather than allowing each division, progressively, to break away to solve problems that are actually more shared than distributed. It is the task force's view that while MPS should take action to address its concerns, especially in research support and advising, it should not initially be looking to a new college structure to do so. Rather, the provost and senate need to determine whether L&S as a whole can be made highly functioning. If it cannot, alternative academic structures need to be considered for the three divisions simultaneously, looking at configurations that are best for the campus.

This process began with the argument that changing the college structure of MPS would ameliorate problems within the division. By considering evidence from a number of angles, the task force has determined that the single change of moving to a separate college rather than a divisional structure

will not, in itself, without new resources and approaches, solve the problems that inspired MPS faculty to pursue college status.

This, however, is not to say that there is no value in considering alternative college structures for the divisions within or beyond L&S, especially if the current challenges cannot ultimately be solved within the college. Given the importance of academic configurations, and the difficulty of changing them, once established, imagining new college structures should consider large opportunities rather than focusing exclusively on current problems. Here it would be essential for us as a campus to know what we want colleges to achieve. Do we want them to draw innovative scholars together in collaboration to solve pressing problems? Do we want them to attract donors with highly focused missions? Do we want them to deliver coordinated curriculum to our undergraduates while holding true to the ideal of a liberal arts education? Do we want the colleges to tell compelling stories to the public? If we begin from such a perspective of opportunity, we can establish college structures that add capacity to our faculty and our students and ultimately the public.

APPENDICES

- Appendix A: MPS Steering Committee discussion regarding the Academic Organization of UC Davis:
Special Committee on MPS Positioning
- Appendix B: Task Force Membership
- Appendix C: Task Force Meeting Dates and Topics
- Appendix D: SCENARIO: College of Natural Sciences
- Appendix E: Organizational Options for HArCS and SS if MPS Becomes an Independent College
- Appendix F: L&S Faculty Personnel Committee Structure
- Appendix G: College of Letters and Science Subcommittees: Divisional Steering Committee
- Appendix H: L&S Pathway Analysis

Date: August 26, 2013

To: Professors Andre Knoesen and Carolyn De la Peña

From: Isabel P. Montañez, Chair of the MPS Steering Committee and Professor of Geology

Re: MPS Steering Committee discussion regarding the academic organization of UC Davis

The MPS Steering Committee was established in 2012 in response to the 2nd report of the Dean's Special Committee on MPS Positioning (Feb. 2012), which recommended that the Division have its own faculty senate committee to provide a comprehensive focus on core functions relevant to MPS and to chart its own destiny as it continues to grow and pursue a unified goal to obtain rankings of '20 [or higher] by 2020.' During its inaugural year, the MPS Steering Committee evaluated various sources of information regarding the current structure of MPS within the College of Letters and Sciences (L&S) with the goal of building a consensus within the division in terms of a shared vision of our future. Our discussions, which twice included the chairs of the five departments and the director of the ORU unit NEAT (Professor Alex Navrotsky, current Interim Dean of MPS), were informed by several sources including oral reports of faculty discussions within each department and three written assessments involving MPS: (a) the Washington Advisory Group (WAG) report and (b) two reports by the Dean's Special Committee on MPS Positioning, which was charged with evaluating the current organizational model of the Division in the context of recent strategic planning. Importantly, the notion of a College of MPS did not arise from our committee, but rather grew out of the grassroots efforts of departments within the Division and the findings of the aforementioned three reports. The MPS Steering Committees' role was to critically evaluate the available information and determine whether there was support for advocating for the creation of a new College of MPS, or for identifying an alternative mechanism for gaining more autonomy for the Division.

The following arguments summarize the compelling reasons for why MPS would benefit from being an autonomous College. They do not necessarily represent the sentiment of all faculty members in MPS but rather they reflect the consensus that developed following intra-departmental faculty and MSP Steering Committee discussions. A comprehensive analysis of various potential models for the organization of MPS and associated departments is presented in the 1st report of the Special Committee on MPS Positioning (Kauzlarich, Chair, August 24, 2011).

The Division has experienced tremendous growth since the 1995 reorganization of the College into three Divisions. Currently, MPS has 154.3 senate faculty FTE, and 1,660 undergraduate majors and 549 graduate students, operating with a yearly budget of \$44.3 million. Of the \$39.5 million of research expenditures for the College, 65% is generated by MPS faculty.

Despite a strong research component, MPS is perceived on campus as a teaching and service unit. The MPS teaching load (3 podium courses per year) is larger than that of faculty in the Colleges of Biological Sciences, Agriculture and Environmental Sciences,

and Engineering reflecting the undergraduate programs, which directly impact majors in these colleges through course requirements. The WAG review team recognized the research potential of the departments in the Division in acknowledging their ‘know-how and ambition to rise in national ranking’ and concluded that ‘the performance of the Division of MPS will be a major determinant in how the higher education community views the College and hence UCD.’ This report further recognized that legacy budgeting of a perceived service Division has resulted in protracted underfunding of MPS and may have negatively affected the research time and productivity of its faculty — an inconsistency in comparison to other top research universities.

Currently, the three divisions in the College of L&S share an Executive Committee and associated College Committees, Undergraduate Advising, College Relations and Development, and College Computing staff. There are multiple advantages to having MPS as a College with its own system of independent committees and staff:

- The L&S College Committees are more interdisciplinary than their equivalents in the other colleges and professional schools at UC Davis resulting in an impacted workload and slow response by several of these committees. Examples of time-impacted committees include the Faculty Personal Committee and the College Courses Committee. Comparable committees of MPS faculty would be more effective, beyond just lower workloads, given that members would be more knowledgeable about the issues presented to them permitting them to be more engaged in and pro-active for MPS-specific issues. See the 2011 report of the Dean’s Special Committee on MPS Positioning for more detail (attached Appendix A).
- The nature of the extramural funding and research is quite different from that of the other two Divisions both in per faculty annual expenditures and departmental distribution of extramural funding brought onto campus. Rather, MPS shares a pattern and level of extramural funding that is more akin to that of the Colleges of Biological Sciences and Engineering. A MPS Executive Committee could work effectively with the Dean to evaluate the role of extramural funding and related issues within the context of the MPS budget model. This could involve defining resources to support faculty efforts in garnering large interdisciplinary extramural grants, including training grants.
- As a stand-alone college with a Dean, Executive Committee, and staffing comparable to that of the Colleges of Biological Sciences, Agriculture and Environmental Sciences, and Engineering, MPS would be much more effective in developing and fostering cross-college research collaborations. It would further create an environment that allows the MPS faculty to realize their full research potential, which has been arguably constrained by the high teaching and administrative loads of this ‘service’ Division.
- The current structure constrains the independence needed in recruiting, specialized advising, and retaining MPS students. Dedicated advising staff would provide a more focused approach to the needs of MPS students, particularly important for the campus’s STEM-related investments and efforts.
- MPS has its own Senior Development Officer who works closely with the Dean, but there is a need for a focused staff that will target marketing, communications and

fund-raising specific to MPS interests and affiliates, including leaders in the related private industries. Given declining administrative budgets, it is anticipated that some shared staff support will be necessary.

The Steering Committee concluded that an organizational structure for MPS that meets the specific objectives and needs of its faculty and students will provide a better framework for the research and teaching mission of the organization than the current structure as it strives to 'break 20 by 2020' and will assure the competitiveness of MPS programs for national prominence. In late fall 2012, a motion was put to vote in the five departments to get a sense of the faculty opinion and it passed in all of them. In turn, the Committee, along with the chairs of the five departments, and the Chair of the L&S Executive Committee met with the Chancellor and Provost to brief them regarding the issues of foremost concern to MPS. These initial consultations eventually led to the formation of the "Joint Academic Senate/Provost Task Force on the Academic Organization of UC Davis" in Spring of 2013.

August 24, 2011

To: Winston Ko

From: Susan Kauzlarich, *Chair*
David Britt, Chemistry
Shirley Chiang, Physics
Louise Kellogg, Geology
Bruno Nachtergaele, Mathematics
Jane-Ling Wang, Statistics
Kathy Olsen, *Staff to the Committee*

Subject: Special Committee on MPS Positioning – Recommendations

This committee was convened by the Dean in light of recent strategic planning and with the goal to evaluate whether the current model or an alternative one supports a successful and prominent Division of Mathematical and Physical Sciences (MPS) at UCDAVIS. This charge was to examine a variety of models of how MPS can be strengthened taking the following into consideration:

- Effectiveness in the delivery of core functions of MPS
- Competitiveness of MPS programs for national prominence
- Synergy with other campus units to achieve the UCDAVIS Vision
- Preparedness for dynamic changes in science and technology
- Receptiveness by and encouragement to the whole MPS faculty

The mission of MPS is to provide the best foundation of discovery, dissemination and application in mathematical and physical sciences, which are fundamental to the scientific and technical innovations in a broad range of fields. The advent of massive data now renders even more a decisive and imperative role of statistics and mathematics in extracting useful information out of them. Frontiers of discoveries are to be pushed, from the most primary structure of the subatomic world, to the complexity of novel materials for clean energy and for health care, from the realm of heaven (cosmology) to earth (geology).

The committee was constituted March 17, 2011 and interacted via email and two in-person meetings. The members from chemistry, physics, and geology were constants and scheduling issues resulted in additional members (Craig Tracy from mathematics and George Roussas and Wolfgang Polonik from statistics). Kathy Olsen provided information from a variety of the UC Davis peer institutions regarding the organization of the MPS departments. We found that there are a variety of ways that the physical sciences are collected into various units, from stand alone schools of chemistry or earth science to collections that included physics within the school of engineering, schools of natural science which encompass what is the current MPS structure along with some of the departments found in the College of Biological Sciences, to similar entities as MPS within a school of letters and sciences (spread sheet with comparison and groupings is

attached). The committee did not find that there was any particular model that was in use for schools with higher rankings than UC Davis, so a variety were discussed as follows:

- The current model of the Division of MPS within the College of Letters and Science with the following departments: chemistry, physics, geology, mathematics, and statistics.
- A College of Mathematical and Physical Sciences that consists of the current departments of MPS.
- A College of Natural Sciences, consisting of the following departments that are focused on research and teaching in the areas of basic biological, physical, and mathematical sciences: Chemistry, Evolution and Ecology, Geology, Mathematics, Microbiology, Molecular and Cellular Biology, Neurobiology, Physiology and Behavior, Physics, Plant Biology, and Statistics.
- A College of Earth Science where our current geology department becomes part of a new entity that collects the various departments focused on earth and climate change.

Summary of the discussion: The discussion of the committee members focused on two different models: Staying with the current model or becoming a College of physical sciences and a College of Natural Sciences that is composed of both MPS and other science departments that are currently housed in the College of Biological Sciences. There were discussion concerning models where one of the departments within MPS left to form an independent college or division, such as a College of Earth Science or College of Chemistry were discussed. All of the committee members support a model where the dean is a strong advocate for the current departments within MPS.

As a result of the committee's discussions, three models are presented on the following pages:

- (1) MPS either as it currently exists or as a College
- (2) College of Natural Sciences
- (3) College or School of Earth Sciences

(1) MPS, either as it currently exists or as an independent College

The primary advantage of the current organization is that the Division of Mathematical and Physical Sciences (MPS) has its own Dean, who reports directly to the Provost and Executive Vice Chancellor. Since our Dean has only five departments reporting to him, he is cognizant of all matters relating to their operation and knows the faculty of these departments very well. In addition, the division receives a separate budget from the other two divisions in the College of Letters and Science, namely the Division of Humanities, Arts, and Cultural Studies (HArCS) and the Division of Social Sciences (SS). Our Dean is a strong advocate for his Division with the upper administration, and he is able to argue for resources for his departments for both their research and teaching missions.

Currently, the three divisions in the College of Letters and Science share the following organizations: the College Executive Committee, a system of College Committees, Undergraduate Advising, College Relations and Development, and College Computing staff. There would be some advantages in making MPS a separate college. The Executive Committee and other College Committees currently have much more business because they represent faculty, courses, majors, and graduate students in all three divisions. For example, the workload of the College Faculty Personnel Committee (FPC), which reviews most faculty merit advancements re-delegated to the Dean, was becoming too large because of the many cases it needed to review. In the last year, it was separated into three subcommittees with some overlapping responsibilities so as to reduce the caseload. Note that this FPC, even with three subcommittees, is much more interdisciplinary than that of any other College or School. Another example is the Courses Committee, which had a huge number of courses to approve when the new general education requirements were implemented. If MPS became a separate division, it would have its own Executive Committee and College Committees, which would each have a much smaller workload. As a separate college, MPS would require its own Undergraduate Advising Staff, which could presumably be much smaller than the current L&S Advising Staff. The MPS Advising Staff would need to be familiar with fewer requirements and might find it easier to advise individual students. MPS also already has its own Senior Development Officer, who works closely with the Dean. However, even as an independent college with its own individual committees, given recent declining administrative budgets, it might be advantageous for MPS to share some staff support with HArCS and SS.

Another advantage of MPS being an independent college is that its extramural funding and research are quite different, particularly from HArCs, which has very little extramural funding, but also from SS, where some departments and fields have extramural funding and others do not. Thus, discussions about the role of extramural funding, indirect cost return, and related issues are better discussed within MPS and independently of the other two divisions. The MPS departments have aspirations to improve their research reputations even further, and these goals may be facilitated by the division becoming an independent college, isolated from the issues of HArCs and SS.

Many faculty members in MPS see only disadvantages in other organizational models, such as combining MPS with either the College of Biological Sciences (CBS) or the College of

Engineering (CoE). MPS currently has a large teaching load, which supports all undergraduate programs, and has a particularly strong impact on students majoring in biological science, agriculture and environmental sciences, and engineering. If MPS were to join with either CBS or CoE, the MPS departments might be viewed as primarily service-related, with little emphasis on their strong research. No compelling additional resources have been identified, such as money or faculty FTEs, which would be likely to be gained by a reorganization joining MPS with either CBS or CoE. In addition, the research culture and funding environments are different for both biological sciences and engineering, since many biologists have National Institutes of Health (NIH) funding, and engineering can turn more to industrial funding sources. In addition, it is not obvious that joining administrations with either CBS or CoE would improve the research environment by making it more stimulating, more efficient, or better for interdisciplinary research.

Some faculty members have particular concerns about joining with CBS to form a College of Natural Sciences. Although the idea of a College of Natural Sciences seems attractive in the abstract, numerous arguments have been advanced against it because of the culture of Biological Sciences on the Davis campus. From the point of view of some MPS faculty, CBS is insular, inward looking, and somewhat isolated from the broader scientific enterprises on campus. Since many biologists think of Davis as being the life sciences campus of the UC system, they view themselves as central to the campus mission and much else as peripheral, including other sciences insofar as they do not further the life sciences "mission." CBS only became an independent college in 2005 and has recently hired a new Dean, an immunologist whose research interests are in biology and medicine. Thus, it is not clear that CBS would willingly give up its present level of autonomy and recognition to merge with MPS into a single College of Natural Sciences, nor that its new Dean has any interest in the development of the physical sciences. If such a merger were to be forced, the MPS departments would likely be the losers, as they would be giving up their own Dean.

Most of the MPS faculty members agree that the current organization, with MPS as a separate division within L&S with its own Dean, is far preferable to the previous organization with the College of L&S having only one Dean, who was often unfamiliar with the research, funding, or teaching issues in MPS. The Division has had its own Dean since 1995, and most faculty members do not see any compelling reasons to change the status quo. As described above, there are also some advantages in beginning the process to become a separate College of Natural Sciences composed of the 5 departments within MPS, which would be independent of HARCS and SS.

(2) College of Natural Sciences Model

Faculty members of the Chemistry Department strongly supported a different model, where all of the fundamental science departments are grouped into a College of Natural Sciences, which would approximately consist of the departments currently in the MPS division and those within the College of Biological Sciences. This would be a powerful unit on campus, combining both research and teaching missions for all of the fundamental sciences. We note, for example, the recent MIT report “Third Revolution: Convergence” speaks directly to the future increasing importance of the interplay between biological and physical scientists. There will be new opportunities for enhancing the curriculum at the undergraduate level, with one Dean providing the leadership and oversight for all of the natural science majors. In particular, this College model would provide a fertile environment for the future of UC Davis’ large Biochemistry major, which would benefit from the involvement of biochemically-oriented chemists as well as biologists (we note that a common model, UCLA, UCSD etc, is to have Biochemistry housed in a Chemistry and Biochemistry Department). In addition some members of this committee view a ten-department scale unit as being approximately optimal as an administrative unit, and the Dean of the College of Natural Sciences would have an impressive portfolio, with a major educational role and large and vibrant science major programs, which will well position the Dean in negotiating for resources for this crucial college (see statistics provided below). The College of Natural Sciences would offer a healthy blend of majors-oriented teaching and service teaching.

Some statistics were collected to related to CBS (MPS) for the year 2009-10:

Number of majors:	5,008 (MPS had 1,292)
Number of Grad. Students:	575 (MPS had 549)
SFR for Ladder Faculty:	20.15 (MPS was lower at 19.72)
SFR for temporary instructors:	73.43 (MPS was lower at 65.94)

In the discussions about various models, as noted above, faculty in other departments were wary of casting our lot with the biological scientists. It is no doubt true that many of the Chemistry faculty do not see a clear distinction between physical and biological sciences and find this distinction to be somewhat arbitrary in the modern world of teaching and research in Chemistry. For example a large portion of the Chemistry research support comes from the National Institutes of Health (NIH), far more than for other MPS departments. In 2010-11, 20% of Chemistry’s extramural expenditures were associated with NIH funded grants. This was compared to 0 to 2.5% of NIH associated expenditures in other MPS departments.

There were numerous comments in our discussions to the effect of how do we know how we would fare in the future in such a combined College of Natural Sciences? One could equally ask questions about what the future holds with the current arrangement, which can easily be viewed as a primarily service related teaching unit for UC Davis which can be maintained with less funding while the university focuses on other areas of research. We may indeed fare better in a College of Natural Sciences explicitly viewed as the home for fundamental scientific research at UC Davis. It is clear that this specific faculty committee will not have all the answers to questions pro or con, but as the administration considers options for the future, the College of

Natural Sciences option, with good faith discussions of the points discussed previously as negatives for this model, should be considered for its potential benefits.

(3) College or School of Earth Sciences

At a number of major universities, the geosciences, environmental, and related energy sciences and engineering departments (defined broadly) have been consolidated into a distinct college, school, or division. By bringing together these related disciplines, Universities are able to take leadership roles in the interdisciplinary subjects such as energy, climate change, sustainability, and the environment. Although it is not clear that this would be the right step for UC Davis, we feel this idea is worth serious consideration. Such a bold move could be a catalyst for UC Davis to achieve its goals in the areas of climate change, sustainability, and energy research and teaching.

The most successful of these colleges and schools share several features:

- They combine both academic departments and organized research units that focus on climate, energy, sustainability, natural resources, natural hazards, environmental sciences, materials, and earth, ocean, atmospheric systems, and geography.
- They are led by a dean, vice chancellor, or equivalent level administrator. At successful universities, this individual provides the leadership and stature required to make a school of this sort successful.
- They have plentiful and diverse resources, including major endowments, industrial affiliate programs, and extramural funding.
- They provide diverse opportunities for undergraduates and graduate students, through a variety of interdisciplinary majors and graduate programs.

Examples include: Scripps Institution of Oceanography at UCSD (SIO predates and to some extent prompted the establishment of UCSD as a campus); the Jackson School of Earth Sciences at U Texas-Austin, the College of Earth & Mineral Sciences at Penn State U., and the School of Earth Sciences at Stanford University.

There would be many questions and challenges to make this idea a success. In particular, two major issues would need to be addressed:

(1) Development of resources. The Jackson School at UT Austin was established with a bequest of more than \$200 M from the Jackson family. All other successful schools also have large endowments (Jackson School being the largest). Thus establishment of a School of Earth Sciences would require significant permanent resources. With the launch of the UC Davis Campaign, this represents an opportunity for the campus. We would challenge the Chancellor and the new Vice Chancellor for Development to pursue such opportunities.

(2) A stronger MPS. Modern earth science is by its very nature interdisciplinary; a strong and effective College/School of Earth Sciences would strengthen the Division of MPS by creating new opportunities for faculty collaborations between the College/School and the remaining departments in MPS (Math, Physics, Chemistry, and Statistics) and by creating programs that require a strong MPS underpinning. If such a school is established, the campus must simultaneously reinforce the MPS Division [1] to provide balanced strengths in the

mathematical and physical sciences. This also represents an opportunity, particularly in conjunction with the UC Davis Campaign, to establish the resources to build up the Division of MPS.

A commitment to both 1 and 2 would be absolutely essential if the campus wishes to pursue the idea of establishing a College or School of Earth Sciences.

Examples:

Stanford School of Earth Sciences: <http://pangea.stanford.edu/>

UT Austin Jackson School of Geosciences: <http://www.jsg.utexas.edu/>

Penn State University College of Earth & Mineral Sciences: <http://www.ems.psu.edu/>

UC San Diego Scripps Institution of Oceanography: <http://www.sio.ucsd.edu/>

[1] The Washington Advisory Group (WAG) provided the following assessment of MPS at UCDAVIS: The review team believes that the performance of the Division of MPS will be a major determinant in how the higher education community views the College and hence UCD. The departments of the Division have the know-how and ambition to rise in national ranking, but not the resources. Unfortunately, a case can be made that the Division has been historically underfunded and held back – that it may have been viewed as a service Department to other units rather than one that both teaches and engages deeply in research, as is typical for a top research university.

(4) Institute or School of Earth and Environmental Sciences (within College or Division of MPS)

To strengthen the fundamental sciences while building on the campus strengths in earth and environmental sciences, an alternative to option (3) would be an Institute or School of Earth & Environmental Sciences within the Division or College of MPS. The rationale is similar to that outlined above, but with a strong connection among the current MPS departments. This would follow the model of UC Berkeley, and several other top universities, which have large, comprehensive interdisciplinary departments focused on the study of earth's systems. By bringing together these related disciplines, Universities are able to take leadership roles in the interdisciplinary subjects such as energy, climate change, sustainability, and the environment.. Such a bold move could be a catalyst for UC Davis to achieve its goals in the areas of climate change, sustainability, and energy research and teaching.

The most successful of these share several features:

- They combine both academic departments and organized research units that focus on climate, energy, sustainability, natural resources, natural hazards, environmental sciences, materials, and earth, ocean, atmospheric systems, and geography.
- They have plentiful and diverse resources, including major endowments, industrial affiliate programs, and extramural funding.

- They have committed leadership who provides the vision and stature required to make the program successful.
- They provide diverse opportunities for undergraduates and graduate students, through a variety of interdisciplinary majors and graduate programs.

A good example of this model is UC Berkeley. Its Department of Earth and Planetary Sciences, is consistently ranked in the top 3 of earth sciences departments and is linked to at least 4 Centers and Organized Research Units (including the longest-established ORU in the UC system).

There would be many questions and challenges to make this idea a success, for example:

- (2) **Development of resources.** All top-ranked departments, divisions, or schools of Earth Sciences have large endowments. Thus establishment of an Institute or School of Earth and Environmental Sciences at UC Davis would require significant permanent resources. With the launch of the UC Davis Campaign, this represents an opportunity for the campus. We would challenge the Chancellor and the new Vice Chancellor for Development to pursue such opportunities.
- (3) **Development of Centers and Institutes.** The top programs in the country all have internationally-recognized associated Centers and Institutes, such as Berkeley's Seismological Laboratory, and Columbia University's Lamont-Doherty Earth Observatory, among many examples.
- (4) **A broader identity (and new name) for the current Department of Geology.** The top-ranked programs in the US are broad and encompassing, and this is reflected in the names of the departments that anchor them. Examples include MIT's Department of Earth, Atmospheric and Planetary Sciences (EAPS); UC Berkeley's Department of Earth and Planetary Sciences; Caltech's Division of Geological and Planetary Sciences; Stanford's School of Earth Sciences, and Harvard's Department of Earth and Planetary Sciences.

A natural direction for UC Davis would be to establish an Institute or School of Earth and Environmental Sciences within MPS.

Appendix B: Task Force Membership

Carolyn de la Peña, Interim Vice Provost for Undergrad Education, *co-chair*

Andre Knoesen, Academic Senate Vice Chair, *co-chair*

David Britt, Professor, Chemistry

John Capitanio, Research Psychologist, Psychology

Paul Dodd, Associate Vice Chancellor, Office of Research

Jesse Drew, Associate Professor, Cinema & Technocultural Studies

Stephanie Dungan, Professor, Food Science & Technology

Theodore Geier, Graduate Student, Comparative Literature

Rachel Goodhue, Professor, Agricultural and Resource Economics

Jay Grossi, Lecturer, French and Italian

Louise Kellogg, Professor, Geology

Katheryn Kolesar, Graduate Student, Civil & Environmental Engineering

Jeff Lefkoff, Executive Assistant Dean, COE

G.J. Matthey, Professor, Philosophy

Karen Nofziger, CAO, Arts Administrative Group

Jessica Potts, CAO, Chemistry

Christopher Reynolds, Professor, Music

Patrick Sheehan, Senior, Computer Science

Scott Shershow, Professor, English

Joseph Sorensen, Associate Professor, East Asian Languages & Cultures

Teresa Steele, Associate Professor, Anthropology

Valley Stewart, Professor, Microbiology and Molecular Genetics

Matt Traxler, Professor, Psychology

Chris van Kessel, Professor and Chair, Plant Sciences

Jane-Ling Wang, Professor, Statistics

Rena Zieve, Professor, Physics

Appendix C: Task Force Meeting Dates and Topics

Meeting	Date	Topics Discussed
1	9/26/13	<ol style="list-style-type: none"> 1. Shared governance and general issues briefing 2. Structures in L&S and how tasks such as advising and IT are split 3. MPS Steering Committee Chair brought to discuss rationale behind request
2	10/15/13	<ol style="list-style-type: none"> 1. Presentation by Susan Keen, Associate Dean, CBS 2. Presentation by Jim McClain, Associate Dean, Undergraduate Education & Advising, L&S
3	10/31/13	<ol style="list-style-type: none"> 1. HArCS and SS Steering Committee's reactions 2. College of Natural Sciences Analysis and report
4	11/13/13	<ol style="list-style-type: none"> 1. Discussion of report format and outline 2. Three L&S Deans invited to give remarks and answer questions
5	12/5/13	<ol style="list-style-type: none"> 1. Develop recommendations and assign groups to draft report
6	1/13/14	<ol style="list-style-type: none"> 1. Report on Students in L&S 2. Report on options for SS and HArCS 3. Task Force Report – Next Steps

UC DAVIS

SCENARIO: College of Natural Sciences

To foster initial discussions by the Academic Organization Task Force, UC Davis

31 October 2013

Prof. R. David Britt, Department of Chemistry, CL&S
Prof. Valley Stewart, Department of Microbiology & Molecular Genetics, CBS

This report is for the joint Academic Senate/Provost Task Force on the Academic Organization of UC Davis. Co-chair André Knoesen asked us to "take the lead in helping the task force address the College of Natural Science model," one of three models recommended by the Special Committee on MPS Positioning (24 August 2011).

We intend this only as a catalyst for discussion, not as a firm recommendation. Indeed, the task force charge is limited to "provide the senate and the administration a firm basis on which to set a direction for next steps" in considering academic organization.

The physical and life sciences have longstanding mutual affinity. During the middle third of the twentieth century, physical scientists (Schrödinger, Delbrück, Crick and others) joined with biologists (Monod, Jacob, Watson and others) to understand the physical-chemical basis of life. They invented a new field — Molecular Biology — that rapidly defined the leading edge of natural sciences research. Today, its many branches and subdisciplines include natural scientists of all stripes. Accordingly, it would be natural and appropriate to join physical and life scientists together.

For this early stage of broader discussion, we present a relatively simple scenario in which the entire Division of Mathematical and Physical Sciences (MPS) and the entire College of Biological Sciences (CBS) are combined into a single College of Natural Sciences (CNS). For simplicity of discussion, we postulate that the Division of Social Sciences (DSS) and the Division of Humanities, Arts and Cultural Studies (HArCS) would remain together in a single college-level unit (DSS+HArCS).

In May 2010, the Washington Advisory Group (WAG) delivered a commissioned report, *External Review of Research at University of California, Davis*. Among many recommendations, the report states that UC Davis "will need to create synergies and balance between the biological, life and medical sciences and the physical, computational, engineering, and social sciences fields" (page 15). In considering weaknesses of the College of Biological Sciences, the report states that "A stand-alone College of Biological Sciences may not be optimal for the future" (page 43), and "Separation from the physical sciences weakens both units" (page 44).

Although not explicitly suggested by the WAG report ("CBS could benefit greatly by joint programs with MPS," page 46), combining MPS and CBS into a College of Natural Sciences represents one obvious response to this external review.

What would CNS look like?

MPS comprises five departments: Chemistry (CHE), Earth & Planetary Sciences (EPS), Mathematics (MAT), Physics (PHY), and Statistics (STA). CBS likewise comprises five departments: Evolution & Ecology (EVE), Microbiology & Molecular Genetics (MG), Molecular & Cellular Biology (MCB), Neurobiology, Physiology & Behavior (NPB), and Plant Biology (PLB). Faculty from both colleges are involved in interdisciplinary centers and programs such as Nanomaterials in Engineering, Agriculture & Technology (NEAT) and the Center for Neuroscience (CNS).

Fig. 1 presents the approximate number of ladder-rank faculty in each of the MPS and CBS departments. MPS departments are larger, by about 10 faculty members each.

Figs. 2-6 present campuswide data, broken down by college or division, for the academic years 1995-96 and 2012-13. Each figure also includes the CNS scenario, showing combined data for the hypothetical CNS and DSS+HARCS units.

Currently, the three CL&S divisions together dominate UC Davis in terms of faculty full-time equivalents (FTE) (**Fig. 2**), undergraduate students (**Fig. 3**), graduate students (**Fig. 4**), and student credit hours (SCH) (**Fig. 5**).

In the CNS scenario — reorganizing into CNS (MPS plus CBS) and DSS+HARCS — the relative sizes of the four undergraduate colleges would be rebalanced, with CNS and DSS+HARCS roughly equivalent (**Figs. 2-5**). This is reflected also in the relative teaching efforts (ratios of student credit hours per faculty full-time equivalent) (**Fig. 6**).

Potential advantages: research

According to the WAG report, "The separation of CBS from the physical sciences is an inherent weakness of the current organization ... As UCD drives to increase research funding, one of the main avenues to achieve this goal is through large grants for interdisciplinary research. Proposals for large institute and center grants are more competitive if research infrastructure and programs are administratively integrated. As major advances in the biological and biomedical sciences will demand the skills of chemists, physicists, mathematicians, statisticians, computer scientists, and bioinformatic professionals, interdisciplinary research at UCD would benefit if greater synergies were stimulated between faculty in the physical and biological sciences" (page 44).

Two reports from the National Research Council of the National Academies reinforce these ideas. *New Biology*⁽¹⁾ contemplates "integration and re-integration of the many sub-disciplines of biology, and the integration into biology of physicists, chemists, computer scientists, engineers, and mathematicians to create a research community with the capacity to tackle a broad range of scientific and societal problems." Similarly, *Research at the Intersection of the Physical and Life Sciences*⁽²⁾ identifies five "grand challenges" including "interactions of the Earth, its climate, and the biosphere."

These reports reflect federally-funded research priorities, which increasingly favor relatively large interdisciplinary teams. The CNS, with a single dean and executive

committee, likely would more easily be able to plan for and allocate new faculty positions in response to interdisciplinary research needs.

Potential advantages: undergraduate instruction

Enhanced coordination and resource allocation for existing course offerings

Currently, almost all CBS students take at least three full quarters (45+ credit hours) of coursework from MPS departments, and many take substantially more (**Table 1**). Given the large number of undergraduates pursuing major programs in CBS (**Fig. 3**), this represents a substantial fraction of the total MPS teaching effort.

Students in all CBS undergraduate major programs take a biological sciences (BIS) core course sequence (**Table 2**), representing nearly two full quarters (24-27 credit hours). The introductory sequence (BIS 2 ABC) was designed just a few years ago. After completing the MPS and BIS required courses, students then take additional upper-division courses according to individual major programs of study (**Table 3**).

The current course-intensive CBS curriculum presents disparate challenges. Students struggle to complete the entire curriculum within four years, often do not begin taking upper-division major-specific courses until their senior year, and are constrained in the number of non-science elective courses they can take. Additionally, the large number of high-enrollment required courses impacts the teaching load (ratio of SCH to FTE) in both MPS and CBS (**Fig. 6**). Finally, the 2020 Initiative to increase the undergraduate student population by about 20% will strain both the human and the physical infrastructures currently available for instruction.

The CNS, with a single dean, executive committee and curriculum committee, likely would more easily be able to plan and implement course offerings to ensure timely, good-quality education for ever-increasing numbers of students.

An opportunity to reimagine the curriculum

Forming the CNS would provide an opening to reconfigure the undergraduate biological and natural sciences curricula, with several potential benefits. **Creation of a new CNS could be integrated explicitly with Biological Sciences curriculum redesign.**

The current biology curriculum, with separate, independent courses in the disciplines of biology, chemistry, mathematics, physics and statistics, may not illuminate fully the increasingly interdisciplinary nature of contemporary biological science research. A reimagined curriculum, with integrated, discipline-spanning courses taught by faculty from different departments, would provide excellent training in contemporary biology.

From a practical standpoint, the current biology curriculum will not easily satisfy new requirements for admission to medical school. Instead of specific coursework, admission will be based on preparation that exhibits "biologically relevant and interdisciplinary science courses that demonstrate and build on complementary concepts in biology, chemistry, physics, and mathematics."⁽³⁾

Thus, undergraduate preparation for medical school will be based on developing specific "competencies" that result from integrated, interdisciplinary education. For example, one competency is "Apply major principles of physics and chemistry to explain normal biology, the pathobiology of significant diseases, and the mechanism of action of major technologies used in the prevention, diagnosis, and treatment of disease."⁽⁴⁾

The premedical track does not — and should not — drive the overall biology curriculum. Nevertheless, many if not most biology students consider themselves to be "premed" for at least a portion of their college career. Furthermore, CBS is considering recasting its curriculum to emphasize "Human Biology" which, although not equivalent to a premedical track, nevertheless shares many features. Overall, reshaping the biology curriculum to reflect interdisciplinary coursework involving biology, chemistry, mathematics, physics and statistics will result in an exciting and attractive program for students in the 21st century.

Finally, Biological Science and introductory Chemistry laboratory courses are located together in the Science Laboratory Building, providing a physical locale to enhance course integration at the level of laboratory as well as lecture.

Accordingly, forming a College of Natural Sciences would provide leadership and administrative infrastructure to enable what surely will be a challenging and even contentious task. The Dean for this new unit could have curriculum integration as the major goal, and be empowered to ensure its successful completion.

Potential advantages: undergraduate advising

Unified advising for CNS could be advantageous to both students and faculty. In practice, advising structure and mechanisms will require careful consideration.

For Fall 2013, CBS has centralized undergraduate advising functions into the Biology Academic Success Center (BASC), located in the Science Laboratory Building near the BioBrew café familiar to all CBS and MPS students. Although early still, it is probable that this will improve both the quality of, and access to, undergraduate advising. CL&S may soon begin reconfiguring its own advising, providing an opportunity to develop a new MPS advising structure perhaps integrated with or parallel to that of CBS.

Potential advantages: administrative coherence

Scholars in both the physical and the biological sciences share similar overall academic cultures. First, most biologists have at least college-level training in the mathematical and physical sciences (**Table 1**), and increasing numbers of physical scientists, mathematicians and statisticians pursue research topics relevant to the biological and health sciences.⁽⁵⁾ Second, most scholars in these disciplines need access to sophisticated wet laboratories and/or high-end computing in order to pursue research, and many undergraduate courses likewise involve laboratory instruction (**Tables 1-2**). Finally, the natural sciences encounter challenges posed by expensive start-up packages, increasingly competitive federal research funding, and accelerating demands posed by regulations governing laboratory safety and grant administration. These challenges are less commonly encountered in the social sciences, humanities and arts.

Colleges that combine scholars from different academic cultures and viewpoints sometimes might struggle to provide a coherent leadership structure able to fully comprehend and nurture disparate disciplines. By contrast, a College of Natural Sciences would have a leadership and administrative infrastructure well-versed in this common culture and shared challenges.

Potential advantages: faculty governance

The Division of Biological Sciences did not have its own Executive Committee, but rather worked through the existing CL&S and A&ES committees. Thus, CBS does not have a long history or culture of faculty governance, and this aspect might be a weakness of the current college. Meanwhile, MPS faculty similarly work through an overall CL&S Executive Committee that represents the disparate needs and cultures of the diverse CL&S faculty.

Accordingly, forming a College of Natural Sciences would provide the opportunity to re-imagine the Executive Committee and its relationship to the Dean, thereby enhancing faculty governance.

Potential advantages: development

Similarly, the common culture and challenges described above could engender a unified development structure. For example, there might be fundraising opportunities centered around new interdisciplinary curricula and research programs.

Potential advantages: UC Davis administrative structure

As noted above, reconfiguration into CNS and DSS+HArCS units would effectively rebalance campus undergraduate colleges in terms of size, while keeping their overall number unchanged. Aside from refocusing the relative administrative burdens and structures, this also might enhance resource allocation and transparency.

Further considerations

A new CNS would impact CL&S in many ways. Imagining these impacts and their solutions is beyond the scope of our task, and would need to be considered carefully by the faculty and administrators involved.

A new CNS might be more than just the merger of existing CBS and MPS units. Integration at the departmental level could, for example, involve select faculty in the departments of Chemistry, Molecular & Cellular Biology, and other units. Indeed, many universities nationwide have formed departments, with names like Chemistry & Biochemistry or Chemical Biology, not only to foster collaboration, but also to deliver a modern, integrated curriculum (note that the Biochemistry & Molecular Biology major program accounts for approximately 1,000 students; **Table 3**).

Summary

The goal for this exercise is to present a simple scenario, imagining possible benefits and challenges, to help stimulate and perhaps guide further discussions.

Formation of a College of Natural Sciences, unquestionably challenging, might nevertheless provide several benefits. Especially deserving of attention are (1) the natural affinity between physical and biological sciences; (2) enhanced "new biology" research efforts; and (3) development of integrated biological sciences curricula for the 21st century.

References

- (1) National Research Council (2009) *A new biology for the 21st ventury. Ensuring the United States leads the coming biology revolution.* www.nap.edu/catalog/12764.html
- (2) National Research Council (2009) *Research at the intersection of the physical and life sciences.* www.nap.edu/catalog/12809.html
- (3) Dienstag, J. L. (2008) *Relevance and rigor in premedical education.* N. Engl. J. Med. **359**:221-224.
- (4) Association of American Medical Colleges and Howard Hughes Medical Institute (2009) *Scientific foundations for future physicians. Report of the AAMC-HHMI committee.* www.hhmi.org/sites/default/files/Programs%20and%20Opportunities/aamc-hhmi-2009-report.pdf
- (5) Gruebele, M., and D. Thirumalai (2013) Perspective: Reaches of chemical physics in biology. J. Chem. Phys. **139**:121701.

Table 1. MPS courses required for Biology students

Course	Title	Units
Biological Sciences B.S. (about 35% of all CBS students)[†]:		
CHE 2 ABC	General Chemistry [‡]	5+5+5
CHE 8 AB	Organic Chemistry: Brief Course [‡]	2+4
~OR~		
CHE 118 ABC	Organic Chemistry for Health and Life Sciences [‡]	4+4+4
MAT 17 ABC	Calculus for Biology and Medicine	4+4+4
~OR~		
MAT 21 AB(C)*	Calculus	4+4+(4)*
PHY 7 ABC	General Physics [‡]	4+4+4
STA 100	Applied Statistics for Biological Sciences	4
TOTAL		45-55
Biochemistry and Molecular Biology B.S. (about 20% of all CBS students):		
CHE 2 ABC	General Chemistry [‡]	5+5+5
CHE 107 AB	Physical Chemistry for the Life Sciences	3+3
CHE 118 ABC	Organic Chemistry for Health and Life Sciences [‡]	4+4+4
~OR~		
CHE 128 ABC	Organic Chemistry	3+3+3
CHE 129 AB	Organic Chemistry Laboratory [‡]	2+2
MAT 17 ABC	Calculus for Biology and Medicine	4+4+4
~OR~		
MAT 21 AB(C)*	Calculus	4+4+(4)*
PHY 7 ABC	General Physics [‡]	4+4+4
STA 100	Applied Statistics for Biological Sciences	4
~OR~		
STA 130 AB	Mathematical Statistics: Brief Course	4+4
TOTAL		57-66

* Recommended

[†] Requirements for most other B.S. major programs are identical or very similar[‡] Includes laboratory

Table 2. CBS courses required for all Biology students

Course	Title	Units
BIS 2 A	Intro. to Biology: Essentials of Life on Earth	4
BIS 2 B	Intro. to Biology: Principles of Ecology and Evolution [‡]	5
BIS 2 C	Intro. to Biology: Biodiversity and the Tree of Life [‡]	5
BIS 101	Genes and Gene Expression	4
BIS 102	Structure and Function of Biomolecules	3
BIS 103	Bioenergetics and Metabolism	3
~OR~		
BIS 105	Biomolecules and Metabolism	3
BIS 104	Cell Biology	3
TOTAL		24-27

[‡] Includes laboratory

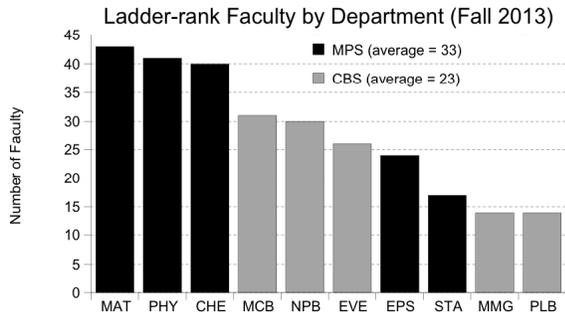
Table 3. Undergraduate major programs in CBS*

Major	Enrollment	% of Total [†]
Biochemistry and Molecular Biology	1,073	20.0
Biological Sciences	1,804	33.6
Cell Biology	135	2.5
Evolution, Ecology, and Biodiversity	75	1.4
Exercise Biology	598	11.2
Genetics	234	4.4
Microbiology	158	3.0
Neurobiology, Physiology, and Behavior	778	14.5
Plant Biology	26	0.5
Undeclared Life Sciences	479	8.9
Total Enrollment	5,360	100

* The vast majority of students complete the B.S. degree

[†] Source: CBS "Facts and Distinctions," 2012

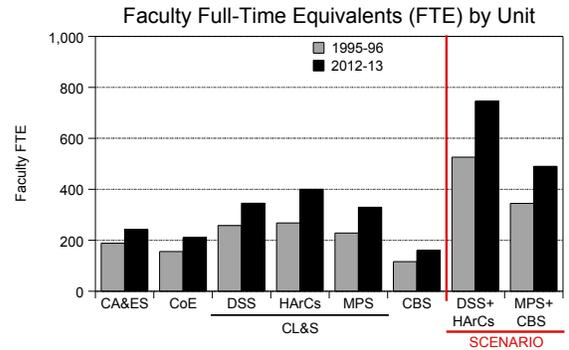
Fig. 1



Data from inspection of departmental web sites

Valley Stewart, 9 October 2013

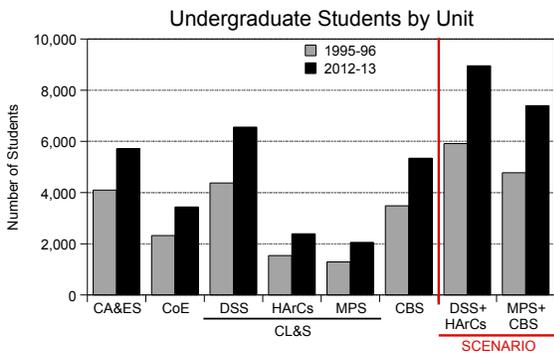
Fig. 2



Data from: MPS Steering Committee Report to the Academic Organization Task Force (09/25/13)

Valley Stewart, 9 October 2013

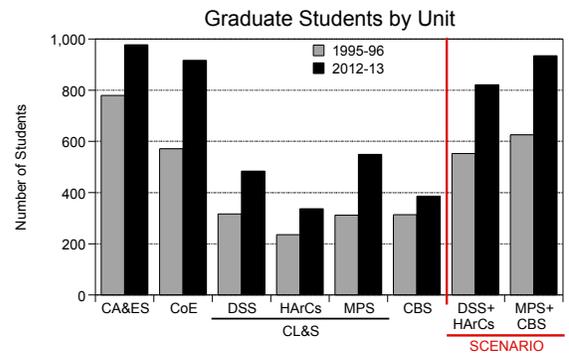
Fig. 3



Data from: MPS Steering Committee Report to the Academic Organization Task Force (09/25/13)

Valley Stewart, 9 October 2013

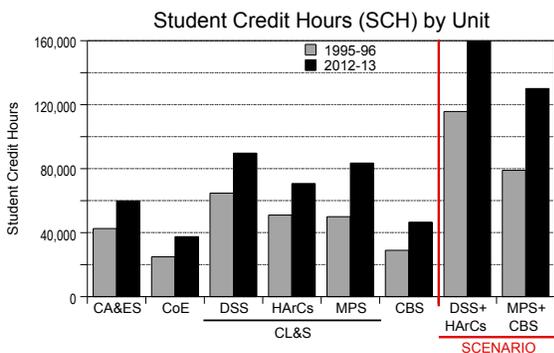
Fig. 4



Data from: MPS Steering Committee Report to the Academic Organization Task Force (09/25/13)

Valley Stewart, 9 October 2013

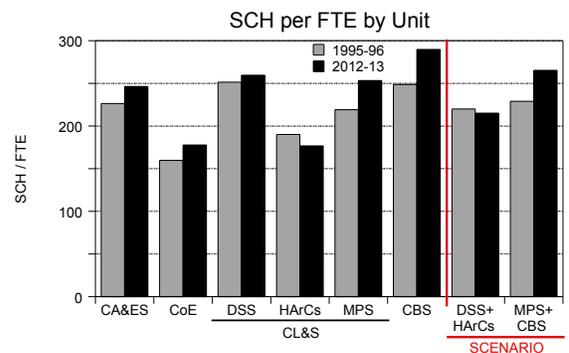
Fig. 5



Data from: MPS Steering Committee Report to the Academic Organization Task Force (09/25/13)

Valley Stewart, 9 October 2013

Fig. 6



Data from: MPS Steering Committee Report to the Academic Organization Task Force (09/25/13)

Valley Stewart, 9 October 2013

Appendix E: Organizational Options for HArCS and SS if MPS Becomes an Independent College

Chris Reynolds, Joseph Sorensen and Jesse Drew

Presented to the AOTF on January 13, 2014

In the comments that follow, we present arguments in favor of two different organizational possibilities: combining SS and HArCS into one college, and keeping them separate, either as separate colleges or as separate divisions within a broader college of Letters and Sciences. We have not articulated arguments against the opposing options.

There are four plausible organizational options if MPS separates from L&S:

1. HArCS and SS become independent colleges, with units maintaining their current divisional homes. This option would pose fewer challenges than the following options, each of which would require extensive faculty discussion, with individual units and/or in the Representative Assembly.
2. HArCS and SS become independent colleges, with units realigning, as for example with Cultural Studies moving to Social Sciences and History moving to HArCS. While there was some discussion of Cultural Studies being a part of Social Sciences in the mid-1990s when L&S moved from one Dean to three, several of the units in Hart Hall have hired faculty whose expertise is clearly humanistic, so it is not clear that all units would easily find an intellectual home in Social Sciences.
3. HArCS and SS combine
4. Humanities, Cultural Studies and SS combine, the Arts become an independent college. This last option would make less sense, because universities in which this model exists (such as Penn State) have much larger arts departments.

We did not discuss a fifth option of maintaining three deans within L&S but adding a fourth dean of L&S over them, a model in place at Berkeley and many other large state universities, because this model requires that MPS remain a part of L&S, a possibility that, whatever the likelihood, was not in our charge as a subcommittee to discuss.

Current Opinions

The deans of SS, HArCS, and MPS each favor independent colleges, as they indicated in their visits to our committee. Current opinion among faculty is diverse and largely uninformed about the pros and cons of a combined SS/HArCS College or separate colleges. Wide discussions would be needed for faculty to be aware of implications for teaching, research, and administrative efficiency.

Possible Advantages of Combining HArCS and SS

Some possible advantages affect undergraduate education. Many majors and double majors come from an undergraduate undeclared pool. Keeping this pool open, not segregated by college, may enable students more easily to find majors that fit them and complementary dual majors. Second, a combined college might also have a streamlined administration with single dean (plus associates and assistants), staff, advising, admissions personnel, etc. This may provide a more efficient administrative structure than the separate colleges model. And third, a combined college would encourage the pooling of resources, rather than encourage the competition for numbers that the new budget model all but necessitates. One example exists in some Sproul Hall language units, where as many as half of the students major in East Asian Studies, International Relations, or other units in SS. Since the number of majors constitutes a large component of the budget model, many perceive it as unfair that language units are serving students who never get counted as majors.

Many of those who favor a SS/HArCS combination point to the often arbitrary nature of departments assigned to either division. Many faculty in the arts, for example, also work in the fields of sociology, history, anthropology, philosophy, etc. Some faculty point out that having work split between two divisions does not make pedagogical or academic sense. When thinking though the various possible realignments of the university, bringing these disciplines into the same unit is appealing. Furthermore, the trend in higher education is towards interdisciplinarity, and combining these divisions furthers that goal.

A combined college would mean a larger pool of students and greater opportunity to double major in “natural” pairs that currently go across divisions:

- Foreign Languages & Linguistics
- Foreign Languages & International Relations
- Asian Languages & East Asian Studies
- Foreign Languages & other Area Studies in Sociology, Anthropology, History, Art History, etc.

The possibility of synergies at the graduate level is evident at Penn State, where there is a dual-title Ph.D. program: <http://agsci.psu.edu/graduatestudents/programs/dual-title-degree-programs>. This program has proven to be popular with prospective graduate students, and to culminate in degrees that help graduates find jobs. The dual-title degree in Women Studies brings together courses and faculty from 18 departments in five colleges.

Strengths of Separate Colleges of HArCS and SS

A model in which SS and HArCS become separate colleges (or remain in L&S with their deans) may provide leadership that is better able to understand and represent departmental needs and

interests in hiring, external grant applications, and development efforts. In the coming years of hirings in the push to 2020, having a social scientist and a humanist at the head of their respective colleges (or divisions) will provide informed leadership that a combined SS and HArCS would not allow for. For a single dean of SS and HArCS to supervise the number of new and replacement hires in the next six years would mean that time for other significant responsibilities, such as development and grant writing, would be curtailed. The disciplinary gulf between the arts and literature on the one hand, and psychology or economics on the other hand, is beyond any one person to bridge. The dean of HArCS already has a strenuous job with well over 20 units and some 400 faculty FTE.

Separate senate Executive Committees for HArCS and SS will promote informed shared governance for both. This is now being acknowledged in the separate steering committees being formed to supplement the L&S Executive Committee.

The overwhelming majority of our R-1 peer institutions separate SS and Humanities (and include the arts with Humanities). Institutions with SS and Humanities combined include the following, most of which do not strive to achieve the kinds of excellence in research that we take for granted, nor do they attract students who are competitive with those we admit:

- UC Riverside and UC Merced
- Brooklyn College
- Carnegie Mellon
- Indiana U of Pennsylvania
- Louisiana State University
- Northeastern University
- U of Arkansas, Fort Smith
- U of Indiana, Kokomo
- U of Indiana, East
- U of Indiana – Purdue
- Utah State University

Instead, our peer institutions are those in which SS and Humanities (+ Arts) have their own deans, either heading separate colleges or divisions within L&S. These include:

- All UCs (other than UCR and UCM)
- CUNY
- BYU
- Rice University
- U of Arizona
- U of Illinois, Champaign-Urbana

- U of Indiana, Bloomington
- U of Massachusetts, Amherst
- U of Michigan, Ann Arbor
- U of North Carolina, Chapel Hill
- U of Wisconsin, Madison

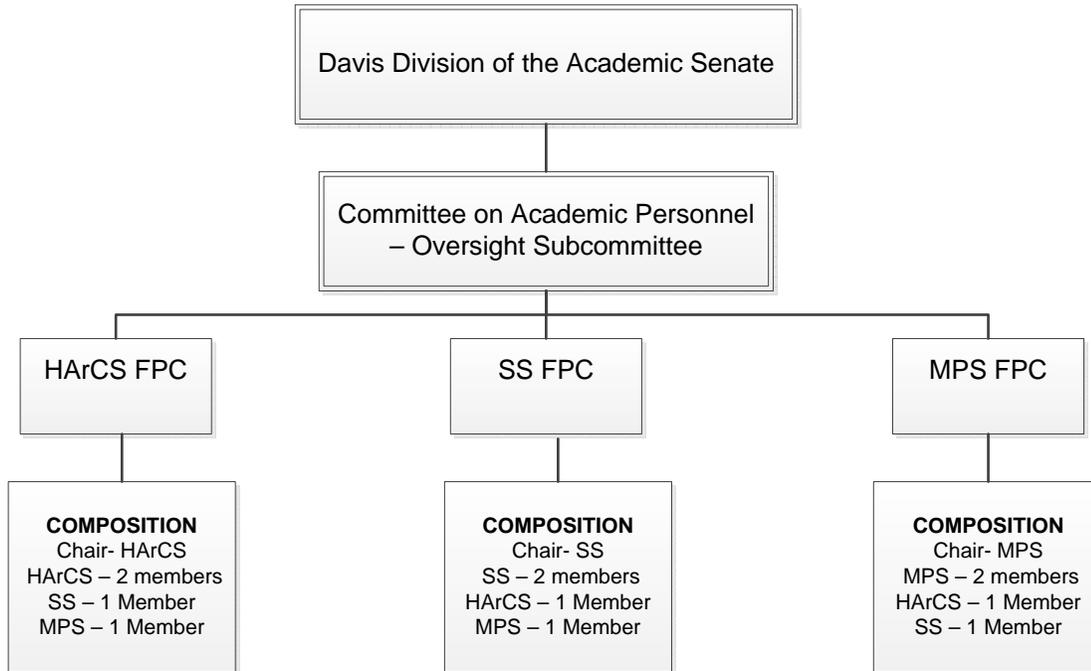
In the past seven years HArCS and SS have benefited in several very tangible ways by having deans that are recognized nationally in their fields.

Recent benefits to HArCS from having a humanist dean include several Mellon Foundation awards, totaling \$2.48 million (as of 1/2014). These fund Mellon Research Initiatives, New Directions Fellowships, etc. The four Mellon Research Initiatives represent cutting edge interdisciplinary clusters, drawing on scholars from across the campus and include Early Modern Studies, Environments & Societies, Digital Cultures, and (In)Security and Social Justice. To secure this funding, Dean Owens made 5 trips to the Mellon Foundation in NYC to help argue our merits. Moreover, in 2012 UCD received an invitation to join the consortium of the ACLS, a distinct honor. In the UC system, only UCB, UCLA, and UCSB have received this invitation. Among the other 28 invited members are Harvard, Princeton, Yale, and Chicago. ACLS President Pauline Yu cited “the conspicuous success of UCD Humanities scholars in recent ACLS selections.”

Finally, the total fundraising for HArCS in last 7 years exceeds \$35 million.

These successes contribute substantially to the national standing of the university as a whole and they are not achievements a social scientist at the head of a combined college would have been able to achieve, first of all for lack of time, second because the ability to present a successful proposal requires a dean close enough to the fields to be persuasive.

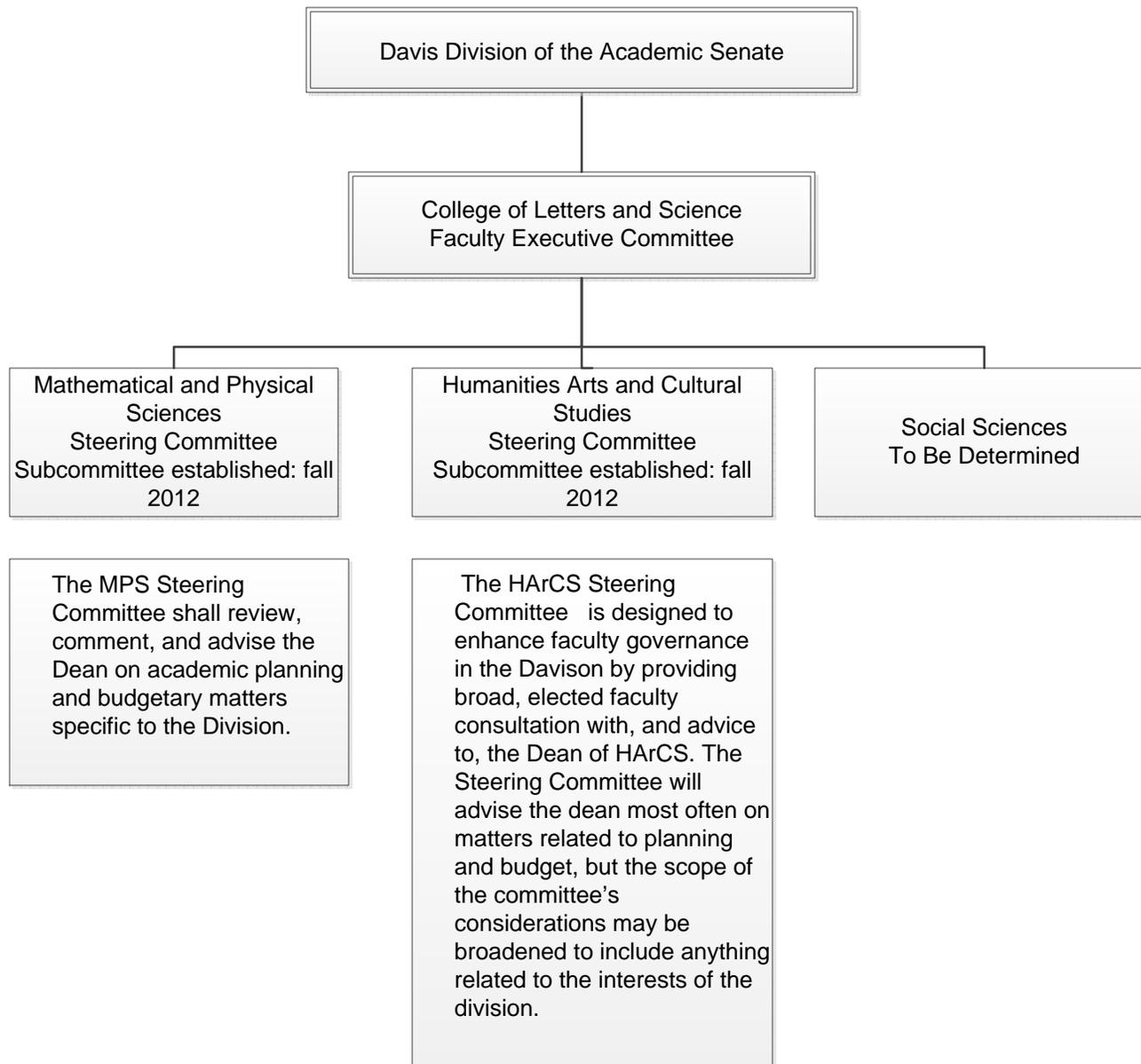
College of Letters and Science
Faculty Personnel Committee Structure



Distribution of Personnel Transactions:

- Nine total Academic Senate members participate in the L&S Faculty Personnel Committee structure (3 Academic Senate members from each Division).
- The FPC Chair serves on one committee (home FPC).
- FPC members serve on two committees to assure interdisciplinary peer review: 1) Home FPC and 2) FPC for another Division (example: One MPS member serves on the MPS FPC and the HArCS FPC.) Each FPC meets every third week to assure the members have only one FPC meeting each week.

College of Letters and Science
Subcommittees: Divisional Steering Committee



College of Letters and Science
Divisional Steering Committee Charges

Humanities Arts & Cultural Studies Division

“The Committee will have a total of 6 elected representatives. Four will be elected by the faculty in the four administrative units in HArCS: the Arts, Hart Hall, Sproul Hall and Voorhies. An additional representative will be elected from among the graduate programs (currently represented by the graduate assembly). Finally, a sixth representative will be elected by programs with 5 FTE or fewer. These six elected representatives will be joined by the two representatives from HArCS who serve on the L&S Faculty Executive Committee (L&S FEC) for a total of 8 members. The Steering Committee will select its own chair.

In cases in which the chair or vice chair of the L&S FEC is from HArCS, that person may serve in an ex officio capacity on the committee. At the suggestion of Dean Owens the FEC agreed that the Divisional Dean would also be an ex officio member.”

Mathematical & Physical Sciences Division

“The MPS-Steering Committee is a subcommittee of the College of Letters and Science (L&S) Executive Committee. The proposed Steering Committee structure consists of the two MPS members of the College of Letters and Science (L&S) Executive Committee, in addition to one member from each department of the Division of MPS, selected by the faculty of that department (with a two-year term), the Dean, Assistant Dean, and Faculty Assistant to the Dean of MPS. The Dean, Assistant Dean, and Faculty Assistant to the Dean will serve as non-voting *ex officio*. A Chair and a Vice Chair/ Secretary would be nominated by the two MPS members of the L & S executive committee from among the 5 department representative members.

- A. The Steering Committee shall review, comment, and advise the Dean on academic planning and budgetary matters specific to the Division.
- B. The MPS-Steering Committee shall meet as often as necessary, but not less than once per academic quarter.
- C. A majority of the Steering Committee membership, excluding vacancies noted in the records of the Vice Chair shall constitute a quorum for the transaction of business by the Steering Committee. There shall be no votes by proxy.”

Report on Students in the College of Letters and Science
G. J. Matthey
December 20, 2013

Background

This report was commissioned by the Academic Organization Task Force. Statistics are drawn from data provided by the office of the Vice Chancellor for Undergraduate Studies.

The purpose of the report is to provide, to the extent possible, answers to three questions:

- What are the pathways by which undergraduate students enter L&S?
- Once in L&S, how do the students traverse through the three divisions to where they eventually graduate?
- How long does it take a student to graduate?

Pathways into L&S

This section tracks students entering undergraduate programs on the campus in the period beginning Fall of 2007 through Fall of 2012, excluding a very small number who entered in quarters other than Fall.

Students Entering Campus Fall Quarter 2007-2012			
Entry level	All Students	L&S Students	
Freshman	28,537	10,936	38.32%
Transfer	13,437	7,360	54.77%
Total	41,974	18,296	43.59%

Students who entered UC Davis in an L&S major did so in the following Divisions (with rounded percentages of the total).

First L&S Division						
Entry-Point	Division of Entry					
	HaRCS		DSS		MPS	
Freshman	2,798	25.59%	5,477	49.81%	2,691	24.61%
Transfer	1,317	17.89%	4,943	67.16%	1,100	14.94%

Comment: DSS students account for nearly half of all Freshmen entering L&S and over two-thirds of transfer students entering L&S.

The following figures show students who either added a major in L&S, changed majors into L&S from a non-L&S major, or did neither. (Due to multiple majors, the number listed is greater than the total

number of students. Also, the numbers list only the first time an addition or change of majors took place, so triple majors or multiple changes of major are not counted.)

Movement into L&S Majors						
	Added L&S Major		Switched from Non-L&S to L&S Major		Neither Added nor Switched to L&S from Non-L&S Major	
Freshman	1,835	6.40%	2,868	10.00%	23,968	83.60%
Transfer	542	3.64%	689	4.63%	13,639	91.72%

Comment: 10% of all students who entered as Freshmen moved from outside of L&S to L&S.

For Freshmen and transfer students listed in the above table who added an L&S major or switched from a non-L&S major to an L&S Major, the number of months after entry to UC Davis when a change was made is tracked. There is substantial clustering of months in which changes were made. The following tables give the percentages of additions and switches made in the years after entry (months 1-11, 12-23, 24-35, etc.).

Percentage of Total Students Who Added L&S Major, by Year					
	Year 1	Year 2	Year 3	Year 4	Years 5+
Freshman	.54%	8.66%	45.36%	38.04%	7.19%
Transfer	10.7%	26.01%	38.19%	22.51%	2.58%

Comment: The bulk of the addition of L&S majors is done by students in their third and fourth years by entering Freshmen and in their second and third years by entering transfer students.

The following percentages

Percentage of Total Students Who Switched from a Non-L&S to an L&S Major, by Year					
	Year 1	Year 2	Year 3	Year 4	Years 5+
Freshman	19.60%	30.16%	32.08%	13.18%	4.99%
Transfer	42.67%	20.03%	22.06%	10.74%	4.50%

Comment: The bulk of switches into L&S by entering Freshmen occurs during the second and third years, peaking in the second year, while for transfer students a very high percentage transfer in the first year, with roughly half as many in the second and third years.

The point of entry and college of origin for students switching from a non-L&S to an L&S Major is given here for single-majors only.

Students Starting as Freshmen with a non-L&S Major and Switching to an L&S Major			
College of Origin	Division of Entry		
	HaRCS	DSS	MPS
A&ES	252	731	98
Biological Sciences	281	736	94
Engineering	82	201	209

Comment: DSS is the destination of choice for students transferring from A&ES or Biological Sciences, and the smaller percentages moving to HaRCS and MPS are roughly equal, with more than twice as many opting for HaRCS. Engineering students are about equally inclined to transfer to DSS or MPS, with very few transferring to a HaRCS major.

Transfer Students Starting with a non-L&S Major and Switching to an L&S Major			
College of Origin	Division of Entry		
	HarCS	DSS	MPS
A&ES	32	99	20
Biological Sciences	10	86	39
Engineering	0	13	10

Comment: The Division of Social Sciences is the dominant entry-point, with the exception that students leaving Engineering only slightly favored DSS over MPS.

Point of Origin for Students Starting with Non-L&S Major and Adding L&S Major			
Entry-point	College of Origin		
	A&ES	Biological Sciences	Engineering
Freshman	156	139	4
Transfer	26	39	1

These figures include multiple majors and so do not track the actual number of students.

Pathways Within and Out of L&S

Until otherwise noted, the data-sets are taken from graduates in Spring, 2013.

The following two tables show the number of majors per student, based on their point of entry into the campus and on their Division within L&S or major in a non-L&S College.

Number of Majors, by Entry-Point							
Entry-Point	Majors						
	Single		Double		Triple		Total
Freshman	710	62.23%	422	36.99%	9	.79%	1,141
Transfer	746	92.08%	65	7.92%	0	0%	821

Comment: Very few multiple majors are added by transfer students, while nearly 37% are added by students who entered as Freshmen.

The number of majors is broken down by non-L&S colleges and L&S divisions. (Triple majors are combined with double majors.)

Number of Majors, by First Major						
First Major	Majors					
	Single		Double		Triple	
Non-L&S	327	69.13%	144	30.44%	2	0.42%
HaRCS	253	75.30%	81	24.11%	2	0.59%
DSS	678	74.59%	226	24.86%	5	0.55%
MPS	206	85.12%	36	14.88%	0	0.00%

Comment: Multiple majors are more common in the non-L&S Colleges and are about equally common with HaRCS and DSS, with by far the fewest in MPS.

The addition of majors to an L&S first major is shown in the following table.

Addition of Majors to an L&S First Major								
First Major	Division/College of Additional Major							
	HaRCS		DSS		MPS		non-L&S	
HaRCS	27	13.5%	150	75.00%	4	2.00%	19	9.5%
DSS	150	40.54%	151	40.81%	13	3.51%	56	15.4%
MPS	4	14.29%	13	46.43%	4	14.29%	7	25%

Comment: DSS is the clear choice for students from HaRCS and MPS adding a further major. DSS students are about equally likely to add a major in their home Division or in HaRCS.

The following table shows the number of students who started in a Division and ended in a different Division or another College. Double majors are counted twice if both are in another Division or College, with number of double-counted in parentheses).

Migration Out of L&S Divisions				
Start Division	End Division			
	HaRCS	DSS	MPS	non-L&S
HaRCS	124	62	3 (1)	3 (1)
DSS	25	359	14 (3)	3 (3)
MPS	8	45 (5)	81	5 (5)

Time to Degree

The numbers in the following tables are indicate total calendar months to degree.

Average Time to Degree for Single Majors		
HaRCS	DSS	MPS
45.9	45.5	44.9

In months, with percentage of time versus the average time for the baseline major. The total number of students is given in parentheses.

Average Time to Degree for Double Majors								
Baseline Major for Comparison	Division/College of Additional Major							
	HaRCS		DSS		MPS		non-L&S	
HaRCS	44.6 (27)	-2.47%	44 (145)	-4.07%	44 (4)	-4.18%	45.7 (19)	-0.51%
DSS	44 (145)	-3.28%	43.4 (147)	-4.7%	46.5 (13)	2.19%	44.7 (56)	-1.78%
MPS	44 (4)	-2.1%	46.5 (13)	3.55%	50 (4)	11.26%	41.0 (7)	-8.77%

Comment: In most cases, students with double majors received their degrees in a shorter time than students with a single major. This is most strikingly the case with MPS majors with a major in another college, who finished 8.77% faster than MPS single majors. The only slow-downs occur with double MPS majors and MPS/DSS majors. Note that the numbers in the most anomolous cases are very small. In the case of cross-college majors, the average time to degree was faster than for students with single L&S majors.

Average Time to Degree of Triple Majors				
Baseline Major	DSS + DSS + HaRCS		DSS + DSS + DSS	
DSS	48.2 (5)	5.84%	44 (4)	-3.28%
HaRCS	48.2 (5)	4.97%		

Comment: High-achieving triple majors did not add much time to their degree or even took less time.

In the following table, data are once again taken from students who entered the campus from Fall of 2007 through Fall of 2013 and have graduated. What is shown is the average time to degree for students with a single major who entered in a Division of L&S and who graduated in either the same or a different Division of L&S (total number of students in parentheses). Percentages indicate deviation in average time from that of students remaining within their division.

Average Time to Degree for Single-Major Students in Divisions in L&S						
Starting Division	Ending Division					
	HaRCS		DSS		MPS	
HaRCS	43.6 (67)	0%	49.0 (48)	12.4%	53 (3)	21.6%
DSS	48.3 (23)	10.3%	43.8 (178)	0%	43.7 (9)	-0.3%
MPS	43.4 (5)	-0.2%	49.5 (43)	13.8%	43.5 (68)	0%

Comment: Average time to degree for single-major students is almost identical across the three Divisions. Movement from HaRCS students and MPS students to DSS and from DSS into HaRCS is roughly similar, adding from 10.3 to 13.8% extra time. Movement from HaRCS students to MPS resulted in the longest delay, with a very small sample. DSS students moving to MPS and MPS students moving to HaRCS resulted in a slight decrease in time to degree, again with small numbers.